The 10-month mortality rate among older patients treated for digestive system cancer during the first wave of the COVID-19 pandemic: The CADIGCOVAGE multicentre cohort study

Thomas Aparicio, Richard Layese, François Hemery, Christophe Tournigand, Elena Paillaud, Nicola de Angelis, Laurent Quero, Nathalie Ganne, Fredéric Prat, Atanas Pachev, et al.

Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Journal of Geriatric Oncology 14 (2023) 101443

Contents lists available at ScienceDirect

Journal of Geriatric Oncology

journal homepage: www.elsevier.com/locate/jgo

Research Paper

The 10-month mortality rate among older patients treated for digestive system cancer during the first wave of the COVID-19 pandemic: The CADIGCOVAGE multicentre cohort study

Thomas Aparicio [a,b,*], Richard Layese [c,d], François Hemery [e], Christophe Tournigand [f], Elena Paillaud [d,g], Nicola De Angelis [h], Laurent Quero [i,b], Nathalie Ganne [j], Fredéric Prat [k,b], Atanas Pachev [l], Gilles Galula [m], Marc-Antoine Benderra [m], Florence Canouï-Poitrine [c,d], on behalf of the Clinical Data Warehouse of Greater Paris University Hospitals/INSERM COVID-19 research collaboration and the Cancer AP-HP Group

[a] AP-HP, Saint Louis Hospital, Gastroenterology and Digestive Oncology Department, F-75010 Paris, France
[b] Université de Paris, F-75000 Paris, France
[c] AP-HP, Henri-Mondor Hospital, Public Health and Clinical Research department (URC Mondor), F-94010 Créteil, France
[d] Univ Paris Est Creteil, INSERM, IMRB U955, F-94000 Creteil, France
[e] AP-HP, Henri-Mondor Hospital, Medical Information Departement, F-94010 Créteil, France
[f] AP-HP, Henri-Mondor Hospital, Medical Oncology Department, F-94010 Créteil, France
[g] AP-HP, Paris Cancer Institute CARPEM, Georges Pompidou Hospital, Geriatric Department, F-75015 Paris, France
[h] AP-HP, Henri-Mondor Hospital, Digestive Surgery, F-94010 Créteil, France
[i] AP-HP, Saint Louis Hospital, Radiotherapy Department, F-75010 Paris, France
[j] AP-HP, Avicenne Hospital, Hepatology Department, F-93000 Bobigny, France
[k] AP-HP, Beaujon Hospital, Endoscopy Department, F-92110 Clichy, France
[l] AP-HP, Saint Louis Hospital, Radiology Department, F-75010 Paris, France
[m] AP-HP, Tenon Hospital, Medical Oncology, F-75020 Paris, France

ARTICLE INFO

Keywords:
Older patients
Colorectal cancer
Gastric cancer
Oesophageal cancer
Pancreatic cancer
Biliary tract cancer
Hepatocellular carcinoma
COVID-19
Lockdown

ABSTRACT

Introduction: The coronavirus disease 2019 (COVID-19) pandemic has had a dramatic impact on cancer diagnosis and care pathways. Here, we assessed the mid-term impact of the COVID-19 pandemic on older adults with cancer before, during and after the lockdown period in 2020.

Materials and Methods: We performed a retrospective, observational, multicentre cohort study of prospectively collected electronic health records. All adults aged 65 or over and having been newly treated for a digestive system cancer in our institution between January 2018 until August 2020 were enrolled.

Results: Data on 7,881 patients were analyzed. Although the overall 10-month mortality rate was similar in 2020 vs. 2018–2019, the mortality rate among for patients newly treated in the 2020 post-lockdown period was (after four months of follow-up) significantly higher. A subgroup analysis revealed higher mortality rates for (i) patients diagnosed in the emergency department during the pre-lockdown period, (ii) patients with small intestine cancer newly treated during the post-lockdown period, and (iii) patients having undergone surgery with curative intent during the post-lockdown period. However, when considering individuals newly treated during the lockdown period, we observed lower mortality rates for (i) patients aged 80 and over, (ii) patients with a biliary or pancreatic cancer, and (iii) patients diagnosed in the emergency department.

Discussion: There was no overall increase in mortality among patients newly treated in 2020 vs. 2018–2019. Longer follow-up is needed to assess the consequences of the pandemic. A subgroup analysis revealed significant intergroup differences in mortality.

* Corresponding author at: Gastroenterology and Digestive Oncology, Saint Louis Hospital, Université de Paris, 1 avenue Claude Vellefaux, 75010 Paris, France.
E-mail address: thomas.aparicio@aphp.fr (T. Aparicio).

https://doi.org/10.1016/j.jgo.2023.101443
Received 14 April 2022; Received in revised form 11 December 2022; Accepted 23 January 2023
Available online 27 January 2023

Table 1
10-month mortality, by period and by subgroup.

	Pre-lockdown period			Overall p*	Lockdown period			Overall p*	Post-lockdown period			Overall p*
	January 1 –March 16 (*N* = 2762)				March 17 –May 10 (*N* = 1668)				May 11 –August 30 (*N* = 3451)			
	2018	2019	2020		2018	2019	2020		2018	2019	2020	
	N = 959	*N* = 889	*N* = 914		*N* = 650	*N* = 645	*N* = 373		*N* = 1247	*N* = 1192	*N* = 1012	
Overall	276/959 (31.1) [47.7]	250/889 (31.7) [49.1]	219/914 (28.2) [44.3]	0.478	197/650 (32.7) [51.6]	172/645 (29.3) [46.4]	98/373 (31.7) [52.1]	0.527	342/1247 (30.2) [46.6]	337/1192 (32.0) [52.2]	296/1012 (35.9) [58.3]	0.067
Age												
65–69	60/257 (25.1) [34.9]	55/227 (28.0) [40.5]	45/239 (22.9) [33.6]	0.623	49/186 (28.2) [43.0]	35/178 (21.8) [32.2]	23/103 (26.8) [42.2]	0.412	70/341 (22.2) [31.5]	66/287 (24.8) [36.2]	53/239 (28.0) [41.3]	0.4
70–79	107/414 (28.1) [41.4]	97/405 (26.9) [39.6]	87/414 (24.7) [35.8]	0.59	64/283 (24.4) [34.5]	68/306 (24.4) [36.1]	40/169 (28.3) [42.6]	0.643	131/553 (25.9) [38.1]	122/547 (25.4) [39.0]	113/466 (29.5) [45.4]	0.471
80+	109/288 (41.1) [73.3]	98/257 (42.7) [76.5]	87/261 (38.5) [73.6]	0.967	84/181 (50.9) [101.8]	69/161 (47.2) [93.7]	35/101 (43.2) [88.3]	0.584	141/353 (45.5) [83.6]	419/358 (49.1) [99.2]	130/307 (51.9) [99.3]	0.407
Sex												
Male	177/600 (31.8) [48.4]	140/519 (30.6) [47.3]	125/576 (25.5) [38.3]	0.093	120/399 (32.2) [50.5]	106/403 (28.9) [45.4]	56/222 (30.4) [48.6]	0.675	200/740 (29.6) [45.3]	183/719 (28.8) [45.8]	167/609 (34.2) [54.6]	0.281
Female	99/359 (30.0) [46.4]	110/370 (33.3) [51.7]	94/338 (32.9) [55.9]	0.57	77/251 (33.5) [53.5]	66/242 (30.2) [48.1]	42/151 (33.6) [57.7]	0.708	142/507 (31.0) [48.5]	154/473 (36.9) [62.7]	129/403 (38.4) [63.8]	0.064
Tumour site												
Colon/rectum	87/376 (24.7) [35.1]	74/332 (25.4) [37.2]	58/322 (21.1) [31.7]	0.64	53/223 (25.3) [39.2]	39/221 (19.2) [28.3]	25/135 (22.9) [37.4]	0.318	107/497 (23.2) [34.8]	106/441 (27.4) [42.3]	89/395 (29.0) [43.5]	0.339
Oesophagus/stomach	40/129 (34.1) [53.7]	35/117 (33.5) [53.6]	30/107 (34.7) [55.2]	0.999	31/92 (38.2) [63.1]	33/101 (35.8) [59.8]	16/41 (47.5) [87.2]	0.6	40/162 (27.9) [42.2]	42/156 (31.2) [52.4]	42/120 (44.1) [82.3]	**0.022**
Pancreas/bile duct	97/265 (39.9) [67.8]	101/267 (43.1) [73.8]	87/288 (35.3) [60.3]	0.452	76/202 (40.4) [66.0]	64/181 (40.0) [68.9]	29/106 (33.6) [56.7]	0.663	148/379 (44.0) [74.4]	122/349 (40.9) [71.5]	113/310 (43.3) [74.8]	0.917
Hepatocellular carcinoma	46/152 (33.7) [52.5]	32/134 (26.1) [38.3]	38/163 (27.4) [40.6]	0.334	32/100 (34.2) [55.8]	30/108 (30.0) [46.2]	25/72 (38.7) [63.9]	0.515	42/165 (27.3) [41.2]	54/200 (28.7) [46.5]	36/139 (30.6) [47.2]	0.859
Small intestine	4/22 (19.8) [26.4]	Apr-20 −23 [30.8]	Mar-16 −18.8 [28.3]	0.981	01-Dec −8.3 [10.4]	Mar-22 −14.6 [22.7]	01-Jun −16.7 [27.9]	0.793	Mar-26 −13.3 [16.6]	Jun-31 −21.4 [30.1]	10/29 (39.9) [66.5]	0.058
Anus	2/15 (13.3) [18.2]	Apr-19 −22.6 [34.7]	Mar-18 −20.9 [33.2]	0.815	Apr-21 −20.5 [26.3]	03-Dec −25.9 [43.6]	Feb-13 −16.9 [22.1]	0.786	Feb-18 −11.8 [15.9]	Jul-15 −51.9 [92.6]	Jun-19 −35.4 [62.1]	0.07
Metastatic status												
Non metastatic	172/774 (24.2) [34.3]	157/711 (25.1) [36.0]	139/755 (22.1) [32.3]	0.614	132/524 (27.3) [40.4]	107/512 (23.3) [33.9]	69/313 (27.2) [42.0]	0.303	206/984 (23.2) [32.7]	190/957 (23.1) [33.8]	189/818 (29.2) [43.6]	**0.019**
Metastatic	104/185 (60.3) [133.8]	93/178 (58.6) [127.0]	80/159 (56.0) [125.5]	0.847	65/126 (55.8) [117.9]	65/133 (53.2) [118.9]	29/60 (54.5) [122.4]	0.911	136/263 (57.2) [129.7]	147/235 (67.4) [178.9]	107/194 (62.4) [143.1]	0.052
Modified Charlson score												
≤3	78/491 (17.6) [23.6]	93/475 (22.7) [31.8]	84/497 (20.8) [29.7]	0.164	72/328 (24.1) [34.8]	63/352 (20.3) [28.9]	32/195 (21.1) [32.1]	0.539	114/637 (20.0) [27.4]	101/601 (19.8) [28.3]	117/534 (28.4) [41.8]	**0.003**
>3	198/468 (45.0) [79.5]	157/414 (41.9) [72.6]	135/417 (36.6) [63.7]	0.129	125/322 (41.4) [71.6]	109/293 (39.9) [71.4]	66/178 (42.0) [74.6]	0.962	228/610 (40.8) [71.7]	236/591 (44.0) [82.0]	179/478 (43.8) [78.5]	0.475
Diagnosis in the emergency department												
No	206/819 (27.2) [39.9]	183/755 (27.5) [40.7]	165/812 (24.2) [35.8]	0.398	141/541 (28.2) [42.4]	140/575 (26.8) [41.0]	71/305 (28.4) [44.0]	0.915	247/1044 (25.9) [38.1]	244/1007 (27.6) [42.6]	191/821 (29.3) [43.9]	0.434
Yes	70/140 (54.9) [110.9]	67/134 (55.2) [113.6]	54/102 (58.6) [160.9]	0.207	56/109 (55.1) [113.7]	32/70 (50.9) [108.2]	27/68 (47.0) [100.9]	0.748	95/203 (53.7) [11.8]	93/185 (56.3) [129.0]	105/191 (62.9) [144.8]	0.304

(*continued on next page*)

Table 1 (*continued*)

	Pre-lockdown period			Overall p*	Lockdown period			Overall p*	Post-lockdown period			Overall p*
	January 1 –March 16 (*N* = 2762)				March 17 –May 10 (*N* = 1668)				May 11 –August 30 (*N* = 3451)			
	2018	2019	2020		2018	2019	2020		2018	2019	2020	
	N = 959	*N* = 889	*N* = 914		*N* = 650	*N* = 645	*N* = 373		*N* = 1247	*N* = 1192	*N* = 1012	
First treatment performed within 3 months of diagnosis												
Surgery with curative intent	24/268 (9.8 [12.5]	25/265 (11.4) [15.1]	29/248 (14.8) [20.3]	0.22	16/184 (9.7) [12.7]	13/174 (9.2) [11.3]	14/110 (18.2) [24.4]	0.086	23/368 (7 [9.0]	40/340 (13.7) [18.9]	32/263 (17.6) [22.5]	**0.002**
Palliative surgery	Aug-17 (−49 [76.2]	Apr-18 (−24.4 [34.3]	Jul-17 (−43.5 [76.7]	0.354	3/11 (33.3) [51.4]	03-Dec (−26.7 [38.7]	0/5 (0 [0]	0.524	Aug-33 (−28.7 [39.5]	Aug-25 (−34.4 [57.5]	11/28 (47.3) [73.7]	0.407
Endoscopic treatment	13/47 (−31.6 [48.2]	16/58 (32.1) [47.6]	Sep-55 (−20.6 [28.8]	0.425	16/54 (34.4) [50.9]	10/53 (23.0) [32.2]	5/23 (27.7) [46.0]	0.51	31/107 (32.8) [50.5]	18/81 (27.3) [38.9]	27/75 (46.0) [71.8]	0.122
Interventional radiology	Sep-51 (−19.1 [25.0]	Apr-52 (−8.6 [10.4]	Aug-54 (−18 [22.4]	0.285	6/39 (16.4) [21.2]	Feb-35 (−6.5 [7.8]	3/27 (11.5) [14.3]	0.444	Jul-66 (−11.4 [14.4]	Apr-77 (−5.5 [7.0]	10/68 (17.8) [22.7]	0.112
Chemotherapy / radiotherapy	77/273 (29.3) [40.5]	79/237 (34.9) [50.6]	58/259 (24.3) [33.7]	0.054	51/171 (30.9) [42.1]	45/185 (25.2) [35.4]	21/93 (24.9) [33.3]	0.589	93/290 (33.0) [48.0]	69/283 (26.6) [37.0]	66/261 (27.1) [37.6]	0.172
Best supportive care only	108/128 (91.7) [530.3]	76/92 (90.3) [562.1]	73/86 (90.3) [779.5]	0.207	78/81 (98.7) [960.5]	79/86 (95.0) [846.8]	40/52 (91.5) [643.0]	0.141	130/158 (91.6) [547.6]	140/165 (95.2) [699.0]	110/134 (93.7) [521.0]	0.132
No treatment recorded in an AP-HP hospital	37/175 (24.9) [36.2]	46/167 (33.7) [51.2]	35/195 (24.0) [37.1]	0.224	27/110 (28.2) [44.8]	20/100 (25.1) [36.3]	15/63 (30.6) [55.9]	0.563	50/225 (26.7) [38.6]	58/221 (33.9) [52.8]	40/183 (32.2) [55.1]	0.234

Results are presented as N1/N2 (N3) [N4] with N1: number of events; N2: total number of patients; N3: 10-month mortality probability from Kaplan-Meier method; N4: mortality rates per 100 person-years.

* Log-rank test.

1. Introduction

Most patients newly diagnosed with digestive system cancer are aged 65 and over. Older age is associated with a greater diagnostic delay, less accurate treatment [1], and less frequent enrolment in a clinical trial [2]. The coronavirus disease 2019 (COVID-19) pandemic has had a dramatic impact on cancer diagnosis and treatment - especially during lockdown periods [3]. Changes in the provision of systemic cancer therapy has especially affected older patients [4]. The first wave of the COVID-19 pandemic prompted the publication of new guidelines on modified treatment strategies for digestive system cancer in patients of all ages [5] and specifically in older patients [6].

The consequences on cancer mortality have only been assessed in modelling studies, with the prediction of a large increase in additional deaths due to breast, lung, colorectal, and oesophageal cancers at one and five years [7]. In France, the first period of lockdown lasted from March 17 to May 10, 2020. Most people were only allowed to leave their home for an hour a day and then only within a 1 km radius of their home. No meetings were allowed and all hospitality venues had to close. Teleconsultations (rather than physical consultations) with general practitioners were promoted, and hospital admissions were restricted to emergencies. The Ile-de-France (Greater Paris) and Great East regions were those most affected by the first wave of the COVID-19 pandemic, with high levels of pressure on hospitals.

We hypothesized that the three periods reflected exposure to different levels of healthcare access and care: normal levels during the pre-lockdown, very low levels during the lockdown period, and low levels during the post-lockdown period. Moreover, frailer, older patients may have even more difficulty accessing healthcare. Here, we sought to determine whether the level of access to care impacted the mortality rate at 10 months.

We performed a retrospective, observational, multicentre cohort study of prospectively collected electronic health records (EHRs) in the Greater Paris Public Hospitals Group's data warehouse (*Entrepot de Données de Santé de l'Assistance Publique Hôpitaux de Paris* [AP-HP]; Paris, France); our objective was to assess the effect of lockdown on newly treated patients with digestive system cancer care in general and on the short-term mortality rate among older patients in particular [8]. Our main findings were that the first COVID-19 lockdown period was associated with a 42.4% decrease in newly treated digestive system cancers, and that there was no "catch-up" after the lockdown period. The proportion of patients admitted to an emergency department increased during the lockdown period. No increase in three-month mortality rate was observed in 2020, relative to the corresponding calendar periods in 2018 and 2019.

Here, we assessed the mortality rate in the 2020 cohort after a longer follow-up period and sought to identify factors associated with mortality.

2. Methods

2.1. Design

The study design has been described in detail elsewhere [8]. Briefly, EHR data from 30 AP-HP hospitals in the Greater Paris area were included in the study. The study cohort comprised all adults aged 65 or over hospitalized in one of the 30 hospitals between January 1, 2018, and August 30, 2020 for whom a digestive system cancer was the main diagnosis or a related diagnosis. We enrolled patients with cancer diagnosed and treated in the participating hospitals and patients with cancer diagnosed elsewhere who had then been referred to the AP-HP for the first time. The following digestive system cancers were

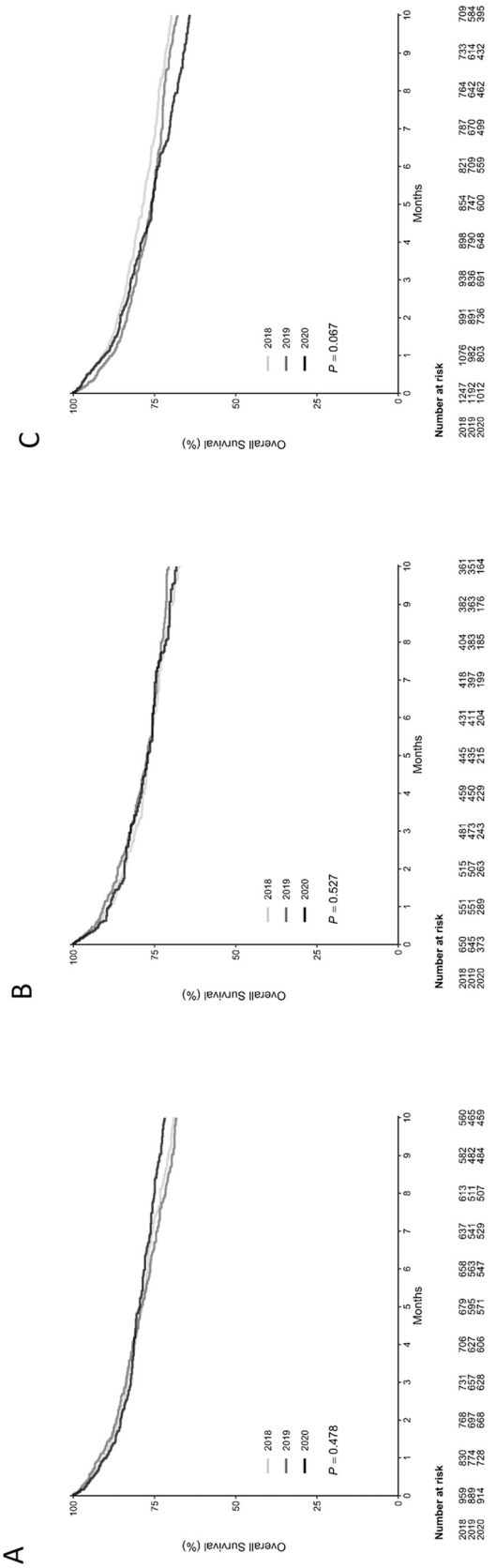

Fig. 1. Overall survival for all patients, by year, in the pre-lockdown period (A), lockdown period (B), and post-lockdown period (C).

considered: cancers of the oesophagus, stomach, pancreas, biliary tract, small intestine, colon, rectum, or anus, and hepatocellular carcinoma. Patients having already been hospitalized with an ICD-10 code for a digestive system cancer in the previous two years were not included. The inclusion date was defined as the date of the first recorded hospital consultation or admission with a digestive system cancer code. Based on the medical procedure codes at the first mention of a newly treated digestive system cancer for a given patient, the type of first treatment was classified as surgery with curative intent, palliative surgery, endoscopic treatment, interventional radiology, chemo/radiotherapy, or best supportive care only.

All the patients were followed up for 10 months after the inclusion date. The overall study period was divided into a pre-lockdown period (January 1, 2020 to March, 16, 2020), a lockdown period (March 17, 2020 to May 10, 2020), and a post-lockdown period (May 11, 2020 to August 30, 2020).

We studied the effect of the times periods (pre-lockdown, lockdown, and post-lockdown) and patients' baseline characteristics: sex, age, comorbidities, the primary tumour site (oesophagus, stomach, pancreas, biliary tract, small intestine, colon, rectum, anus, or hepatocellular carcinoma), the metastatic status, and initial presentation at an emergency department. Corresponding calendar periods were defined for the two reference years (2018 and 2019). Three age groups were defined: 65–69 years, 70–79 years, and 80 years or over. Comorbidities were assessed using a modified Charlson Comorbidity Index (adapted for use with hospital administrative data [9]), and patients were categorized in quartiles.

The study was approved by the AP-HP's research ethics committee (Paris, France; reference: 00011591). The study database was registered with the French National Data Protection Commission (*Commission nationale de l'informatique et des libertés* (Paris, France); reference: CNIL 1980120).

2.2. Statistical Analysis

The 10-month overall mortality and survival curves were analyzed using the Kaplan-Meier method, as a function of the baseline characteristics and the year (2020 vs. the mean value in 2018–2019) separately for patients newly treated during the pre-lockdown, lockdown, and post-lockdown periods, respectively. Mortality was expressed as probability from the Kaplan-Meier method and rates per 100 person-years. Univariate and multivariate analyses (Cox proportional hazards regression models) were used to study the association between mortality on one hand and the interaction between the year and each study variable on the other. The interaction term between the year and the baseline characteristic was taken as a measure of the risk of death in 2020, relative to the pooled reference period (i.e., 2018–2019). We have considered the first recorded hospital consultation/admission with a digestive system cancer code as time 0 for the mortality assessment. Due to non-proportionality of the hazard ratios (HRs) for the treatment and the period, these variables were studied by considering two follow-up periods: less than four months and from four to 10 months. Each term for the interaction between the year and a baseline characteristic was evaluated in multivariate analyses by adjusting for the other characteristics. For example, to obtain the HR for the "2020 - Age 65-69" group, we included the interaction term between the year and the age class and the other characteristics and then chose "2018-2019 – Age 65-69" as the reference for the corresponding HR). All tests were two-sided, and the threshold for statistical significance was set to $p < 0.05$. The statistical analyses were performed with Python software and R software (version 3.6.3, The R Project for Statistical Computing, Vienna, Austria).

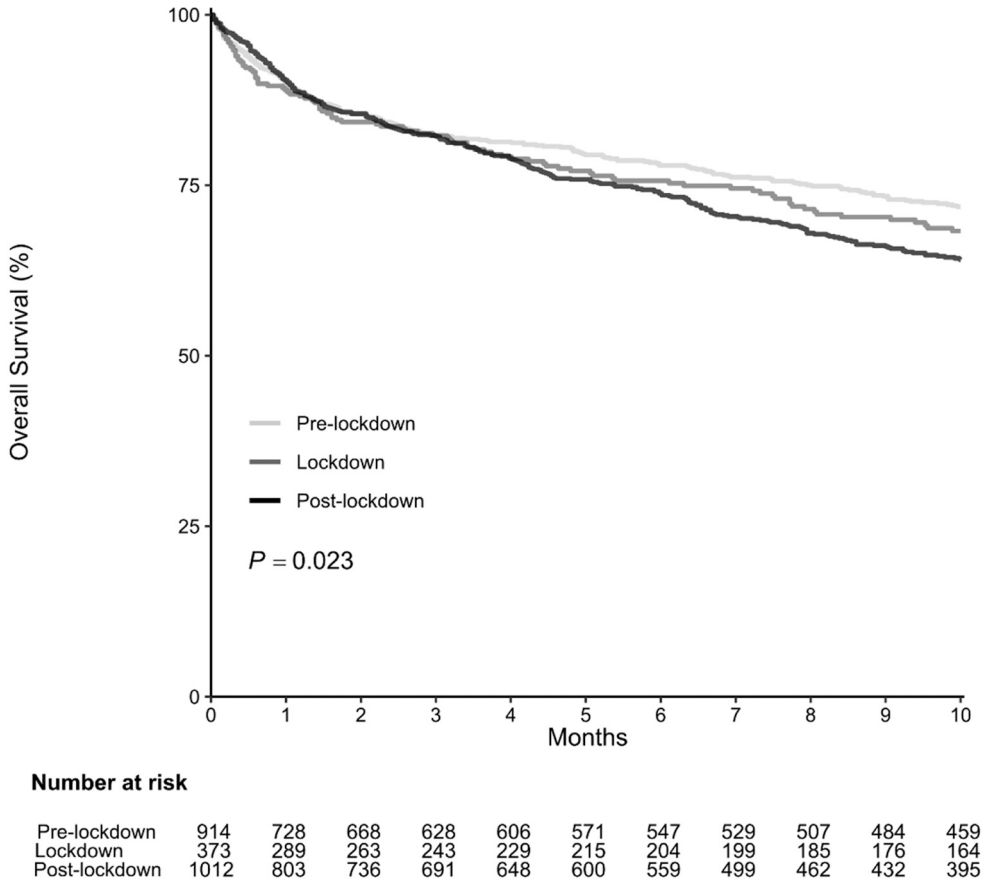

Fig. 2. Overall survival in 2020, by period.

3. Results

3.1. Probability of 10-Month Mortality and Overall Survival by Period and Year

During the study period, a total of 10,821 patients aged 65 and over with an ICD-10 code for a digestive system cancer were found. Among them, 2,940 (27.2%) patients that had a previous diagnostic of digestive system cancer were excluded. Thus, 7,881 patients remained with newly treated digestive system cancer that were included in the study. The description of the characteristics of patients by year and by period was already reported in a previous article [8] and presented in supplementary data (Table S1 and Table S2). Overall, the 10-month mortality rate in 2020 was similar to those observed in 2018 and 2019 (Table 1). This was also true for the pre-lockdown, lockdown, and post-lockdown periods separately. However, there was a non-significant trend towards greater mortality among patients newly treated for cancer during the post-lockdown period (Fig. 1). In 2020, the overall survival rate decreased over time (Fig. 2).

3.2. Mortality by Subgroup

Subgroup analyses revealed year-on-year variations in the 10-month mortality rate (Table 1). All the excess mortality in 2020 was observed during the post-lockdown period. The subgroups with a significant increase in the mortality rate were patients with oesophageal cancer, gastric cancer, or non-metastatic cancer, patients with a Charlson score ≤ 3, and patients having undergone surgery with curative intent (Table 1). In 2020, hospital admission for COVID-19 was associated with a greater risk of death. We observed 28 deaths (45%) after 62 hospital admissions for COVID 19 and 789 deaths after 2,237 (32%) hospital admissions for other reasons (HR [95% confidence interval (CI)] = 2.27 [1.45; 3.54], $p < 0.001$).

Multivariate subgroup analyses revealed that among patients newly treated in the pre-lockdown period, only those diagnosed in the emergency department had an excess risk of death in 2020 vs. 2018–2019 (Table 2). For patients newly treated during lockdown itself, none of the clinical features was associated with an excess risk of death. There was a non-significant trend for patients having undergone surgery with curative intent. Surprisingly, the oldest patients (aged over 80 years), patients with primary pancreatic or bile duct cancer, patients diagnosed in the emergency department, and patients who received supportive care only had a lower risk of death (Table 3). For patients newly treated in the post-lockdown period, those with primary small intestine cancer and those having undergone surgery with curative intent presented an excess of risk of death (Table 4). Taking the pre-lockdown period in 2020 as the reference, an adjusted multivariate analysis revealed an increased risk of death after four to 10 months of follow-up for patients newly treated during the post-lockdown period (HR [95%CI] = 1.49 [1.10; 2.04], $p = 0.011$). However, the greater risk of death was not observed when considering the first four months of follow-up for these same patients (HR [95%CI] = 0.85 [0.68; 1.05], $p = 0.139$). Moreover, there was no relative increase in mortality for patients newly treated during the lockdown period during the first four months of follow-up (HR 0.92; 95%CI [0.69; 1.23], $p = 0.572$) or after four to 10 months of follow-up (HR [95%CI] = 1.17 [0.75; 1.81], $p = 0.487$).

4. Discussion

During France's first wave of COVID-19, we did not observe excess 10-month mortality among older patients with digestive system cancer newly treated in AP-HP hospital either before, during, or after the

Table 2
Univariate and multivariate analyses of death during the 10 months following enrolment in the pre-lockdown period.

Year-feature interaction [a] Reference: 2018–2019	Univariate analysis		Multivariate analysis [b]	
	HR [95%CI]	*P*-value	HR [95%CI]	P-value
Year / age				
2020 / age 65–69	0.88 [0.62; 1.24]	0.472	0.99 [0.70; 1.41]	0.971
2020 / age 70–79	0.88 [0.69; 1.14]	0.334	1.01 [0.79; 1.31]	0.916
2020 / age 80+	0.97 [0.76; 1.25]	0.829	0.96 [0.74; 1.24]	0.767
Year / sex				
2020 / female	1.12 [0.88; 1.43]	0.376	1.10 [0.86; 1.40]	0.467
2020 / male	0.80 [0.65; 0.98]	**0.032**	0.92 [0.75; 1.14]	0.443
Year / tumour site				
2020 / colon or rectum	0.87 [0.65; 1.18]	0.367	0.96 [0.71; 1.30]	0.800
2020 / oesophagus/ stomach	1.00 [0.66; 1.53]	0.991	1.50 [0.98; 2.30]	0.061
2020 / pancreas/bile duct	0.85 [0.66; 1.10]	0.222	0.88 [0.68; 1.14]	0.330
2020 / hepatocellular carcinoma	0.89 [0.60; 1.31]	0.552	0.99 [0.67; 1.46]	0.956
2020 / small intestine	1.00 [0.27; 3.77]	0.999	1.06 [0.28; 3.99]	0.937
2020 / anus	1.18 [0.30; 4.73]	0.812	0.94 [0.23; 3.76]	0.927
Year / metastatic status				
2020 / non-metastatic	0.91 [0.75; 1.11]	0.347	1.01 [0.82; 1.23]	0.954
2020 / metastatic	0.96 [0.75; 1.25]	0.763	0.96 [0.74; 1.25]	0.766
Year /modified Charlson score				
2020 / score ≤ 3	1.07 [0.82; 1.38]	0.631	1.16 [0.89; 1.51]	0.274
2020 / score > 3	0.83 [0.68; 1.02]	0.073	0.91 [0.74; 1.11]	0.337
Year/ diagnosis in the emergency department				
2020 / no	0.88 [0.73; 1.06]	0.176	0.89 [0.74; 1.07]	0.212
2020 / yes	1.34 [0.98; 1.84]	0.068	1.41 [1.02; 1.93]	**0.036**
Year/main treatment in the first 3 months				
Baseline to 4 months of follow-up				
2020 / surgery with curative intent	1.57 [0.85; 2.89]	0.149	1.49 [0.81; 2.74]	0.205
2020 / palliative surgery	2.00 [0.61; 6.54]	0.254	2.11 [0.64; 6.92]	0.220
2020 / endoscopic treatment	0.71 [0.28; 1.80]	0.468	0.71 [0.28; 1.81]	0.476
2020 / interventional radiology	1.36 [0.23; 8.13]	0.738	1.50 [0.25; 8.96]	0.659
2020 / chemotherapy/ radiotherapy	0.89 [0.56; 1.43]	0.642	0.92 [0.57; 1.47]	0.712
2020 / best supportive care only	1.38 [1.05; 1.81]	**0.022**	1.22 [0.92; 1.62]	0.165
2020 / no treatment recorded in an AP-HP hospital	1.08 [0.66; 1.75]	0.765	1.21 [0.74; 1.96]	0.450
>4 months to 10 months of follow-up				
2020 / surgery with curative intent	1.35 [0.67; 2.71]	0.399	1.25 [0.62; 2.52]	0.530
2020 / palliative surgery	0.80 [0.16; 3.95]	0.782	0.82 [0.17; 4.08]	0.810
2020 / endoscopic treatment	0.47 [0.13; 1.67]	0.244	0.55 [0.15; 1.94]	0.351
2020 / interventional radiology	1.27 [0.46; 3.51]	0.639	1.38 [0.50; 3.80]	0.533
2020 / chemotherapy/ radiotherapy	0.66 [0.45; 0.98]	**0.042**	0.65 [0.44; 0.96]	**0.032**
2020 / best supportive care only	Not assessable		Not assessable	
2020 / no treatment recorded in an AP-HP hospital	0.56 [0.28; 1.14]	0.109	0.64 [0.32; 1.29]	0.212

HR: hazard ratio; CI, confidence interval.
P-value are from the Wald test.
[a] The risk of death of each category is compared with those of the same category in 2018–2019 using a different cox proportional model for each modality.
[b] Adjusted for all variables in the table.

lockdown period (relative to the same calendar period in the two previous years). Nevertheless, our results highlighted an elevated risk of mortality among patients newly treated in the post-lockdown period - especially when considering more than four months of follow-up. We did not observe excess three-month mortality in the same cohort [8]. Our results are in line with those of a large, retrospective cohort study of primary care data collected during the first wave of the COVID-19 epidemic in England: there was no excess mortality among patients with cancer [10]. In contrast, our results are not in agreement with Maringe et al.'s population-based modelling study, which predicted an increase in mortality as a result of diagnostic delay during first wave of COVID-19 [7]. However, the modelling study predicted that the excess of mortality would be seen after five years; our study only had 10 months of follow-up. Moreover, Maringe et al. investigated diagnostic delays (i.e., patients not diagnosed during the year 2020), whereas our study assessed the prognosis of patients diagnosed during the pandemic. Lastly, older patients were excluded from Maringe et al.'s analysis – even though this age group accounts for a large proportion of patients with cancer. Interestingly, we observed a decrease in overall survival for each successive period in 2020. The decrease was especially marked when comparing the post-lockdown with the lockdown period. This might be due to a longer time interval between diagnosis and surgery [11], resulting in a larger primary tumour and/or more metastases [12]. Although there are probably several reasons for shorter survival, the main ones is likely related to delayed access to our institution during the lockdown period and thus later-stage disease on diagnosis. Unfortunately, we were unable to assess the delay in access to our institution after the first symptoms. Nevertheless, the lower survival rate observed for patients newly treated after the lockdown period is a cause for concern and must be investigated.

A multivariate subgroup analysis revealed some significant differences in the mortality rate in 2020 compared with 2018 and 2019. We reported previously that there was no difference in the patients' characteristics (age, sex, primary site, metastatic status, and median Charlson comorbidity index) as a function of the period, except for higher proportion of patients admitted to an emergency department during the lockdown period [8]. In the pre-lockdown period, patients diagnosed in the emergency department had an excess risk of 10-month mortality in the present study. In our previous analysis of the same subgroup, we did not observed a trend towards excess three-month mortality rate [8]. One could speculate that these patients did not receive the emergency treatment during the lockdown [5], as has been observed for surgery and intensive chemotherapy [4,13].

We were surprised to see that for some subgroups of patients newly treated during the lockdown, the 10-month mortality rate was lower in 2020 than in 2018 and 2019. We hypothesize that this was due to restricted access to general practitioners [14] (especially for the most frail patients), and so only the fitter patients over 80 were referred to our

Table 3
Univariate and multivariate analyses of death during the 10 months following enrolment in the lockdown period.

Year-feature interaction Reference: 2018–2019 [a]	Univariate analysis		Multivariate analysis [b]	
	HR [95%CI]	P-value	HR [95%CI]	P-value
Year / age				
2020 / age 65–69	1.07 [0.68; 1.70]	0.766	1.08 [0.68; 1.72]	0.748
2020 / age 70–79	1.17 [0.82; 1.67]	0.382	1.07 [0.74; 1.53]	0.732
2020 / age 80+	0.87 [0.60; 1.26]	0.470	0.66 [0.45; 0.96]	**0.031**
Year / sex				
2020 / female	1.09 [0.77; 1.54]	0.625	0.92 [0.65; 1.32]	0.662
2020 / male	0.98 [0.73; 1.32]	0.902	0.86 [0.64; 1.16]	0.322
Year / tumour site				
2020 / colon or rectum	1.05 [0.67; 1.63]	0.838	1.26 [0.80; 1.97]	0.324
2020 / oesophagus or stomach	1.30 [0.75; 2.25]	0.344	0.87 [0.50; 1.52]	0.629
2020 / pancreas or bile duct	0.83 [0.56; 1.24]	0.356	0.62 [0.41; 0.93]	**0.021**
2020 / hepatocellular carcinoma	1.25 [0.78; 1.99]	0.349	1.04 [0.65; 1.67]	0.875
2020 / small intestine	1.55 [0.17; 13.85]	0.696	1.10 [1.12; 9.97]	0.930
2020 / anus	0.71 [0.15; 3.42]	0.669	1.48 [0.30; 7.23]	0.631
Year / metastatic status				
2020 / non-metastatic	1.09 [0.83; 1.43]	0.526	0.86 [0.65; 1.14]	0.295
2020 / metastatic	0.99 [0.66; 1.49]	0.976	0.94 [0.63; 1.41]	0.767
Year /modified Charlson score				
2020 / score ≤ 3	0.96 [0.65; 1.41]	0.838	0.99 [0.67; 1.47]	0.978
2020 / score > 3	1.03 [0.78; 1.35]	0.826	0.84 [0.63; 1.11]	0.214
Diagnosis in the emergency department				
2020 / no	1.02 [0.79; 1.33]	0.853	1.03 [0.79; 1.35]	0.817
2020 / yes	0.87 [0.56; 1.34]	0.521	0.60 [0.39; 0.94]	**0.026**
Main treatment in the first 3 months				
Baseline to 4 months of follow-up				
2020 / surgery with curative intent	1.71 [0.70; 4.15]	0.237	1.69 [0.69; 4.12]	0.247
2020 / palliative surgery	Not assessable	–	Not assessable	
2020 / endoscopic treatment	1.60 [0.53; 4.85]	0.409	1.34 [0.44; 4.09]	0.608
2020 / interventional radiology	1.34 [0.12; 14.78]	0.811	1.38 [0.13; 15.22]	0.793
2020 / chemotherapy/ radiotherapy	0.69 [0.31; 1.55]	0.373	0.75 [0.33; 1.67]	0.480
2020 / best supportive care only	0.68 [0.47; 0.97]	**0.031**	0.61 [0.42; 0.89]	**0.010**
2020 / no treatment recorded in an AP-HP hospital	1.51 [0.78; 2.94]	0.225	1.53 [0.78; 2.98]	0.215
>4 months to 10 months of follow-up				
2020 / surgery with curative intent	2.41 [0.96; 6.03]	0.061	2.37 [0.94; 5.94]	0.066
2020 / palliative surgery	Not assessable		Not assessable	
2020 / endoscopic treatment	0.49 [0.06; 3.76]	0.792	0.43 [0.06; 3.31]	0.417
2020 / interventional radiology	0.83 [0.17; 4.11]	0.820	0.84 [0.17; 4.15]	0.828
2020 / chemotherapy/ radiotherapy	0.98 [0.55; 1.76]	0.946	1.07 [0.59; 1.92]	0.830
2020 / best supportive care only	2.48 [0.41; 14.87]	0.321	1.84 [0.30; 11.28]	0.510
2020 / no treatment recorded in an AP-HP hospital	0.86 [0.25; 2.97]	0.818	0.86 [0.25; 2.97]	0.816

HR: hazard ratio; CI, confidence interval.
P-value are from the Wald test.
[a] The risk of death of each category is compared with those of the same category in 2018–2019, using a different Cox proportional hazards model for each modality.
[b] Adjusted for all variables in the table.

hospital network. Some very frail nursing home residents might have died in their institution rather than in hospital. Patients with pancreas and bile duct cancer (requiring surgery in a specialist centre) might have been more stringently selected prior to referral to our tertiary care hospitals. The better prognoses of patients initially admitted to the emergency department might reflect the fact that this was the main hospital admission pathway during the lockdown. Indeed, we previously reported that the proportion of patients with a digestive system cancer admitted through the emergency department was higher during the lockdown period [8]. Thus, one can reasonably hypothesize that some fit patients usually referred to a hospital's cancer centre or oncology department by a general practitioner went straight to the emergency department during the lockdown.

We observed an increased risk of mortality for patients having undergone surgery with curative intent during the post-lockdown period. This might have been due to the longer time interval between diagnosis and surgery among patients with localized tumours [11]. We also speculate that during the lockdown period, patients did not receive appropriate treatment before surgery or prehabilitation. We also observed an increased risk of mortality in patients with small intestine tumours – a rare entity that mainly comprises neuro-endocrine tumours and small bowel adenocarcinoma. Our hospitals' disease coding does not distinguish between these two histologic subtypes. Small bowel adenocarcinoma has a poor prognosis [15]. One can speculate that the diagnostic delay for indolent neuro-endocrine tumours was longer than that for small bowel adenocarcinoma, which is frequently diagnosed in emergency.

In the cohort of patients enrolled in 2020, we observed excess mortality among those hospitalized for COVID-19. This is in line with a previous report of a high mortality rate in patients with cancer infected with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [16]. A recent analysis of mortality among patients with colorectal cancer revealed that COVID-19 was the main reason for direct excess mortality in 2020 [17]. However, it must be borne in mind that the proportion of patients with COVID-19 in our cohort was low. This might reflect efforts to protect patients with cancer from SARS-CoV-2 infections, as reflected by French national guidelines [5] and the reorganization of oncology departments [18]. However, we did not have exhaustive data on diagnoses of COVID-19: outpatients with COVID-19 and patients treated for severe COVID-19 outside our institution were not included in the COVID-19 subgroup in the present study.

Our study had some limitations. Firstly, the follow-up period was short; three years would be needed for an evaluation of the overall impact of the COVID-19 pandemic on cancer prognoses. Secondly, this was not a registry study; even though our hospital network cares for a high proportion of people with cancer in our region, some patients usually referred to an AP-HP hospital might have been referred to another hospital less impacted by the COVID-19 pandemic.

Table 4
Univariate and multivariate analyses of death during the 10 months following enrolment in the post-lockdown period

Year-feature interaction Reference: 2018–2019 [a]	Univariate analysis		Multivariate analysis [b]	
	HR [95% CI]	P-value	HR [95% CI]	P-value
Year / age				
2020 / age 65–69	1.19 [0.86; 1.63]	0.293	1.16 [0.84; 1.59]	0.375
2020 / age 70–79	1.15 [0.92; 1.44]	0.218	1.21 [0.97; 1.51]	0.096
2020 / age 80+	1.06 [0.86; 1.31]	0.561	0.91 [0.73; 1.12]	0.358
Year / sex				
2020 / female	1.13 [0.92; 1.39]	0.245	1.00 [0.81; 1.23]	0.972
2020 / male	1.16 [0.97; 1.39]	0.114	1.10 [0.92; 1.33]	0.291
Year / tumour site				
2020 / colon or rectum	1.10 [0.86; 1.41]	0.458	1.16 [0.90; 1.49]	0.256
2020 / oesophagus or stomach	1.67 [1.15; 2.42]	**0.007**	1.11 [0.76; 1.61]	0.597
2020 / pancreas or bile duct	1.01 [0.81; 1.26]	0.932	0.90 [0.72; 1.12]	0.335
2020 / hepatocellular carcinoma	1.04 [0.71; 1.53]	0.823	1.14 [0.77; 1.67]	0.513
2020 / small intestine	2.64 [1.07; 6.49]	**0.035**	2.81 [1.14; 6.94]	**0.025**
2020 / anus	1.36 [0.48; 3.81]	0.563	1.07 [0.38; 3.02]	0.899
Year / metastatic status				
2020 / non-metastatic	1.27 [1.07; 1.51]	**0.007**	1.05 [0.88; 1.25]	0.602
2020 / metastatic	0.96 [0.77; 1.20]	0.698	1.07 [0.85; 1.33]	0.575
Year /modified Charlson score				
2020 / score ≤ 3	1.44 [1.15; 1.81]	**0.001**	1.19 [0.94; 1.49]	0.144
2020 / score > 3	1.01 [0.85; 1.20]	0.936	0.99 [0.83; 1.18]	0.903
Diagnosis in the emergency department				
2020 / no	1.06 [0.90; 1.26]	0.470	1.06 [0.89; 1.25]	0.514
2020 / yes	1.17 [0.92; 1.49]	0.191	1.05 [0.82; 1.34]	0.690
Main treatment in the first 3 months				
Baseline to 4 months of follow-up				
2020 / surgery with curative intent	1.09 [0.61; 1.98]	0.767	1.06 [0.59; 1.92]	0.845
2020 / palliative surgery	1.39 [0.49; 3.91]	0.532	1.57 [0.56; 4.41]	0.394
2020 / endoscopic treatment	1.38 [0.72; 2.63]	0.329	1.34 [0.70; 2.55]	0.379
2020 / interventional radiology	1.32 [0.32; 5.52]	0.705	1.30 [0.31; 5.44]	0.719
2020 / chemotherapy/ radiotherapy	0.79 [0.50; 1.25]	0.312	0.77 [0.49; 1.22]	0.267
2020 / best supportive care only	0.80 [0.63; 1.01]	0.058	0.83 [0.65; 1.05]	0.117
2020 / no treatment recorded in an AP-HP hospital	1.30 [0.84; 2.01]	0.240	1.42 [0.92; 2.20]	0.118
>4 months to 10 months of follow-up				
2020 / surgery with curative intent	2.75 [1.46; 5.17]	**0.002**	2.67 [1.42; 5.04]	**0.002**
2020 / palliative surgery	1.79 [0.57; 5.65]	0.318	2.03 [0.64; 6.40]	0.227
2020 / endoscopic treatment	1.81 [0.91; 3.59]	0.090	1.81 [0.91; 3.60]	0.091
2020 / interventional radiology	2.94 [0.99; 8.75]	0.053	2.89 [0.97; 8.60]	0.057
2020 / chemotherapy/ radiotherapy	0.95 [0.66; 1.37]	0.792	0.90 [0.63; 1.31]	0.588
2020 / best supportive care only	1.69 [0.84; 3.40]	0.141	1.47 [0.73; 2.97]	0.282
2020 / no treatment recorded in an AP-HP hospital	0.95 [0.49; 1.84]	0.873	0.98 [0.51; 1.91]	0.958

HR: hazard ratio; CI, confidence interval.
P-values are from the Wald test.
[a] The risk of death of each category is compared with those of the same category in 2018–2019, using a different Cox proportional hazards model for each modality.
[b] Adjusted for all variables in the table.

Unfortunately, in our database we have no information about the time of initial diagnosis if it was performed outside of our institution. Nevertheless, we applied the same rules for all the times periods to minimize the risk of bias. Thirdly, the low number of patients in some subgroups prevented us from drawing definitive conclusions.

In conclusion, the COVID-19 pandemic's effect on mortality among patients with cancer is subject to a time lag. A worse survival was observed in patients newly treated in the post-lockdown period; this might have been due to a longer diagnostic delay and thus delayed initiation of treatment. To better respond to future acute health crises, efforts should be made to maintain the level of access to radiologic or endoscopic examinations for patients with signs or symptoms of cancer. A study with a longer follow-up period (covering 2020 and 2021) would be required for a general evaluation of the COVID-19 pandemic effects on the survival of patients with cancer.

Author Contributions

Thomas Aparicio: conceptualization, data curation, drafting the manuscript. Richard Layese: conceptualization, formal analysis, drafting the manuscript. François Hemery: conceptualization, methodology, drafting the manuscript. Christophe Tournigand: data curation, funding acquisition. Elena Paillaud: data curation, revising the initial manuscript. Nicola De Angelis: data curation. Laurent Quero: data curation. Nathalie Ganne: data curation. Frédéric Prat: data curation. Atanas Pachev: data curation. Gilles Galula: funding acquisition. Marc-Antoine Benderra: data curation. Florence Canouï-Poitrine: conceptualization, methodology, drafting the manuscript.

Funding Support

Assistance Publique - Hôpitaux de Paris.

Declaration of Competing Interest

All authors declare no conflicts of interest with regard to this study.

Appendix A. Supplementary Data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jgo.2023.101443.

References

[1] Aparicio T, Pamoukdjian F, Quero L, Manfredi S, Wind P, Paillaud E. Colorectal cancer care in elderly patients: unsolved issues. Dig Liver Dis 2016;48(10):1112–8.
[2] Canouï-Poitrine F, Lièvre A, Dayde F, Lopez-Trabada-Ataz D, Baumgaertner I, Dubreuil O, et al. Inclusion of older patients with Cancer in clinical trials: the SAGE prospective multicenter cohort survey. Oncologist. 2019;24(12):e1351–9.
[3] Brugel M, Carlier C, Essner C, Debreuve-Theresette A, Beck MF, Merrouche Y, et al. Dramatic changes in oncology care pathways during the COVID-19 pandemic: the French ONCOCARE-COV study. Oncologist. 2021;26(2):e338–41.

[4] Kamposioras K, Lim KHJ, Williams J, Alani M, Barriuso J, Collins J, et al. Modification to systemic anticancer therapy at the start of the COVID-19 pandemic and its overall impact on survival outcomes in patients with colorectal cancer. Clin Colorectal Cancer 2022;21(2):e117–25.
[5] Di Fiore F, Bouché O, Lepage C, Sefrioui D, Gangloff A, Schwarz L, et al. COVID-19 epidemic: proposed alternatives in the management of digestive cancers: a French intergroup clinical point of view (SNFGE, FFCD, GERCOR, UNICANCER, SFCD, SFED, SFRO, SFR). Dig Liver Dis 2020;52(6):597–603.
[6] Battisti NML, Mislang AR, Cooper L, O'Donovan A, Audisio RA, Cheung KL, et al. Adapting care for older cancer patients during the COVID-19 pandemic: recommendations from the International Society of Geriatric Oncology (SIOG) COVID-19 working group. J Geriatr Oncol 2020;11(8):1190–8.
[7] Maringe C, Spicer J, Morris M, Purushotham A, Nolte E, Sullivan R, et al. The impact of the COVID-19 pandemic on cancer deaths due to delays in diagnosis in England, UK: a national, population-based, modelling study. Lancet Oncol 2020;21(8):1023–34.
[8] Aparicio T, Layese R, Hemery F, Tournigand C, Paillaud E, De Angelis N, et al. Effect of lockdown on digestive system cancer care amongst older patients during the first wave of COVID-19: the CADIGCOVAGE multicentre cohort study. Dig Liver Dis 2022;54(1):10–8.
[9] Bannay A, Chaignot C, Blotière PO, Basson M, Weill A, Ricordeau P, et al. The best use of the Charlson comorbidity index with electronic health care database to predict mortality. Med Care 2016;54(2):188–94.
[10] Carey IM, Cook DG, Harris T, DeWilde S, Chaudhry UAR, Strachan DP. Risk factors for excess all-cause mortality during the first wave of the COVID-19 pandemic in England: a retrospective cohort study of primary care data. PLoS One 2021;16(12):e0260381.
[11] COVIDSurg Collaborative. Effect of COVID-19 pandemic lockdowns on planned cancer surgery for 15 tumour types in 61 countries: an international, prospective, cohort study. Lancet Oncol 2021;22(11):1507–17.
[12] Thierry AR, Pastor B, Pisareva E, Ghiringhelli F, Bouché O, De La Fouchardière C, et al. Association of COVID-19 lockdown with the tumor burden in patients with newly diagnosed metastatic colorectal cancer. JAMA Netw Open 2021;4(9):e2124483.
[13] Priou S, Lamé G, Chatellier G, Tournigand C, Kempf E. Effect of the COVID-19 pandemic on colorectal cancer care in France. Lancet Gastroenterol Hepatol 2021;6(5):342–3.
[14] Jones D, Neal RD, Duffy SRG, Scott SE, Whitaker KL, Brain K. Impact of the COVID-19 pandemic on the symptomatic diagnosis of cancer: the view from primary care. Lancet Oncol 2020;21(6):748–50.
[15] Aparicio T, Zaanan A, Svrcek M, Laurent-Puig P, Carrere N, Manfredi S, et al. Small bowel adenocarcinoma: epidemiology, risk factors, diagnosis and treatment. Dig Liver Dis 2014;46(2):97–104.
[16] Lièvre A, Turpin A, Ray-Coquard I, Le Malicot K, Thariat J, Ahle G, et al. Risk factors for coronavirus disease 2019 (COVID-19) severity and mortality among solid cancer patients and impact of the disease on anticancer treatment: a French nationwide cohort study (GCO-002 CACOVID-19). Eur J Cancer 2020;141:62–81.
[17] Kempf E, Priou S, Lamé G, Daniel C, Bellamine A, Sommacale D, et al. Impact of two waves of Sars-Cov2 outbreak on the number, clinical presentation, care trajectories and survival of patients newly referred for a colorectal cancer: a French multicentric cohort study from a large group of university hospitals. Int J Cancer 2022;150(10):1609–18.
[18] Aguinaga L, Ursu R, Legoff J, Delaugerre C, Nguyen O, Harel S, et al. Prolonged positive SARS-CoV-2 RT-PCR in cancer outpatients requires specific reorganization of cancer centres. Ann Oncol 2023;31(Supplement 4). S1010.