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ABOUT COVER

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Management of cancer patients during COVID-19 pandemic at developing countries

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Abstract

Cancer patient care requires a multi-disciplinary approach and multiple medical and ethical considerations. Clinical care during a pandemic health crisis requires prioritising the use of resources for patients with a greater chance of survival, especially in developing countries. The coronavirus disease 2019 crisis has generated new challenges given that cancer patients are normally not prioritised for admission in critical care units. Nevertheless, the development of new cancer drugs and novel adjuvant/neoadjuvant protocols has dramatically improved the prognosis of cancer patients, resulting in a more complex decision-making when prioritising intensive care in pandemic times. In this context, it is essential to establish an effective and transparent communication between the oncology team, critical care, and emergency units to make the best decisions, considering the principles of justice and charity. Concurrently, cancer treatment protocols must be adapted to prioritise according to oncologic response and prognosis. Communication technologies are powerful tools to optimise cancer care during pandemics, and we must adapt quickly to this new scenario of clinical care and teaching. In this new challenging pandemic scenario, multi-disciplinary work and effective communication between clinics, technology, science, and ethics is the key to optimising clinical care of cancer patients.

Key words: Cancer; Oncology; Pandemic; COVID-19; SARS-CoV-2

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Core tip: Pandemics such as coronavirus disease 2019 (COVID-19) create new challenges in care of cancer patients, what makes necessary adapt the resources to be used, and consider the risk-benefit balance of cancer therapies. This review establishes a perspective on how COVID-19 pandemic affect cancer patients, and a proposal for managing these patients at developing countries.

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INTRODUCTION

In all of mankind history, humanity has experienced multiple health catastrophes caused by wars and famines. Pandemics have a special place in health catastrophes. The bloodiest were the bubonic plague during the 13th and 14th centuries and the Spanish flu during the 20th century. The coronavirus disease 2019 (COVID-19) pandemic has generated an unprecedented health crisis, challenging all health systems in every country of the world. This pandemic has led to large health expenditures, and the prioritisation of clinical care and resources for patients with the best prognosis. In this context, cancer patients may be displaced from priority of care^[1], making it necessary to create specific protocols for cancer patients. During the last ten years, there has been a revolution in cancer therapies. The development of immunotherapy, molecular targeted therapies, and new techniques of radiotherapy and surgery has led to an improvement in the survival and quality of life of these patients. The improvement in survival of cancer patients has led to more frequent medical complications, frequent admissions to critical care units, and sometimes transitory requirements of artificial life support, with good survival outcomes after critical care. For all these reasons, even in pandemics, it is necessary to consider cancer patients at the time of prioritising care during health crisis.

Historically, cancer has been associated with a poor vital prognosis and quality of life because of its related morbidity and high short-term mortality. In advanced or metastatic stages, cancer was treated with cytotoxic chemotherapy and resulted in low response rates and a large number of adverse events which could often be serious^[2]. In the last decade, the development of immunotherapy (with check point inhibitors) and molecular targeted therapies has generated a revolution in cancer management. The survival of cancer patients including those in metastatic stages has multiplied by several times^[3]. Molecular targeted therapies have been administered in multiple clinical settings *e.g.*, BRAF and MEK inhibitors have tripled survival in metastatic melanomas^[4]. In colorectal cancer, epidermal growth factor receptor (EGFR) inhibitor therapies have doubled overall survival of some patients^[5]. Vascular endothelial growth factor (VEGF) and VEGF-receptor inhibitors have improved survival in multiple types of cancer, such as colorectal, gastric, breast, ovarian, and endometrial cancer, among many others^[6]. The development of tyrosine kinase inhibitors has been applied in multiple types of tumours. The most successful cases have been its administration in renal cell cancer, hepatocellular carcinoma, refractory colorectal cancer, and kidney cancer, among many others^[7].

Immunotherapy has led to a historical revolution in cancer management. The development of check point inhibitors, such as programmed cell death protein 1 (PD-1), PD-1 ligand (PDL-1), and cytotoxic T-lymphocyte-associated protein 4 (CTLA-4) inhibitors has improved the survival of patients with tumours with a high mutational burden^[8]. The first type of tumour where immunotherapy was successfully administered was melanoma, initially with CTLA-4 inhibitors and then with PD-1 inhibitors, significantly improving the survival of these patients^[9]. Currently, combination immunotherapy treatment has made dramatic progress in the long-term survival of these patients^[10]. Other tumours where these therapies have been successfully administered are non-small cell lung cancer, kidney cancer, and more recently, triple-negative metastatic breast cancer^[11], among many others. The

development of these therapies has generated a true revolution in the management of cancer patients. Even when patients have metastatic disease, these new therapies are capable of ostensibly improving the survival and quality of life^[12], while creating other challenges in cancer treatment that need to be solved, such as the management of long-term oncological complications and adverse reactions to these novel therapies.

Despite the fact that patients with metastatic cancer had an indication for being admitted into the intensive care units, it was not so because of their predicted poor prognosis^[13]. The development of new oncology therapies has improved survival in cancer patients, and therefore, increased the probability of developing medical complications requiring admission to the ICU, such as intestinal obstruction, infections, respiratory failure, acute kidney injury, among others, and complications associated with cancer treatment^[14]. It has been proven that patients with even advanced stage of cancer who have control over their disease through oncological treatment, *i.e.*, having stable disease or partial/complete response as well as acute medical morbidities have a similar prognosis as patients without cancer and admitted to the ICU^[15]. There have been multiple reports about the survival of cancer patients hospitalised in the ICU^[16-19]. The change in the prognosis of cancer patients and the improvement of their prognosis after critical care hospitalisation opens the challenging scenario of evaluating the risk-benefit balance of advanced life support and prioritisation of medical resources, especially in a complex scenario as a pandemic. In several countries, the COVID-19 crisis has forced physicians to choose patients to be admitted to ICUs. In this context, some cancer patients, even in the metastatic stage, should also be considered when prioritising critical care^[20].

CANCER PATIENTS IN PANDEMIC

During the last century, there have been major pandemics that have challenged health systems. The A(H1N1) pandemic, Severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS) outbreaks previously revealed the challenges that health systems must face in the event of a large-scale pandemic, and this has now become more evident in the COVID-19 pandemic.

Historical aspects

A(H1N1): The A(H1N1) flu was declared on June 11, 2009 by the World Health Organization (WHO) as the first pandemic in the 21st century due to its rapid spread around the world^[21]. The first cases were reported in Mexico as atypical pneumonia in 2009^[22]. Subsequent reports showed a rapid trend towards saturation of critically ill units with patients with respiratory problems^[23-25]. During the pandemic, there was unprecedented coordination of the global medical and public health community to reduce the impact of a problem with potential lethality and morbidity^[23]. It is estimated that the mortality associated with the 2009 influenza pandemic during the first 5 years was 151700-575400 patients as a result of respiratory and cardiovascular deaths^[26], which would be far from the Spanish flu pandemic that is estimated to have caused a mortality of millions of people^[27,28].

Seasonal influenza has had an important impact in cancer patient mortality even before the pandemic. It has been described that they have a ten-times risk of death than the general population^[29]. There is a concern about the outcomes of cancer patients during the pandemic since cancer patients have a higher risk for influenza complications whether on chemotherapy or not such as parenchymal pulmonary compromise, bacterial infection, respiratory insufficiency, and sepsis^[30,31]. Cancer patients with the A(H1N1) flu have similar symptoms as the general population, but tend to have haematological abnormalities as anaemia, neutropenia or leukopenia^[32]. Different clinical series described that patients with solid or haematological tumours had a poor prognosis during the pandemic, such as increased hospitalization, bacterial infection, and death^[33-36]. In fact, it has been described that patients who received chemotherapy in the last month or had neutropenia on admission had fatal outcomes^[33,35]. Other risk factors for worse outcomes were a low albumin level and poor nutritional status^[34], which are very frequent in cancer patients. Another resulting problem from the pandemic was an interruption of chemotherapy^[37].

A potent strategy to avoid infections in the years following the pandemic was periodic immunization of these high-risk patients^[38,39], which was effective in preventing nosocomial outbreaks^[40]. There are lessons following the 2009 influenza pandemic that need to be taken into consideration for cancer patients for next pandemic: It necessary a rapid response and massive diversification of scientific

information in crisis preparation, with the final objectives to ameliorate cancer poor outcomes due to immunosuppression status and lack of access to anti-cancer treatments during time is ongoing the pandemic.

SARS and MERS: SARS and MERS are two major coronavirus outbreaks in the last 20 years prior to the COVID-19 pandemic. The first report of SARS was in the Guangdong province of China in November 2002, and it spread later to Vietnam, Canada, and Hong Kong^[41]. The first reports of MERS was in Saudi Arabia in 2012, and it became an endemic zoonosis in the Middle East^[42]. Both diseases quickly caught the attention of the public health community due to their high mortality rates, and nosocomial transmission to health care workers and patients^[42-44]. They have a similar clinical presentation ranging from no symptoms to pneumonia, and in more severe cases, respiratory failure^[45]. Although both require a large amount of resources in the ICU, there are differences in the severity of both pathologies. It is estimated that 20%-30% of the patients with SARS and 50%-89% of patients with MERS will require ICU hospitalization^[43,45-47]. According to WHO, the MERS case fatality rate was 34% and for SARS 10%^[48,49].

It has been described that the presence of comorbidities, such as cancer increases the risk of poor outcomes in SARS patients^[43], but there exist only few patients with cancer affected by SARS. In the case of MERS, a meta-analysis found that immunosuppressed patients and patients with the human immunodeficiency virus (HIV) have poor clinical outcomes^[50]. In a retrospective analysis, cancer patients showed an 80% admission rate to the ICU and 84% mortality rates. Mortality rates could reach 100% in advanced solid tumours and haematologic neoplasms, but in this study only hospitalised patients were included and the sample size was small (19 patients)^[51]. Despite the high mortality rates of these diseases, it was possible to control their worldwide spread given the rapid action of the authorities to track and isolate contacts^[52]. We theorise that patients with a high risk due to immunosuppression, such as cancer probably do not show worse outcomes due to a low number of cases despite a high severity of both infections. This prevented the discussion of prioritisation of critical care resources for patients with malignancies which is a relevant issue in the times of another coronavirus crisis by SARS coronavirus 2 (SARS-CoV-2).

SARS-CoV-2 pandemic

In December 2019 in Wuhan, Hubei Province, China, rare cases of unknown pneumonia were reported to the local authorities that were related to the seafood and wet animal wholesale market^[53]. Subsequently, epidemiological and molecular data described a novel coronavirus and its genetic material was rapidly identified and described as similar to that detected in bats^[54]. This new virus was renamed recently to SARS-CoV-2 by the International Committee on Taxonomy of Viruses^[55], it was found to be related with SARS (79% similarity) and MERS (50% similarity)^[56,57]. The virus spread rapidly round the world and was declared a new pandemic by WHO on 11 March 2020^[58]. The clinical syndrome associated with SARS-CoV-2 infection was globally denominated COVID-19 (coronavirus disease). The high mortality rates are of public health concern. The estimated global mortality rate is 4.7%, and varies in different countries, *e.g.*, it is as low as 0.7% in Germany and as high as 10.8% in Italy^[59]. Another important preoccupation is the high use of critical care resources in COVID-19 patients. In a Chinese series, 5% to 32% of hospitalised patients required ICU^[60,61] and in an Italian series, 9% of the patients in ICU had a positive test^[62]. The problem of the lack of resources to treat critically ill patients became more obvious when nearly twenty million confirmed COVID-19 cases are registered by WHO (as at August 2020)^[63]. The discussion about the rationalization of critical resources for the care of patients with COVID-19 or other critical diseases during pandemics is a fact^[64-66], and that is undoubtedly affecting to cancer patients.

There are several clinical characteristics that are related to mortality in COVID-19 patients, including old age and the presence of chronic conditions, such as cardiovascular disease, diabetes, chronic respiratory disease, hypertension, and cancer^[67,68]. An estimated prevalence of cancer in a cohort of COVID-19 cases was 2% in a pooled meta-analysis^[69]. It has also been suggested that the incidence of COVID-19 in cancer patients could be greater than in the general population^[70]. Indeed, there is a concern about an immunosuppression status in patients with cancer and outcomes in COVID-19, which may increase due to treatments, such as chemotherapy and radiotherapy^[70]. In addition, there is no clarity about the optimal treatment for patients diagnosed with cancer requiring treatments such as surgery, chemotherapy, and radiotherapy which have been cancelled or rescheduled during this ongoing pandemic^[71]. Clinical symptoms of COVID-19 in cancer patients are similar as that of

the general population. These symptoms are fever, dry cough, fatigue, and dyspnoea, although anaemia and hypoproteinaemia are more frequent in cancer patients^[72]. Reports in Chinese patients have described that cancer patients have a 3.5 times higher risk for the need of ICU beds, mechanical ventilation, or death, compared to patients without cancer^[73,74]. Moreover, patients who have started chemotherapy or undergone surgery have more severe events (ICU, mechanical ventilation, or death)^[74]. Similarly, Zhang *et al*^[72] (2020) described that cancer patients who received oncologic therapies (chemotherapy, targeted therapy, radiotherapy, or immunotherapy) in the last 14 days developed more frequent severe adverse events. This series reported a 28.6% mortality rate in 28 cancer patients. Likewise, Dai *et al*^[75] observed a high mortality rate with the need of ICU and mechanical ventilation in 126 cancer patients compared to a matched sample of COVID-19 patients without cancer. In addition, Yang *et al*^[76] also reported a 20% mortality rate and in its cohorts is described that receiving chemotherapy 4 wk before symptoms onset and male sex are risk factors for fatal outcomes. A Major cohort from Cancer Consortium (CCC19) database includes 928 patients with COVID-19, reporting 13% death rate. Also, in this cohort older age, male sex, former smoking, two or more comorbidities, ECOG > 2 and active cancer status are described as risk factors for 30-d mortality. However, contrarily to other cohorts is not observed a worse prognostic with recent anti-cancer treatments^[77]. A special preoccupation has emerged in patients with thoracic malignancies and SARS-CoV-2 infection, an international collaboration The Thoracic Cancers International COVID-19 Collaboration (TERAVOLT) registry has recollected data in these patients showing higher mortality rate (33%). Risk factors for worse outcomes are similar to previous studies, such as more than 65 years old, current or former status, receiving chemotherapy alone and the presence of comorbidities in a univariate analysis, but in a multivariate analysis only smoking status was associated with mortality. Interestingly, admission to ICU was lower than other series, authors suggest a difficulty in ICU admission in the context of a lack of material and human resources^[78].

Recently, a report published by the Gustave Roussy Institute in 137 patients reported that the Eastern Cooperative Oncology Group (ECOG) performance status, cancer type, and prior cancer therapy can predict the risk of clinical worsening or death in cancer patients with COVID-19. The majority of cancer patients had active/metastatic disease (59%), and the remaining (41%) were in remission or had localised disease. The investigators reported that ECOG performance status > 1 (hazard ratio, HR 4.6), patients with hematologic malignancies (HR 2.7), and patients who received chemotherapy for their disease within the past 3 months had a higher risk for poor clinical outcome. Although prior chemotherapy correlated with a greater chance of clinical deterioration, treatment with immunotherapy or targeted agents in the past 3 mo did not^[79]. **Table 1** shows a summary of up-to-date retrospective published studies in cancer patients infected with SARS-CoV-2.

Although there is limited information about outcomes in cancer patients, previous reports suggest a complex scenario. In this line, guidelines and protocols are needed that can decrease the risks in cancer management in these pandemic times.

Cancer therapies during the pandemic

The current COVID-19 pandemic challenges oncologists to profoundly organise oncological care to reduce hospital visits and admissions, and therapy-induced immune-related complications without compromising cancer outcomes. The following section presents relevant information and publications regarding the management of cancer with different oncological therapies in the context of the COVID-19 pandemic, and in **Table 2**, we present a scheme for prioritisation of cancer therapies during pandemic.

Curative therapies: Curative therapies in cancer patients include surgery, adjuvant, and neoadjuvant protocols. Surgery has a pivotal role in the management of cancer, as a diagnostic, curative, and palliative tool. Surgeries are procedures with risks surgical complications, and non-surgical-associated complications (pneumonia, deep venous thromboembolism, respiratory insufficiency, and others), ICU admission, and death. Not all surgeries have the same risk. Breast cancer-related surgeries are associated with a 1.7% risk of readmission^[80], the readmission risk 2 weeks after a radical gastrectomy for gastric cancer was 3%^[81], 12% in lung cancer surgery^[82] and 20% after an oesophagectomy^[83]. Oncology surgeries require a huge amount of material, infrastructure, and human resources in a setting where there is a lack of materials^[1] or they are redistributed for COVID-19-related care. In this global pandemic wherein all cancer patients do not have a similar prognosis or prioritisation for surgery, many centres and professionals are redirected to triage patients. Many of the proposed

Table 1 Retrospective reports about cancer patients with severe acute respiratory syndrome coronavirus 2 infection

Ref.	n ¹	Mean age	Outcomes	Results
Liang <i>et al</i> ^[74] , 2020	18	63	Severe clinical events (ICU admission and mechanical ventilation or death)	Severe clinical events: 39% (7/18 patients) <i>vs</i> 8% (126/1572 patients without cancer) ($P = 0.0003$)
Zhang <i>et al</i> ^[72] , 2020	28	65	Severe clinical events (ICU admission, life-threatening complications or death)	Severe clinical events: 53.6% (15/28 patients). Death rate: 28.6% (8/28 patients)
Dai <i>et al</i> ^[75] , 2020	105	64	Death rate, ICU admission and severe or critical symptom	Death rate: 11.4% (OR 2.34, $P = 0.03$); ICU admission: 19.0% (OR 2.84, $P < 0.01$); Severe or critical symptom: 34.3% (OR 2.79, $P < 0.01$)
Barlesi <i>et al</i> ^[79] , 2020 ²	137	61	ICU admission or death	ICU admission: 11.0% (15/137 patients); Death rate: 14.6% (20/137patients)
Yang <i>et al</i> ^[76] , 2020	205	63	ICU admission or death	ICU admission: 15.0% (30/205 patients); Death rate: 20.0% (40/205 patients)
Kuderer <i>et al</i> ^[77] , 2020	928	66	ICU admission, mechanical ventilation or death	ICU admission: 14.2% (132/928 patients); Mechanical ventilation: 12.5% (116/928 patients); Death rate: 13.0% (121/928patients)
Garassino <i>et al</i> ^[78] , 2020 ³	200	68	ICU admission, mechanical ventilation in hospitalised patient and death in all patients	ICU admission: 8.8% (13/147 patients); Mechanical ventilation: 6.1% (9/147 patients); Death rate: 33.0% (66/200 patients)

¹Patients with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) confirmed and cancer.

²Results reported at congress, some patient are not discharged at the time of calculate finals outcomes.

³Results from a cohort with thoracic malignancies and SARS-CoV-2 confirmed infection. ICU: Intensive care unit.

triages are based on experience or expert consensus.

Some recommendations have proposed using a general criteria for all types of surgeries, depending on the risk itself, like that proposed by the American College of Surgeons who recommend that high-acuity surgeries in healthy patients should not be postponed unlike intermediate-acuity surgeries in healthy patients and those with a low risk for cancer in whom surgeries could be postponed or they could consider an ambulatory surgery centre^[84]. Moreover, another strategy is considering the stage, previous treatment, and specific tumour site in the choice of the more appropriate treatment for the patients, as is recommended by the Society of Surgical Oncology^[85]. Furthermore, it has also been proposed that the tumour type, natural progression, and short-term aggressiveness should be considered in making the most appropriate decision^[86-90]. The decision to schedule or delay surgery in some centres has been made through the decision of experts (surgeons, oncologists, pathologists, and radiologists) through a video conference triage where cases are discussed considering the patient preference, urgency, local logistic conditions, and other non-surgery treatment options^[89-91].

Adjuvant and neoadjuvant protocols with chemotherapy and/or radiotherapy have a major role in the treatment of many cancers in different stages. Both treatments have adverse effects that can lead to immunosuppression associated with infections^[92]; these should be considered because cancer patients have a higher mortality associated with viral pneumonia due to respiratory viruses, such as parainfluenza or other non-COVID-19 coronaviruses^[93]. Additionally, delaying some therapies with a curative intent may lead to adverse outcomes in cancer patients. A decrease in overall survival has been reported among patients with locally advanced breast cancer who had a delayed adjuvant or neoadjuvant chemotherapy^[94-96]. In stage II-III colon cancer, delaying adjuvant chemotherapy was also found to have a worse overall survival^[97,98]. Similarly, delayed radiotherapy also has deleterious effects. A study showed that delayed radiotherapy initiation has been associated with a higher local recurrence rate in head and neck cancers and breast cancer^[99].

Therefore, it is necessary to compare the potential benefits and risks of delays in therapy initiation to which the patients are exposed during the current pandemic at the time of planning the administration of therapies. The European Society for Medical Oncology (ESMO)^[100] has proposed a 3-tier classification for prioritisation of treatment during the COVID-19 pandemic. The high-priority group comprises patients with vital commitment or who could gain a significant improvement in mortality or quality of life with treatment. The medium-priority group are non-critical patients, but a delay in starting their therapy beyond 6 wk could have consequences. Finally, the low-priority group could be treated after the pandemic since the benefit of treatment is marginal.

Table 2 Proposal for an approach to cancer therapies that should be prioritized in the event of a pandemic

Priority	Clinical scenario	Examples
High	Tumors with high early mortality associated and high response rate to treatment	Advanced germ cell tumors, lymphomas or acute leukemias
	Definitive curative cancer treatments	CRT for head and neck, cervical or anal cancers
Intermediate	Neoadjuvant or adjuvant therapies with high survival benefit	Perioperative ChT for gastric cancer and neoadjuvant CRT for localized rectal cancer. Adjuvant ChT for stage III or high risk stage II colorectal cancer, or stage III melanoma. ChT and RT for high risk breast cancer
	Neoadjuvant or adjuvant indications with modest survival benefit	Neoadjuvant ChT for muscle invasive bladder cancer. Adjuvant ChT for NSCLC, gallbladder and pancreatic cancer or gynecologic malignancies
	Palliative indications with high survival benefit	Immunotherapy for melanoma, NSCLC (with PDL1 > 50%) or high risk kidney cancer. Systemic ChT for metastatic breast or colorectal cancer. Molecular targeted therapy for NSCLC with driver mutation. TKI for GIST or low risk kidney cancer, and ADT and abiraterone or docetaxel for castrate-sensitive prostate cancer
Low	Palliative indications with modest survival benefit	Palliative chemotherapy for upper gastrointestinal cancers. Chemotherapy for gallbladder or pancreatic cancer, SCLC or bladder cancer
	Palliative indications without benefits in terms of overall survival	Second and third line palliative ChT for many solid tumors, as regorafenib for colorectal cancer or ramucirumab and paclitaxel for gastric cancer

CRT: Chemoradiotherapy; ChT: Chemotherapy; NSCLC: Non small cell lung cancer; RT: Radiotherapy; SCLC: Small cell lung cancer; TKI: Tyrosin kinase inhibitors; ADT: Androgen deprivation therapy; PDL1: Programmed death-ligand 1; GIST: Gastrointestinal stromal tumors.

Adoption of these recommendations has been translated to different types and stages of cancer, such as prioritisation of radiotherapy treatment in head and neck cancer^[101] and lung cancer^[102] in this current pandemic by the American Society of Radiation Oncology (ASTRO) and the European Society for Radiotherapy and Oncology (ESTRO). In pandemics, strategies such as triage are necessary. In the categorisation process, multiple factors, such as the type of tumour, stage, comorbidities, short-term progression, local material resources, and alternatives to surgery must be considered and discussed in order to allocate a beneficial treatment to oncology patients.

Non-curative treatments: Non-curative treatments with systemic chemotherapy have a main role in advanced cancer stages and a great impact in the overall survival and quality of life of patients. In recent decades, important advances have taken place in some disseminated diseases with systemic therapies or target therapies for palliative treatment, such as molecular targeted therapy in the presence of some mutations in non-small cell lung cancer^[103], or EGFR and VEGF inhibitors in colorectal cancer^[104]. These systemic treatments with high response rates could be prioritised in some cases of optimal clinical conditions with close clinical follow-up and a careful and transparent risk-benefit analysis with the patient and family. In another group of patients with poor ECOG performance statuses or advanced malignancies with systemic therapies of low effectiveness and high risk of complications, the initiation of

systemic therapy should be evaluated case-by-case. In case of oncologic emergencies, such as spinal compression, hypercalcaemia, severe anaemia, hip fracture, and others according to the ESMO guidelines, these problems represent high priority and require urgent interventions^[100].

Immunotherapy is a common treatment in different malignancies, such as melanoma, non-small cell lung cancer, kidney cancer, triple negative metastatic breast cancer, among many others. A concern with the use of immune checkpoint inhibitors in the COVID-19 era is pneumonitis reported in 2% of patients within 2.5 (0.5-11.5) months of therapy onset^[105], with nonspecific symptoms similar to those of COVID-19 infection^[106]. It has been theorised that a synergic lung injury with COVID-19 and immune checkpoint inhibitor pneumonitis occurs, although there is not enough information to affirm this hypothesis^[107]. Moreover, immunotherapy-related serious infection rate is low. In a series of melanoma and anti-CTLA-4, its incidence is only 7.3%^[108]. However, a recent report in a small sample of patients with COVID-19 on immunotherapy (6 patients) suggested that patients tend to have a high mortality. ESMO^[100] recommends a double dosing of anti-PD-1 drugs with a double interval for reducing visit exposition in patients with lung cancer and melanoma.

CONCLUSION

The COVID-19 pandemic has created an unprecedented change in the lives of people worldwide, especially in patients with chronic diseases. Cancer patients are an especially vulnerable population, because cancer has been associated with high mortality, and its treatment is associated with multiple and frequent adverse events. In parallel, COVID-19 has led to a high occupancy rate of ICUs, and patients with metastatic cancer are not a priority at the time of admission to these units. However, new cancer therapies have led to a radical change as cancer patients have a longer survival, treatments are better tolerated, and patients have better outcomes after hospitalisation in the ICU. This situation has led to the need for the establishment of specific care protocols for cancer patients in these current times.

First, it is imperative to define which cancer treatments should be prioritised in pandemic times. The NCCN^[109] and ESMO^[100] guidelines propose treatment prioritisation in tumours with high early mortality and high response rate to chemotherapy or radiotherapy, such as haematologic malignancies and advanced testicular cancer. In these cases, the early start of cancer therapy can be curative; therefore, these therapies should not be delayed. Intermediate priority cases are neoadjuvant and adjuvant treatments with a high response rate, such as perioperative chemotherapy for gastric cancer, adjuvant treatment for stage III or high-risk stage II colon cancer, or high-risk breast cancer, among others. Systemic therapies in advanced diseases [*e.g.*, immunotherapy for melanoma and high risk kidney cancer, and target therapy in non-small cell lung cancer with driver mutation (EGFR, ALK or ROS1 mutation)] with high response rates are also at this priority level. The initiation of these therapies should be planned by evaluating the risk-benefit balance. It is important to consider the start time especially in adjuvant treatments, which should not be longer than 6-8 wk after surgery. Lastly, we have cancer therapies with low priority of initiation during this pandemic. These therapies have a low response rate and high associated toxicity, such as chemotherapy for upper gastrointestinal malignancies (gastric, gallbladder, or pancreas), metastatic bladder cancer, small cell lung cancer, triple negative breast cancer, among many others. The initiation of second or third-line cancer therapies after progression to a first line of cancer therapy can also be considered at this priority level (*i.e.*, regorafenib for colorectal cancer, ramucirumab and paclitaxel for gastric cancer, among others), and the risk-benefit balance of its initiation during the pandemic should be carefully evaluated. Table 2 shows a summary of the proposed prioritisation of oncological therapies during the pandemic. It is important to clarify that this proposed approach is transitory while we are in the period of greatest contagiousness. This scheme can help to optimise health resources and minimise the mobility of cancer patients to prevent possible infections.

In patients who are on cancer therapies during the pandemic, it is important to minimise their visits to hospitals through the use of telemedicine technologies, which has had very good results^[110], especially in terms of quality of life and patient satisfaction^[111]. Patients can send the results of their blood tests and computed tomography by email or message, and the medical evaluation is done by streaming, thus minimising the mobility of patients to the hospital. In addition, telemedicine can be used for communication, counselling, and disease monitoring^[112] especially for low-

priority symptoms (nausea, constipation, leg swelling, among others). In this context, the role of navigating oncology nurses is key^[113], because this process requires complex coordination between the medical team, laboratory team, radiology team, and administrative staff.

Finally, it is important to define which cancer patients affected with COVID-19 could be prioritised in case of a need for ICU admission. This very complex scenario is very likely to occur in countries where intensive care beds are scarce, especially in developing countries. This theme was recently addressed by the American Society of Clinical Oncology (ASCO)^[114]. First, it is imperative to maximise positive outcomes in patients hospitalised in ICU, and to choose patients with a higher probability of having better outcomes. Clinicians have a duty of care (principle of charity) and to optimise resources (principle of justice). For this reason, multi-disciplinary evaluation of the oncology team is critical to establish and communicate the prognosis of cancer patients to the ICU and emergency physicians with transparency and consistency. To establish the prognosis of a cancer patient with COVID-19, the oncology team has to consider the previous ECOG performance status, type and stage of cancer (localised or advanced), type and goal of cancer therapy (adjuvant, neoadjuvant, or palliative) and the line of cancer treatment (first, second, or third-line). In this process, communication and teamwork are key to achieving the best decision. In case of complex clinical scenarios, it is imperative to request the opinion of palliative care and medical ethics teams early.

Care of the health team is a very important issue. In our centre, we divide the medical staff into two teams to be able to maintain the continuity of cancer patient care in case of disability of a member by infection or a high-risk SARS-CoV-2 contact. In addition, we carry out clinical and oncology committee meetings through remote videoconferences with optimal results. With regards to oncology residents' training, teachings have been adapted to be carried out remotely and with limited clinical practices to optimise the availability of personal protection elements in accordance with the ESMO and NCCN recommendations for this pandemic^[100,109].

In summary, it is essential that oncology teams adapt to these new times of great challenges. Medical teams must adapt cancer treatment protocols and prioritise them according to patient response and prognosis. In cancer patients infected with SARS-CoV-2, it is essential that an effective and transparent communication is built between the oncology and critical care team to make the best decisions regarding the complex care of these patients. Optimising clinical care using technology and telemedicine have become powerful tools in facing this pandemic, and we must adapt quickly to this new reality of medical care.

REFERENCES

- 1 Ueda M, Martins R, Hendrie PC, McDonnell T, Crews JR, Wong TL, McCreery B, Jagels B, Crane A, Byrd DR, Pergam SA, Davidson NE, Liu C, Stewart FM. Managing Cancer Care During the COVID-19 Pandemic: Agility and Collaboration Toward a Common Goal. *J Natl Compr Canc Netw* 2020; 1-4 [PMID: 32197238 DOI: 10.6004/jnccn.2020.7560]
- 2 Nygren P; SBU-group. Swedish Council on Technology Assessment in Health Care. What is cancer chemotherapy? *Acta Oncol* 2001; 40: 166-174 [PMID: 11441929 DOI: 10.1080/02841860151116204]
- 3 Floudas CS, Brar G, Greten TF. Immunotherapy: Current Status and Future Perspectives. *Dig Dis Sci* 2019; 64: 1030-1040 [PMID: 30830521 DOI: 10.1007/s10620-019-05516-7]
- 4 Kim S, Kim HT, Suh HS. Combination therapy of BRAF inhibitors for advanced melanoma with BRAF V600 mutation: a systematic review and meta-analysis. *J Dermatolog Treat* 2018; 29: 314-321 [PMID: 28504036 DOI: 10.1080/09546634.2017.1330530]
- 5 Fornasier G, Francescon S, Baldo P. An Update of Efficacy and Safety of Cetuximab in Metastatic Colorectal Cancer: A Narrative Review. *Adv Ther* 2018; 35: 1497-1509 [PMID: 30218345 DOI: 10.1007/s12325-018-0791-0]
- 6 Apte RS, Chen DS, Ferrara N. VEGF in Signaling and Disease: Beyond Discovery and Development. *Cell* 2019; 176: 1248-1264 [PMID: 30849371 DOI: 10.1016/j.cell.2019.01.021]
- 7 Roskoski R Jr. Small molecule inhibitors targeting the EGFR/ErbB family of protein-tyrosine kinases in human cancers. *Pharmacol Res* 2019; 139: 395-411 [PMID: 30500458 DOI: 10.1016/j.phrs.2018.11.014]
- 8 Yang Y. Cancer immunotherapy: harnessing the immune system to battle cancer. *J Clin Invest* 2015; 125: 3335-3337 [PMID: 26325031 DOI: 10.1172/JCI83871]
- 9 Larkin J, Chiarion-Sileni V, Gonzalez R, Grob JJ, Cowey CL, Lao CD, Schadendorf D, Dummer R, Smylie M, Rutkowski P, Ferrucci PF, Hill A, Wagstaff J, Carlino MS, Haanen JB, Maio M, Marquez-Rodas I, McArthur GA, Ascierto PA, Long GV, Callahan MK, Postow MA, Grossmann K, Sznol M, Dreno B, Bastholt L, Yang A, Rollin LM, Horak C, Hodi FS, Wolchok JD. Combined Nivolumab and Ipilimumab or Monotherapy in Untreated Melanoma. *N Engl J Med* 2015; 373: 23-34 [PMID: 26027431 DOI: 10.1056/NEJMoa1504030]
- 10 Larkin J, Chiarion-Sileni V, Gonzalez R, Grob JJ, Rutkowski P, Lao CD, Cowey CL, Schadendorf D, Wagstaff J, Dummer R, Ferrucci PF, Smylie M, Hogg D, Hill A, Márquez-Rodas I, Haanen J, Guidoboni

- M, Maio M, Schöffski P, Carlino MS, Lebbé C, McArthur G, Ascierto PA, Daniels GA, Long GV, Bastholt L, Rizzo JI, Balogh A, Moshyk A, Hodi FS, Wolchok JD. Five-Year Survival with Combined Nivolumab and Ipilimumab in Advanced Melanoma. *N Engl J Med* 2019; **381**: 1535-1546 [PMID: [31562797](#) DOI: [10.1056/NEJMoa1910836](#)]
- 11 **Benzaquen J**, Marquette CH, Glaichenhaus N, Leroy S, Hofman P, Ilié M. [The biological rationale for immunotherapy in cancer]. *Rev Mal Respir* 2018; **35**: 206-222 [PMID: [29428191](#) DOI: [10.1016/j.rmr.2017.11.008](#)]
 - 12 **Nagao A**, Takei Y, Ogawa Y, Shimada M, Tanigawa K, Suzuki S. [Examination of the quality of life in the cancer patients under immunotherapy]. *Gan To Kagaku Ryoho* 2012; **39**: 1785-1787 [PMID: [23267886](#)]
 - 13 **Wallace SK**, Rathu NK, Waller DK, Ensor JE Jr, Haque SA, Price KJ, Piller LB, Tilley BC, Nates JL. Two Decades of ICU Utilization and Hospital Outcomes in a Comprehensive Cancer Center. *Crit Care Med* 2016; **44**: 926-933 [PMID: [26765498](#) DOI: [10.1097/CCM.0000000000001568](#)]
 - 14 **Torres VB**, Vassallo J, Silva UV, Caruso P, Torelly AP, Silva E, Teles JM, Knibel M, Rezende E, Netto JJ, Piras C, Azevedo LC, Bozza FA, Spector N, Salluh JJ, Soares M. Outcomes in Critically Ill Patients with Cancer-Related Complications. *PLoS One* 2016; **11**: e0164537 [PMID: [27764143](#) DOI: [10.1371/journal.pone.0164537](#)]
 - 15 **Wigmore T**, Farquhar-Smith P. Outcomes for Critically Ill Cancer Patients in the ICU: Current Trends and Prediction. *Int Anesthesiol Clin* 2016; **54**: e62-e75 [PMID: [27623129](#) DOI: [10.1097/AIA.0000000000000121](#)]
 - 16 **Hawari FI**, Nazer LH, Addassi A, Rimawi D, Jamal K. Predictors of ICU Admission in Patients With Cancer and the Related Characteristics and Outcomes: A 5-Year Registry-Based Study. *Crit Care Med* 2016; **44**: 548-553 [PMID: [26562345](#) DOI: [10.1097/CCM.0000000000001429](#)]
 - 17 **Martos-Benítez FD**, Soto-García A, Gutiérrez-Noyola A. Clinical characteristics and outcomes of cancer patients requiring intensive care unit admission: a prospective study. *J Cancer Res Clin Oncol* 2018; **144**: 717-723 [PMID: [29362918](#) DOI: [10.1007/s00432-018-2581-0](#)]
 - 18 **Bos MM**, de Keizer NF, Meynaar IA, Bakhshi-Raiez F, de Jonge E. Outcomes of cancer patients after unplanned admission to general intensive care units. *Acta Oncol* 2012; **51**: 897-905 [PMID: [22548367](#) DOI: [10.3109/0284186X.2012.679311](#)]
 - 19 **Panay S**, Ruiz C, Abarca M, Nervi B, Salazar I, Caro P, Muñiz S, Briones J, Bruhn A, Mondaca S. Mortality of Adult Patients With Cancer Admitted to an Intensive Care Unit in Chile: A Prospective Cohort Study. *J Glob Oncol* 2018; **4**: 1-9 [PMID: [30582431](#) DOI: [10.1200/JGO.18.00091](#)]
 - 20 **Al-Shamsi HO**, Alhazzani W, Alhuraiji A, Coomes EA, Chemaly RF, Almuhanha M, Wolff RA, Ibrahim NK, Chua MLK, Hotte SJ, Meyers BM, Elfiki T, Curigliano G, Eng C, Grothey A, Xie C. A Practical Approach to the Management of Cancer Patients During the Novel Coronavirus Disease 2019 (COVID-19) Pandemic: An International Collaborative Group. *Oncologist* 2020; **25**: e936-e945 [PMID: [32243668](#) DOI: [10.1634/theoncologist.2020-0213](#)]
 - 21 **Redelman-Sidi G**, Sepkowitz KA, Huang CK, Park S, Stiles J, Eagan J, Perlin DS, Pamer EG, Kamboj M. 2009 H1N1 influenza infection in cancer patients and hematopoietic stem cell transplant recipients. *J Infect* 2010; **60**: 257-263 [PMID: [20138188](#) DOI: [10.1016/j.jinf.2010.01.009](#)]
 - 22 **Centers for Disease Control and Prevention (CDC)**. Outbreak of swine-origin influenza A (H1N1) virus infection - Mexico, March-April 2009. *MMWR Morb Mortal Wkly Rep* 2009; **58**: 467-470 [PMID: [19444150](#)]
 - 23 **Ortiz JR**, Jacob ST, West TE. Clinical care for severe influenza and other severe illness in resource-limited settings: the need for evidence and guidelines. *Influenza Other Respir Viruses* 2013; **7** Suppl 2: 87-92 [PMID: [24034491](#) DOI: [10.1111/irv.12086](#)]
 - 24 **Chowell G**, Echevarria-Zuno S, Viboud C, Simonsen L, Miller MA, Fernández-Gárate I, González-Bonilla C, Borja-Aburto VH. Epidemiological characteristics and underlying risk factors for mortality during the autumn 2009 pandemic wave in Mexico. *PLoS One* 2012; **7**: e41069 [PMID: [22815917](#) DOI: [10.1371/journal.pone.0041069](#)]
 - 25 **Domínguez-Cherit G**, Lapinsky SE, Macias AE, Pinto R, Espinosa-Perez L, de la Torre A, Poblano-Morales M, Baltazar-Torres JA, Bautista E, Martínez A, Martínez MA, Rivero E, Valdez R, Ruiz-Palacios G, Hernández M, Stewart TE, Fowler RA. Critically Ill patients with 2009 influenza A(H1N1) in Mexico. *JAMA* 2009; **302**: 1880-1887 [PMID: [19822626](#) DOI: [10.1001/jama.2009.1536](#)]
 - 26 **Dawood FS**, Iuliano AD, Reed C, Meltzer MI, Shay DK, Cheng PY, Bandaranayake D, Breiman RF, Brooks WA, Buchy P, Feikin DR, Fowler KB, Gordon A, Hien NT, Horby P, Huang QS, Katz MA, Krishnan A, Lal R, Montgomery JM, Mølbak K, Pebody R, Presanis AM, Razuri H, Steens A, Tinoco YO, Wallinga J, Yu H, Vong S, Bresee J, Widdowson MA. Estimated global mortality associated with the first 12 months of 2009 pandemic influenza A H1N1 virus circulation: a modelling study. *Lancet Infect Dis* 2012; **12**: 687-695 [PMID: [22738893](#) DOI: [10.1016/S1473-3099\(12\)70121-4](#)]
 - 27 **Viboud C**, Simonsen L. Global mortality of 2009 pandemic influenza A H1N1. *Lancet Infect Dis* 2012; **12**: 651-653 [PMID: [22738892](#) DOI: [10.1016/S1473-3099\(12\)70152-4](#)]
 - 28 **Murray CJ**, Lopez AD, Chin B, Feehan D, Hill KH. Estimation of potential global pandemic influenza mortality on the basis of vital registry data from the 1918-20 pandemic: a quantitative analysis. *Lancet* 2006; **368**: 2211-2218 [PMID: [17189032](#) DOI: [10.1016/S0140-6736\(06\)69895-4](#)]
 - 29 **Cooksley CD**, Avritscher EB, Bekele BN, Rolston KV, Geraci JM, Elting LS. Epidemiology and outcomes of serious influenza-related infections in the cancer population. *Cancer* 2005; **104**: 618-628 [PMID: [15973737](#) DOI: [10.1002/encr.21203](#)]
 - 30 **Kunisaki KM**, Janoff EN. Influenza in immunosuppressed populations: a review of infection frequency, morbidity, mortality, and vaccine responses. *Lancet Infect Dis* 2009; **9**: 493-504 [PMID: [19628174](#) DOI: [10.1016/S1473-3099\(09\)70175-6](#)]
 - 31 **Francisci D**, Labianca R, Roila F. Prevention and treatment of pandemic influenza in cancer patients. *Ann Oncol* 2010; **21**: 2301-2303 [PMID: [20616196](#) DOI: [10.1093/annonc/mdq351](#)]
 - 32 **Jain S**, Kamimoto L, Bramley AM, Schmitz AM, Benoit SR, Louie J, Sugarman DE, Druckenmiller JK, Ritger KA, Chugh R, Jasuja S, Deutscher M, Chen S, Walker JD, Duchin JS, Lett S, Soliva S, Wells EV, Swerdlow D, Uyeki TM, Fiore AE, Olsen SJ, Fry AM, Bridges CB, Finelli L; 2009 Pandemic Influenza A

- (H1N1) Virus Hospitalizations Investigation Team. Hospitalized patients with 2009 H1N1 influenza in the United States, April-June 2009. *N Engl J Med* 2009; **361**: 1935-1944 [PMID: [19815859](#) DOI: [10.1056/NEJMoa0906695](#)]
- 33 **Chemaly RF**, Vigil KJ, Saad M, Vilar-Compte D, Cornejo-Juarez P, Perez-Jimenez C, Mubarak S, Salhab M, Jiang Y, Granwehr B, Adachi JA, Raad II. A multicenter study of pandemic influenza A (H1N1) infection in patients with solid tumors in 3 countries: early therapy improves outcomes. *Cancer* 2012; **118**: 4627-4633 [PMID: [22359314](#) DOI: [10.1002/cncr.27447](#)]
 - 34 **Saad M**, Hayajneh W, Mubarak S, Yousef I, Awad H, Elbjairami W, Rihani R. Clinical presentations and outcomes of influenza infection among hematology/oncology patients from a single cancer center: pandemic and post-pandemic seasons. *Scand J Infect Dis* 2014; **46**: 770-778 [PMID: [25134648](#) DOI: [10.3109/00365548.2014.943282](#)]
 - 35 **Souza TM**, Salluh JJ, Bozza FA, Mesquita M, Soares M, Motta FC, Pitrowsky MT, de Lourdes Oliveira M, Mishin VP, Gubareva LV, Whitney A, Rocco SA, Gonçalves VM, Marques VP, Velasco E, Siqueira MM. H1N1pdm influenza infection in hospitalized cancer patients: clinical evolution and viral analysis. *PLoS One* 2010; **5**: e14158 [PMID: [21152402](#) DOI: [10.1371/journal.pone.0014158](#)]
 - 36 **Ángeles-Sistac D**, Martín-Onraet A, Cornejo-Juárez P, Volkow P, Pérez-Jimenez C, Vilar-Compte D. Influenza in patients with cancer after 2009 pandemic AH1N1: An 8-year follow-up study in Mexico. *Influenza Other Respir Viruses* 2020; **14**: 196-203 [PMID: [31747133](#) DOI: [10.1111/irv.12704](#)]
 - 37 **Tran D**, Science M, Dix D, Portwine C, Zelcer S, Johnston DL, Yanofsky R, Gassas A, Ethier MC, Sung L. Pandemic (H1N1) 2009 influenza in Canadian pediatric cancer and hematopoietic stem cell transplant patients. *Influenza Other Respir Viruses* 2012; **6**: e105-e113 [PMID: [22417068](#) DOI: [10.1111/j.1750-2659.2012.00352.x](#)]
 - 38 **Beck CR**, McKenzie BC, Hashim AB, Harris RC; University of Nottingham Influenza and the ImmunoCompromised (UNIC) Study Group., Nguyen-Van-Tam JS. Influenza vaccination for immunocompromised patients: systematic review and meta-analysis by etiology. *J Infect Dis* 2012; **206**: 1250-1259 [PMID: [22904335](#) DOI: [10.1093/infdis/jis487](#)]
 - 39 **Beck CR**, McKenzie BC, Hashim AB, Harris RC, Zanuzdana A, Agboado G, Orton E, Béchard-Evans L, Morgan G, Stevenson C, Weston R, Mukaigawara M, Enstone J, Augustine G, Butt M, Kim S, Puleston R, Dabke G, Howard R, O'Boyle J, O'Brien M, Ahyow L, Denness H, Farmer S, Figuereroa J, Fisher P, Greaves F, Haroon M, Haroon S, Hird C, Isba R, Ishola DA, Kerac M, Parish V, Roberts J, Rosser J, Theaker S, Wallace D, Wigglesworth N, Lingard L, Vinogradova Y, Horiuchi H, Peñalver J, Nguyen-Van-Tam JS. Influenza vaccination for immunocompromised patients: systematic review and meta-analysis from a public health policy perspective. *PLoS One* 2011; **6**: e29249 [PMID: [22216224](#) DOI: [10.1371/journal.pone.0029249](#)]
 - 40 **Helanterä I**, Janes R, Anttila VJ. Clinical efficacy of seasonal influenza vaccination: characteristics of two outbreaks of influenza A(H1N1) in immunocompromised patients. *J Hosp Infect* 2018; **99**: 169-174 [PMID: [29225054](#) DOI: [10.1016/j.jhin.2017.12.003](#)]
 - 41 **Ksiazek TG**, Erdman D, Goldsmith CS, Zaki SR, Peret T, Emery S, Tong S, Urbani C, Comer JA, Lim W, Rollin PE, Dowell SF, Ling AE, Humphrey CD, Shieh WJ, Guarner J, Paddock CD, Rota P, Fields B, DeRisi J, Yang JY, Cox N, Hughes JM, LeDuc JW, Bellini WJ, Anderson LJ; SARS Working Group. A novel coronavirus associated with severe acute respiratory syndrome. *N Engl J Med* 2003; **348**: 1953-1966 [PMID: [12690092](#) DOI: [10.1056/NEJMoa030781](#)]
 - 42 **Zumla A**, Hui DS, Perlman S. Middle East respiratory syndrome. *Lancet* 2015; **386**: 995-1007 [PMID: [26049252](#) DOI: [10.1016/S0140-6736\(15\)60454-8](#)]
 - 43 **Booth CM**, Matukas LM, Tomlinson GA, Rachlis AR, Rose DB, Dwosh HA, Walmsley SL, Mazzulli T, Avendano M, Derkach P, Ephtimios IE, Kitai I, Mederski BD, Shadowitz SB, Gold WL, Hawryluck LA, Rea E, Chenkin JS, Cescon DW, Poutanen SM, Detsky AS. Clinical features and short-term outcomes of 144 patients with SARS in the greater Toronto area. *JAMA* 2003; **289**: 2801-2809 [PMID: [12734147](#) DOI: [10.1001/jama.289.21.JOC30885](#)]
 - 44 **Arabi YM**, Balkhy HH, Hayden FG, Bouchama A, Luke T, Baillie JK, Al-Omari A, Hajeer AH, Senga M, Denison MR, Nguyen-Van-Tam JS, Shindo N, Birmingham A, Chappell JD, Van Kerkhove MD, Fowler RA. Middle East Respiratory Syndrome. *N Engl J Med* 2017; **376**: 584-594 [PMID: [28177862](#) DOI: [10.1056/NEJMSr1408795](#)]
 - 45 **de Wit E**, van Doremalen N, Falzarano D, Munster VJ. SARS and MERS: recent insights into emerging coronaviruses. *Nat Rev Microbiol* 2016; **14**: 523-534 [PMID: [27344959](#) DOI: [10.1038/nrmicro.2016.81](#)]
 - 46 **Peiris JS**, Chu CM, Cheng VC, Chan KS, Hung IF, Poon LL, Law KI, Tang BS, Hon TY, Chan CS, Chan KH, Ng JS, Zheng BJ, Ng WL, Lai RW, Guan Y, Yuen KY; HKU/UCH SARS Study Group. Clinical progression and viral load in a community outbreak of coronavirus-associated SARS pneumonia: a prospective study. *Lancet* 2003; **361**: 1767-1772 [PMID: [12781535](#) DOI: [10.1016/S0140-6736\(03\)13412-5](#)]
 - 47 **Assiri A**, Al-Tawfiq JA, Al-Rabecah AA, Al-Rabiah FA, Al-Hajjar S, Al-Barrak A, Flemban H, Al-Nassir WN, Balkhy HH, Al-Hakeem RF, Makhdoom HQ, Zumla AI, Memish ZA. Epidemiological, demographic, and clinical characteristics of 47 cases of Middle East respiratory syndrome coronavirus disease from Saudi Arabia: a descriptive study. *Lancet Infect Dis* 2013; **13**: 752-761 [PMID: [23891402](#) DOI: [10.1016/S1473-3099\(13\)70204-4](#)]
 - 48 **World Health Organization**. Middle East respiratory syndrome coronavirus (MERS-CoV). In: World Health Organization [Internet]. Geneva: 2020. Available from: <https://www.who.int/emergencies/mers-cov/en/>
 - 49 **Rabaan AA**, Al-Ahmed SH, Haque S, Sah R, Tiwari R, Malik YS, Dhama K, Yatoo MI, Bonilla-Aldana DK, Rodriguez-Morales AJ. SARS-CoV-2, SARS-CoV, and MERS-CoV: A comparative overview. *Infez Med* 2020; **28**: 174-184 [PMID: [32275259](#)]
 - 50 **Badawi A**, Ryoo SG. Prevalence of comorbidities in the Middle East respiratory syndrome coronavirus (MERS-CoV): a systematic review and meta-analysis. *Int J Infect Dis* 2016; **49**: 129-133 [PMID: [27352628](#) DOI: [10.1016/j.ijid.2016.06.015](#)]
 - 51 **Jazieh AR**, Alenazi TH, Alhejazi A, Al Safi F, Al Olayan A. Outcome of Oncology Patients Infected With Coronavirus. *JCO Glob Oncol* 2020; **6**: 471-475 [PMID: [32196389](#) DOI: [10.1200/GO.20.00064](#)]

- 52 **Koplan JP**, Butler-Jones D, Tsang T, Yu W. Public health lessons from severe acute respiratory syndrome a decade later. *Emerg Infect Dis* 2013; **19**: 861-863 [PMID: [23739634](#) DOI: [10.3201/eid1906.121426](#)]
- 53 **Zhu N**, Zhang D, Wang W, Li X, Yang B, Song J, Zhao X, Huang B, Shi W, Lu R, Niu P, Zhan F, Ma X, Wang D, Xu W, Wu G, Gao GF, Tan W; China Novel Coronavirus Investigating and Research Team. A Novel Coronavirus from Patients with Pneumonia in China, 2019. *N Engl J Med* 2020; **382**: 727-733 [PMID: [31978945](#) DOI: [10.1056/NEJMoa2001017](#)]
- 54 **Ji W**, Wang W, Zhao X, Zai J, Li X. Cross-species transmission of the newly identified coronavirus 2019-nCoV. *J Med Virol* 2020; **92**: 433-440 [PMID: [31967321](#) DOI: [10.1002/jmv.25682](#)]
- 55 **Coronaviridae Study Group of the International Committee on Taxonomy of Viruses**. The species Severe acute respiratory syndrome-related coronavirus: classifying 2019-nCoV and naming it SARS-CoV-2. *Nat Microbiol* 2020; **5**: 536-544 [PMID: [32123347](#) DOI: [10.1038/s41564-020-0695-z](#)]
- 56 **Lai CC**, Shih TP, Ko WC, Tang HJ, Hsueh PR. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019 (COVID-19): The epidemic and the challenges. *Int J Antimicrob Agents* 2020; **55**: 105924 [PMID: [32081636](#) DOI: [10.1016/j.ijantimicag.2020.105924](#)]
- 57 **Lu R**, Zhao X, Li J, Niu P, Yang B, Wu H, Wang W, Song H, Huang B, Zhu N, Bi Y, Ma X, Zhan F, Wang L, Hu T, Zhou H, Hu Z, Zhou W, Zhao L, Chen J, Meng Y, Wang J, Lin Y, Yuan J, Xie Z, Ma J, Liu WJ, Wang D, Xu W, Holmes EC, Gao GF, Wu G, Chen W, Shi W, Tan W. Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. *Lancet* 2020; **395**: 565-574 [PMID: [32007145](#) DOI: [10.1016/S0140-6736\(20\)30251-8](#)]
- 58 **Baud D**, Qi X, Nielsen-Saines K, Musso D, Pomar L, Favre G. Real estimates of mortality following COVID-19 infection. *Lancet Infect Dis* 2020; **20**: 773 [PMID: [32171390](#) DOI: [10.1016/S1473-3099\(20\)30195-X](#)]
- 59 **Omer SB**, Malani P, del Rio C. The COVID-19 Pandemic in the US: A Clinical Update. *JAMA* 2020; **323**: 1757-1768 [PMID: [32250388](#) DOI: [10.1001/jama.2020.5788](#)]
- 60 **Guan WJ**, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, Liu L, Shan H, Lei CL, Hui DSC, Du B, Li LJ, Zeng G, Yuen KY, Chen RC, Tang CL, Wang T, Chen PY, Xiang J, Li SY, Wang JL, Liang ZJ, Peng YX, Wei L, Liu Y, Hu YH, Peng P, Wang JM, Liu JY, Chen Z, Li G, Zheng ZJ, Qiu SQ, Luo J, Ye CJ, Zhu SY, Zhong NS; China Medical Treatment Expert Group for Covid-19. Clinical Characteristics of Coronavirus Disease 2019 in China. *N Engl J Med* 2020; **382**: 1708-1720 [PMID: [32109013](#) DOI: [10.1056/NEJMoa2002032](#)]
- 61 **Huang C**, Wang Y, Li X, Ren L, Zhao J, Hu Y, Zhang L, Fan G, Xu J, Gu X, Cheng Z, Yu T, Xia J, Wei Y, Wu W, Xie X, Yin W, Li H, Liu M, Xiao Y, Gao H, Guo L, Xie J, Wang G, Jiang R, Gao Z, Jin Q, Wang J, Cao B. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet* 2020; **395**: 497-506 [PMID: [31986264](#) DOI: [10.1016/S0140-6736\(20\)30183-5](#)]
- 62 **Grasselli G**, Zangrillo A, Zanella A, Antonelli M, Cabrini L, Castelli A, Cereda D, Coluccello A, Foti G, Fumagalli R, Iotti G, Latronico N, Lorini L, Merler S, Natalini G, Piatto A, Ranieri MV, Scandroglio AM, Storti E, Cecconi M, Pesenti A; COVID-19 Lombardy ICU Network, Nalescu A, Corona A, Zangrillo A, Protti A, Albertin A, Forastieri Molinari A, Lombardo A, Pezzi A, Benini A, Scandroglio AM, Malara A, Castelli A, Coluccello A, Micucci A, Pesenti A, Sala A, Alborghetti A, Antonini B, Capra C, Troiano C, Roscitano C, Radrizzani D, Chiumello D, Coppini D, Guzzon D, Costantini E, Malpetti E, Zoia E, Catena E, Agosteo E, Barbara E, Beretta E, Boselli E, Storti E, Harizay F, Della Mura F, Lorini FL, Donato Sigurtà F, Marino F, Mojoli F, Rasulo F, Grasselli G, Casella G, De Filippi G, Castelli G, Aldegheri G, Gallioli G, Lotti G, Albano G, Landoni G, Marino G, Vitale G, Battista Perego G, Evasi G, Citerio G, Foti G, Natalini G, Merli G, Sforzini I, Bianciardi L, Carnevale L, Grazioli L, Cabrini L, Guatteri L, Salvi L, Dei Poli M, Galletti M, Gemma M, Ranucci M, Riccio M, Borelli M, Zambon M, Subert M, Cecconi M, Mazzoni MG, Raimondi M, Panigada M, Belliato M, Bronzini N, Latronico N, Petrucci N, Belgiorio N, Tagliabue P, Cortellazzi P, Gnesin P, Grosso P, Gritti P, Perazzo P, Severgnini P, Ruggeri P, Sebastiano P, Covello RD, Fernandez-Olmos R, Fumagalli R, Keim R, Rona R, Valsecchi R, Cattaneo S, Colombo S, Cirri S, Bonazzi S, Greco S, Mutini S, Langer T, Alaimo V, Viola U. Baseline Characteristics and Outcomes of 1591 Patients Infected With SARS-CoV-2 Admitted to ICUs of the Lombardy Region, Italy. *JAMA* 2020 [PMID: [32250385](#) DOI: [10.1001/jama.2020.5394](#)]
- 63 **World Health Organization**. Coronavirus disease (COVID-19) Pandemic. In: World Health Organization [Internet]. Geneva: 2020. Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>
- 64 **Truog RD**, Mitchell C, Daley GQ. The Toughest Triage - Allocating Ventilators in a Pandemic. *N Engl J Med* 2020; **382**: 1973-1975 [PMID: [32202721](#) DOI: [10.1056/NEJMp2005689](#)]
- 65 **White DB**, Lo B. A Framework for Rationing Ventilators and Critical Care Beds During the COVID-19 Pandemic. *JAMA* 2020 [PMID: [32219367](#) DOI: [10.1001/jama.2020.5046](#)]
- 66 **Emanuel EJ**, Persad G, Upshur R, Thome B, Parker M, Glickman A, Zhang C, Boyle C, Smith M, Phillips JP. Fair Allocation of Scarce Medical Resources in the Time of Covid-19. *N Engl J Med* 2020; **382**: 2049-2055 [PMID: [32202722](#) DOI: [10.1056/NEJMs2005114](#)]
- 67 **Wu Z**, McGoogan JM. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72 314 Cases From the Chinese Center for Disease Control and Prevention. *JAMA* 2020 [PMID: [32091533](#) DOI: [10.1001/jama.2020.2648](#)]
- 68 **Yang J**, Zheng Y, Gou X, Pu K, Chen Z, Guo Q, Ji R, Wang H, Wang Y, Zhou Y. Prevalence of comorbidities and its effects in patients infected with SARS-CoV-2: a systematic review and meta-analysis. *Int J Infect Dis* 2020; **94**: 91-95 [PMID: [32173574](#) DOI: [10.1016/j.ijid.2020.03.017](#)]
- 69 **Desai A**, Sachdeva S, Parekh T, Desai R. COVID-19 and Cancer: Lessons From a Pooled Meta-Analysis. *JCO Glob Oncol* 2020; **6**: 557-559 [PMID: [32250659](#) DOI: [10.1200/GO.20.00097](#)]
- 70 **Yu J**, Ouyang W, Chua MLK, Xie C. SARS-CoV-2 Transmission in Patients With Cancer at a Tertiary Care Hospital in Wuhan, China. *JAMA Oncol* 2020 [PMID: [32211820](#) DOI: [10.1001/jamaoncol.2020.0980](#)]
- 71 **Cannistra SA**, Haffty BG, Ballman K. Challenges Faced by Medical Journals During the COVID-19 Pandemic. *J Clin Oncol* 2020; **38**: 2206-2207 [PMID: [32267782](#) DOI: [10.1200/JCO.20.00858](#)]
- 72 **Zhang L**, Zhu F, Xie L, Wang C, Wang J, Chen R, Jia P, Guan HQ, Peng L, Chen Y, Peng P, Zhang P, Chu

- Q, Shen Q, Wang Y, Xu SY, Zhao JP, Zhou M. Clinical characteristics of COVID-19-infected cancer patients: a retrospective case study in three hospitals within Wuhan, China. *Ann Oncol* 2020; **31**: 894-901 [PMID: 32224151 DOI: 10.1016/j.annonc.2020.03.296]
- 73 **Motlagh A**, Yamrali M, Azghandi S, Azadeh P, Vaezi M, Ashrafi F, Zendeheh K, Mirzaei H, Basi A, Rakhsha A, Seifi S, Tabatabaeifar M, Elahi A, Pirjani P, Moadab Shoar L, Nadarkhani F, Khoshabi M, Bahar M, Esfahani F, Fudazi H, Samiei F, Farazmand B, Ahmari A, Vand Rajabpour M, Janbabaei G, Raisi A, Ostovar A, Malekzadeh R. COVID-19 Prevention & Care; A Cancer Specific Guideline. *Arch Iran Med* 2020; **23**: 255-264 [PMID: 32271599 DOI: 10.34172/aim.2020.07]
- 74 **Liang W**, Guan W, Chen R, Wang W, Li J, Xu K, Li C, Ai Q, Lu W, Liang H, Li S, He J. Cancer patients in SARS-CoV-2 infection: a nationwide analysis in China. *Lancet Oncol* 2020; **21**: 335-337 [PMID: 32066541 DOI: 10.1016/S1470-2045(20)30096-6]
- 75 **Dai M**, Liu D, Liu M, Zhou F, Li G, Chen Z, Zhang Z, You H, Wu M, Zheng Q, Xiong Y, Xiong H, Wang C, Chen C, Xiong F, Zhang Y, Peng Y, Ge S, Zhen B, Yu T, Wang L, Wang H, Liu Y, Chen Y, Mei J, Gao X, Li Z, Gan L, He C, Li Z, Shi Y, Qi Y, Yang J, Tenen DG, Chai L, Mucci LA, Santillana M, Cai H. Patients with Cancer Appear More Vulnerable to SARS-CoV-2: A Multicenter Study during the COVID-19 Outbreak. *Cancer Discov* 2020; **10**: 783-791 [PMID: 32345594 DOI: 10.1158/2159-8290.CD-20-0422]
- 76 **Yang K**, Sheng Y, Huang C, Jin Y, Xiong N, Jiang K, Lu H, Liu J, Yang J, Dong Y, Pan D, Shu C, Li J, Wei J, Huang Y, Peng L, Wu M, Zhang R, Wu B, Li Y, Cai L, Li G, Zhang T, Wu G. Clinical characteristics, outcomes, and risk factors for mortality in patients with cancer and COVID-19 in Hubei, China: a multicentre, retrospective, cohort study. *Lancet Oncol* 2020; **21**: 904-913 [PMID: 32479787 DOI: 10.1016/S1470-2045(20)30310-7]
- 77 **Kuderer NM**, Choueiri TK, Shah DP, Shyr Y, Rubinstein SM, Rivera DR, Shete S, Hsu CY, Desai A, de Lima Lopes G Jr, Grivas P, Painter CA, Peters S, Thompson MA, Bakouny Z, Batist G, Bekaii-Saab T, Bilen MA, Bouganim N, Larroya MB, Castellano D, Del Prete SA, Doroshow DB, Egan PC, Elkrief A, Farmakiotis D, Flora D, Galsky MD, Glover MJ, Griffiths EA, Gulati AP, Gupta S, Hafez N, Halfdanarson TR, Hawley JE, Hsu E, Kasi A, Khaki AR, Lemmon CA, Lewis C, Logan B, Masters T, McKay RR, Mesa RA, Morgans AK, Mulcahy MF, Panagiotou OA, Peddi P, Pennell NA, Reynolds K, Rosen LR, Rosovsky R, Salazar M, Schmidt A, Shah SA, Shaya JA, Steinharter J, Stockerl-Goldstein KE, Subbiah S, Vinh DC, Wehbe FH, Weissmann LB, Wu JT, Wulff-Burchfield E, Xie Z, Yeh A, Yu PP, Zhou AY, Zubiri L, Mishra S, Lyman GH, Rini BI, Warner JL; COVID-19 and Cancer Consortium. Clinical impact of COVID-19 on patients with cancer (CCC19): a cohort study. *Lancet* 2020; **395**: 1907-1918 [PMID: 32473681 DOI: 10.1016/S0140-6736(20)31187-9]
- 78 **Garassino MC**, Whisenant JG, Huang LC, Trama A, Torri V, Agustoni F, Baena J, Banna G, Berardi R, Bettini AC, Bria E, Brighenti M, Cadranel J, De Toma A, Chini C, Cortellini A, Felip E, Finocchiaro G, Garrido P, Genova C, Giusti R, Gregorc V, Grossi F, Grosso F, Intagliata S, La Verde N, Liu SV, Mazieres J, Mercadante E, Michielin O, Minuti G, Moro-Sibilot D, Pasello G, Passaro A, Scotti V, Solli P, Stroppa E, Tiseo M, Viscardi G, Voltolini L, Wu YL, Zai S, Pancaldi V, Dingemans AM, Van Meerbeeck J, Barlesi F, Wakelee H, Peters S, Horn L; TERA-VOLT investigators. COVID-19 in patients with thoracic malignancies (TERA-VOLT): first results of an international, registry-based, cohort study. *Lancet Oncol* 2020; **21**: 914-922 [PMID: 32539942 DOI: 10.1016/S1470-2045(20)30314-4]
- 79 **Barlesi F**, Foulon S, Bayle A, Gachot B, Pommeret F, Willekens C, Stoclin A, Merad M, Griscellii F, Micol JB, Sun R, Nihouarn T, Balleygier C, André F, Scotte F, Besse B, Soria JC, Albiges L. CT403 - Outcome of cancer patients infected with COVID-19, including toxicity of cancer treatments [Abstract]. Proceeding of the AACR Annual Meeting 2020; 2020 April 27-28; Online meeting. Available from: <https://www.abstractsonline.com/pp8/#!/9045/presentation/10935>
- 80 **James TA**, Kasumova G, Alapati A, Mamtani A. Unplanned readmissions following breast cancer surgery. *Am J Surg* 2019; **218**: 988-992 [PMID: 31272676 DOI: 10.1016/j.amjsurg.2019.06.017]
- 81 **Xiao H**, Quan H, Pan S, Yin B, Luo W, Tang M, Ouyang Y, Tang W. Incidence, causes and risk factors for 30-day readmission after radical gastrectomy for gastric cancer: a retrospective study of 2,023 patients. *Sci Rep* 2018; **8**: 10582 [PMID: 30002486 DOI: 10.1038/s41598-018-28850-8]
- 82 **Hu Y**, McMurtry TL, Isbell JM, Stukenborg GJ, Kozower BD. Readmission after lung cancer resection is associated with a 6-fold increase in 90-day postoperative mortality. *J Thorac Cardiovasc Surg* 2014; **148**: 2261-2267.e1 [PMID: 24823283 DOI: 10.1016/j.jtcvs.2014.04.026]
- 83 **Hu Y**, McMurtry TL, Stukenborg GJ, Kozower BD. Readmission predicts 90-day mortality after esophagectomy: Analysis of Surveillance, Epidemiology, and End Results Registry linked to Medicare outcomes. *J Thorac Cardiovasc Surg* 2015; **150**: 1254-1260 [PMID: 26412319 DOI: 10.1016/j.jtcvs.2015.08.071]
- 84 **American College of Surgeons**. COVID-19: Guidance for Triage of Non-Emergent Surgical Procedures. In American College of Surgeons [Internet]. Chicago: 2020. Available from: <https://www.facs.org/covid-19/clinical-guidance/triage>
- 85 **Bartlett DL**, Howe JR, Chang G, Crago A, Hogg M, Karakousis G, Levine E, Maker A, Mamounas E, McGuire K, Merchant N, Shibata D, Sohn V, Solorzano C, Turaga K, White R, Yang A, Yoon S; Society of Surgical Oncology. Management of Cancer Surgery Cases During the COVID-19 Pandemic: Considerations. *Ann Surg Oncol* 2020; **27**: 1717-1720 [PMID: 32270420 DOI: 10.1245/s10434-020-08461-2]
- 86 **Diaz A**, Sarac BA, Schoenbrunner AR, Janis JE, Pawlik TM. Elective surgery in the time of COVID-19. *Am J Surg* 2020; **219**: 900-902 [PMID: 32312477 DOI: 10.1016/j.amjsurg.2020.04.014]
- 87 **Marano L**, Marrelli D, Roviello F. Cancer care under the outbreak of COVID-19: A perspective from Italian tertiary referral center for surgical oncology. *Eur J Surg Oncol* 2020; **46**: 1184-1185 [PMID: 32312591 DOI: 10.1016/j.ejso.2020.04.004]
- 88 **Werner MT**, Carey RM, Albergotti WG, Lukens JN, Brody RM. Impact of the COVID-19 Pandemic on the Management of Head and Neck Malignancies. *Otolaryngol Head Neck Surg* 2020; **162**: 816-817 [PMID: 32312163 DOI: 10.1177/0194599820921413]
- 89 **Fakhry N**, Schultz P, Morinière S, Breuskin I, Bozec A, Vergez S, de Garbory L, Hartl D, Temam S,

- Lescanne E, Couloigner V, Barry B; French Society of Otorhinolaryngology, Head and Neck Surgery (SFORL); French Society of Head and Neck Carcinology (SFCCF). French consensus on management of head and neck cancer surgery during COVID-19 pandemic. *Eur Ann Otorhinolaryngol Head Neck Dis* 2020; **137**: 159-160 [PMID: 32303485 DOI: 10.1016/j.anorl.2020.04.008]
- 90 Tuech JJ, Gangloff A, Di Fiore F, Michel P, Brigand C, Slim K, Pocard M, Schwarz L. Strategy for the practice of digestive and oncological surgery during the Covid-19 epidemic. *J Visc Surg* 2020; **157**: S7-S12 [PMID: 32249098 DOI: 10.1016/j.jvisurg.2020.03.008]
- 91 Qadan M, Hong TS, Tanabe KK, Ryan DP, Lillemoe KD. A Multidisciplinary Team Approach for Triage of Elective Cancer Surgery at the Massachusetts General Hospital During the Novel Coronavirus COVID-19 Outbreak. *Ann Surg* 2020; **272**: e20-e21 [PMID: 32301804 DOI: 10.1097/SLA.0000000000003963]
- 92 Rolston KV. Infections in Cancer Patients with Solid Tumors: A Review. *Infect Dis Ther* 2017; **6**: 69-83 [PMID: 28160269 DOI: 10.1007/s40121-017-0146-1]
- 93 Kim YJ, Lee ES, Lee YS. High mortality from viral pneumonia in patients with cancer. *Infect Dis (Lond)* 2019; **51**: 502-509 [PMID: 31081422 DOI: 10.1080/23744235.2019.1592217]
- 94 Chavez-MacGregor M, Clarke CA, Lichtensztajn DY, Giordano SH. Delayed Initiation of Adjuvant Chemotherapy Among Patients With Breast Cancer. *JAMA Oncol* 2016; **2**: 322-329 [PMID: 26659132 DOI: 10.1001/jamaoncol.2015.3856]
- 95 Gagliato Dde M, Gonzalez-Angulo AM, Lei X, Theriault RL, Giordano SH, Valero V, Hortobagyi GN, Chavez-Macgregor M. Clinical impact of delaying initiation of adjuvant chemotherapy in patients with breast cancer. *J Clin Oncol* 2014; **32**: 735-744 [PMID: 24470007 DOI: 10.1200/JCO.2013.49.7693]
- 96 Flores-Balcázar CH, Flores-Luna ML, Villarreal-Garza CM, Bargalló-Rocha JE. Provider delay in treatment initiation and its influence on survival outcomes in women with operable breast cancer. *Rep Pract Oncol Radiother* 2020; **25**: 271-275 [PMID: 32140085 DOI: 10.1016/j.rpor.2020.02.002]
- 97 Kim YW, Choi EH, Kim BR, Ko WA, Do YM, Kim IY. The impact of delayed commencement of adjuvant chemotherapy (eight or more weeks) on survival in stage II and III colon cancer: a national population-based cohort study. *Oncotarget* 2017; **8**: 80061-80072 [PMID: 29108388 DOI: 10.18632/oncotarget.17767]
- 98 Bos AC, van Erning FN, van Gestel YR, Creemers GJ, Punt CJ, van Oijen MG, Lemmens VE. Timing of adjuvant chemotherapy and its relation to survival among patients with stage III colon cancer. *Eur J Cancer* 2015; **51**: 2553-2561 [PMID: 26360411 DOI: 10.1016/j.ejca.2015.08.016]
- 99 Huang J, Barbera L, Brouwers M, Browman G, Mackillop WJ. Does delay in starting treatment affect the outcomes of radiotherapy? A systematic review. *J Clin Oncol* 2003; **21**: 555-563 [PMID: 12560449 DOI: 10.1200/JCO.2003.04.171]
- 100 European Society for Medical Oncology (ESMO). Cancer patient management during the COVID-19 pandemic. In: European Society for Medical Oncology [Internet]. Lugano: 2020. Available from: <https://www.esmo.org/guidelines/cancer-patient-management-during-the-covid-19-pandemic>
- 101 Thomson DJ, Palma D, Guckenberger M, Balcermpas P, Beitler JJ, Blanchard P, Brizel D, Budach W, Caudell J, Corry J, Corvo R, Evans M, Garden AS, Giralt J, Gregoire V, Harari PM, Harrington K, Hitchcock YJ, Johansen J, Kaanders J, Koyfman S, Langendijk JA, Le QT, Lee N, Margalit D, Mierzwa M, Porceddu S, Soong YL, Sun Y, Thariat J, Waldron J, Yom SS. Practice Recommendations for Risk-Adapted Head and Neck Cancer Radiation Therapy During the COVID-19 Pandemic: An ASTRO-ESTRO Consensus Statement. *Int J Radiat Oncol Biol Phys* 2020; **107**: 618-627 [PMID: 32302681 DOI: 10.1016/j.ijrobp.2020.04.016]
- 102 Guckenberger M, Belka C, Bezjak A, Bradley J, Daly ME, DeRuyscher D, Dziadziuszko R, Faivre-Finn C, Flentje M, Gore E, Higgins KA, Iyengar P, Kavanagh BD, Kumar S, Le Pechoux C, Lievens Y, Lindberg K, McDonald F, Ramella S, Rengan R, Ricardi U, Rimner A, Rodrigues GB, Schild SE, Senan S, Simone CB 2nd, Slotman BJ, Stuschke M, Videtic G, Widder J, Yom SS, Palma D. Practice recommendations for lung cancer radiotherapy during the COVID-19 pandemic: An ESTRO-ASTRO consensus statement. *Radiother Oncol* 2020; **146**: 223-229 [PMID: 32342863 DOI: 10.1016/j.radonc.2020.04.001]
- 103 Shea M, Costa DB, Rangachari D. Management of advanced non-small cell lung cancers with known mutations or rearrangements: latest evidence and treatment approaches. *Ther Adv Respir Dis* 2016; **10**: 113-129 [PMID: 26620497 DOI: 10.1177/1753465815617871]
- 104 Van Cutsem E, Martinelli E, Cascinu S, Sobrero A, Banzi M, Seitz JF, Barone C, Ychou M, Peeters M, Brenner B, Hofheinz RD, Maiello E, André T, Spallanzani A, Garcia-Carbonero R, Arriaga YE, Verma U, Grothey A, Kappeler C, Miriyala A, Kalmus J, Falcone A, Zaniboni A. Regorafenib for Patients with Metastatic Colorectal Cancer Who Progressed After Standard Therapy: Results of the Large, Single-Arm, Open-Label Phase IIIb CONSIGN Study. *Oncologist* 2019; **24**: 185-192 [PMID: 30190299 DOI: 10.1634/theoncologist.2018-0072]
- 105 Calabrò L, Peters S, Soria JC, Di Giacomo AM, Barlesi F, Covre A, Altomonte M, Vegni V, Gridelli C, Reck M, Rizvi N, Maio M. Challenges in lung cancer therapy during the COVID-19 pandemic. *Lancet Respir Med* 2020; **8**: 542-544 [PMID: 32278368 DOI: 10.1016/S2213-2600(20)30170-3]
- 106 Nishino M, Ramaiya NH, Awad MM, Sholl LM, Maattala JA, Taibi M, Hatabu H, Ott PA, Armand PF, Hodi FS. PD-1 Inhibitor-Related Pneumonitis in Advanced Cancer Patients: Radiographic Patterns and Clinical Course. *Clin Cancer Res* 2016; **22**: 6051-6060 [PMID: 27535979 DOI: 10.1016/S2213-2600(20)30170-3]
- 107 Bersanelli M. Controversies about COVID-19 and anticancer treatment with immune checkpoint inhibitors. *Immunotherapy* 2020; **12**: 269-273 [PMID: 32212881 DOI: 10.2217/imt-2020-0067]
- 108 Del Castillo M, Romero FA, Argüello E, Kyi C, Postow MA, Redelman-Sidi G. The Spectrum of Serious Infections Among Patients Receiving Immune Checkpoint Blockade for the Treatment of Melanoma. *Clin Infect Dis* 2016; **63**: 1490-1493 [PMID: 27501841 DOI: 10.1093/cid/ciw539]
- 109 NCCN. Coronavirus Disease 2019 (COVID-19) Resources for the Cancer Care Community. In: National Comprehensive Cancer Network [Internet]. Plymouth Meeting: 2020. Available from: <https://www.nccn.org/covid-19/>
- 110 Hollander JE, Carr BG. Virtually Perfect? Telemedicine for Covid-19. *N Engl J Med* 2020; **382**: 1679-1681 [PMID: 32160451 DOI: 10.1056/NEJMp2003539]

- 111 **Rabow M**, Kvale E, Barbour L, Cassel JB, Cohen S, Jackson V, Luhrs C, Nguyen V, Rinaldi S, Stevens D, Spragens L, Weissman D. Moving upstream: a review of the evidence of the impact of outpatient palliative care. *J Palliat Med* 2013; **16**: 1540-1549 [PMID: [24225013](#) DOI: [10.1089/jpm.2013.0153](#)]
- 112 **Humphreys J**, Schoenherr L, Elia G, Saks NT, Brown C, Barbour S, Pantilat SZ. Rapid Implementation of Inpatient Telepalliative Medicine Consultations During COVID-19 Pandemic. *J Pain Symptom Manage* 2020; **60**: e54-e59 [PMID: [32283219](#) DOI: [10.1016/j.jpainsymman.2020.04.001](#)]
- 113 **Pautasso FF**, Zelmanowicz AM, Flores CD, Caregnato RCA. Role of the Nurse Navigator: integrative review. *Rev Gaucha Enferm* 2018; **39**: e20170102 [PMID: [30043944](#) DOI: [10.1590/1983-1447.2018.2017-0102](#)]
- 114 **Marron JM**, Joffe S, Jagsi R, Spence RA, Hlubocky FJ. Ethics and Resource Scarcity: ASCO Recommendations for the Oncology Community During the COVID-19 Pandemic. *J Clin Oncol* 2020; **38**: 2201-2205 [PMID: [32343643](#) DOI: [10.1200/JCO.20.00960](#)]



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