

THE LANCET Oncology

Supplementary appendix

This appendix formed part of the original submission and has been peer reviewed. We post it as supplied by the authors.

Supplement to: Yang K, Sheng Y, Huang C, et al. 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; published online May 29. [http://dx.doi.org/10.1016/S1470-2045\(20\)30310-7](http://dx.doi.org/10.1016/S1470-2045(20)30310-7).

Supplementary Table 1. Hospitals involved in the study

No.	Study center	Principle investigator	Number of patients
1	Jin Yin-tan Hospital, Wuhan, China West Branch, Union Hospital Tongji Medical	Chaolin Huang	73
2	College, Huazhong University of Science and Technology, Wuhan, China Cancer Center, Union Hospital, Tongji Medical	Yang Jin	47
3	College, Huazhong University of Science and Technology, Wuhan, China	Gang Wu	29
4	Wuhan Red Cross Hospital, Wuhan, Hubei, China The Central Hospital of Wuhan, Tongji Medical	Nian Xiong	21
5	College, Huazhong University of Science and Technology, Wuhan, China	Hongda Lu	14
6	Huagang Central Hospital, Huanggang, Hubei, China	Jing Liu	9
7	The First People's Hospital Affiliated to Yangtze University, Jingzhou, China	Jiyuan Yang	6
8	Xianning Central Hospital, Xianning, China	Chengrong Shu	3
9	Suizhou Central Hospital, Suizhou, China	Dongfeng Pan	3

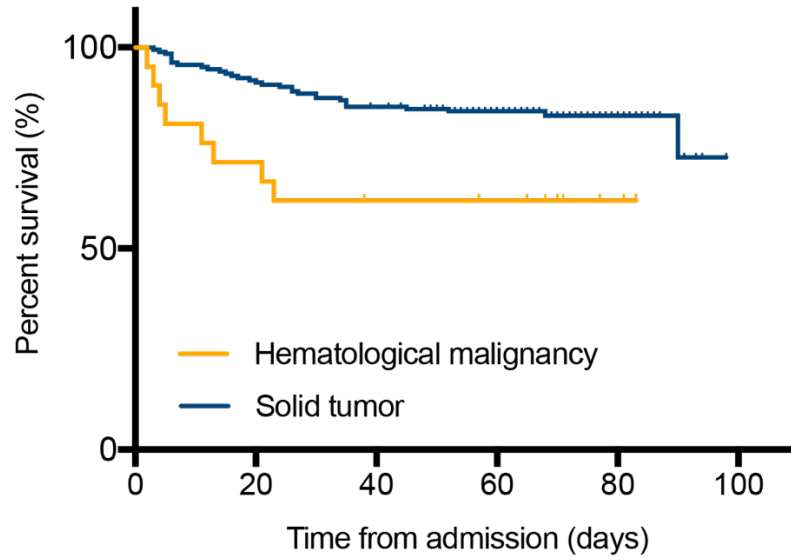
Supplementary Table 2. Univariable logistic regression for chemotherapy

Chemotherapy	OR (95% CI)	p value	Number of patients
≤ 1 week	12.00 (3.15-45.75)	0.0003	14
>1 week, ≤ 4 weeks	10.67 (3.01-37.80)	0.0002	17
>4 weeks, ≤ 1 year	3.43 (0.86-13.75)	0.082	18
>1 year	2.35 (0.78-7.03)	0.13	55
Never receiving chemotherapy	..	1 (ref)	78

Supplementary Table 3. Cancer types in 205 patients with cancer and COVID-19

Cancer type	Number	Cancer type	Number
breast	40	oral cavity	3
colorectum	28	acute myelogenous leukemia	2
lung	24	glioma	2
thyroid	16	pancreas	2
stomach	12	bile duct	1
cervix	9	gall bladder	1
lymphoma	7	testis	1
liver	6	osteosarcoma	1
ovary	6	myelodysplastic syndrome	1
prostate	6	melanoma	1
endometrium	6	larynx	1
bladder	5	skin	1
acute lymphoblastic leukemia	5	kidney	1
chronic lymphocytic leukemia	4	gastric stromal tumor	1
esophagus	4	fibrosarcoma	1
nasopharynx	3	penis	1
multiple myeloma	3

Supplementary Figure 1. Survival curves in patients with COVID-19 and with hematological malignancy versus solid tumor



Number at risk (number censored)

Hematological malignancy	22 (0)	15 (0)	12 (1)	11 (2)	3 (10)	0 (13)
Solid tumor	183 (0)	168 (0)	153 (3)	114 (40)	27 (126)	0 (152)

Supplementary Figure 1. Hematological malignancy induces a higher risk of death. (Hazard ratio, 3.28; 95% CI 1.56-6.91; log rank p=0.0009)

Supplementary Table 4. Demographics and baseline characteristics of patients with cancer and COVID-19

	All patients (n=205)	Solid tumor (n=183)	Hematological malignancy (n=22)	p value
Age, years	63 (56-70)	64 (57-70)	55 (26-62)	0.0003
Age range				
≤40 years	16 (8%)	7 (4%)	9 (41%)	
41-60 years	70 (34%)	63 (34%)	7 (32%)	<0.0001
61-80 years	103 (50%)	97 (53%)	6 (27%)	
> 80 years	16 (8%)	16 (9%)	0	
Sex				
Female	109 (53%)	102 (56%)	7 (32%)	0.058
Male	96 (47%)	81 (44%)	15 (68%)	
Symptoms				
Fever	159 (78%)	140 (77%)	19 (86%)	0.44
Chills	17 (8%)	16 (9%)	1 (5%)	0.79
Cough	151 (74%)	135 (74%)	16 (73%)	1.00
Sputum	70 (34%)	59 (32%)	11 (50%)	0.16
Chest Congestion	67 (33%)	59 (32%)	8 (36%)	0.88
Short of breath	71 (35%)	62 (34%)	9 (41%)	0.68
Dyspnea	39 (19%)	34 (19%)	5 (23%)	0.86
Nausea or vomiting	14 (7%)	10 (5%)	4 (18%)	0.074
Diarrhea	24 (12%)	21 (11%)	3 (14%)	1.00
Fatigue	75 (37%)	69 (38%)	6 (27%)	0.47
Median time from onset of symptoms to admission, days ^a	12 (7-19)	12 (7-20)	11 (7-16)	0.41
Disease severity				
None-severe	153 (75%)	141 (77%)	12 (54%)	0.042
Severe	52 (25%)	42 (23%)	10 (45%)	
Comorbidity	106 (52%)	97 (53%)	9 (41%)	0.40
Hypertension	67 (33%)	63 (34%)	4 (18%)	0.20
Diabetes	22 (11%)	19 (10%)	3 (14%)	0.92
COPD	5 (2%)	5 (3%)	0	0.96
Coronary heart disease	16 (8%)	14 (8%)	2 (9%)	1.00
Hepatitis B	13 (6%)	12 (7%)	1 (5%)	1.00
Chronic kidney disease	4 (2%)	4 (2%)	0	1.00
Hospital admission before Feb 13, 2020 ^b				
Yes	123 (60%)	107 (58%)	16 (73%)	0.29
No	82 (40%)	76 (42%)	6 (27%)	
Median temperature, °C	36.6 (36.4-36.9)	36.6 (36.4-36.9)	36.6 (36.4-37.2)	0.49
Median heart rate, beats per min	86.0 (79.5-99.5)	86.0 (79.0-100.0)	87.0 (80.0-97.3)	0.91
Median respiratory rate, breaths per min ^c	20 (20-22)	20 (20-22)	22 (20-25)	0.029
Median SpO ₂ , % ^d	97 (95-98)	97 (95-98)	97 (93-98)	0.75

Data are median (IQR) or n (%). COPD=chronic obstructive pulmonary disease; SpO₂= blood oxygen saturation.

^aData about time from onset of symptoms to admission were missing for eight patients.

^bHospital admission before Feb 13, 2020, is used to represent time period of the COVID-19 pandemic.

^cData about respiratory rate were missing for one patient.

^dData about SpO₂ were missing for 17 patients.

Supplementary Table 5. Laboratory and radiologic findings of patients with cancer and COVID-19

	All patients (n=205)	Solid tumor (n=183)	Hematological malignancy (n=22)	p value
Laboratory findings				
White blood cells, $\times 10^9$ cells per L				
Median	5.3 (3.9-7.5)	5.3 (4.0-7.2)	6.5 (2.5-15.5)	0.40
<4	54/203 (27%)	46/181 (25%)	8/22 (36%)	
4-10	124/203 (61%)	118/181 (65%)	6/22 (27%)	0.0002
> 10	25/203 (12%)	17/181 (9%)	8/22 (36%)	
Neutrophil, $\times 10^9$ cells per L				
Median	3.5 (2.5-5.5)	3.4 (2.6-5.4)	3.9 (1.7-6.1)	1.00
<2	32/203 (16%)	26/181 (14%)	6/22 (27%)	0.21
Lymphocyte, $\times 10^9$ cells per L				
Median	0.99 (0.61-1.52)	0.99 (0.62-1.48)	1.06 (0.26-3.57)	0.87
<1	102/203 (50%)	91/181 (50%)	11/22 (50%)	1.00
Platelet, $\times 10^9$ /L				
Median (IQR)	188 (134-246)	194 (143-250)	132 (46-189)	0.0007
<100	25/203 (12%)	16/181 (9%)	9/22 (41%)	<0.0001
NLR >4	90/203 (44%)	79/181 (44%)	11/22 (50%)	0.73
Median haemoglobin, g/L ^a	117 (105-130)	119 (108-131)	97 (81-116)	0.0003
Median albumin, g/L ^b	33.0 (29.8-37.5)	33.6 (30.1-37.7)	30.8 (26.9-34.4)	0.024
Creatinine >133 μ M	12/205 (6%)	10/183 (5%)	2/22 (9%)	0.84
Blood urea nitrogen >7.1 mM	47/202 (23%)	40/180 (22%)	7/22 (32%)	0.46
Lactate dehydrogenase > 245 U/L	78/160 (49%)	65/140 (46%)	13/20 (65%)	0.19
Creatine kinase > 185 U/L	21/168 (13%)	18/146 (12%)	3/22 (14%)	1.00
D-dimer > 0.5 mg/L	129/185 (70%)	110/164 (67%)	19/21 (90%)	0.052
C-reaction protein > 10 mg/L	115/192 (60%)	99/171 (58%)	16/21 (76%)	0.17
Median procalcitonin, ng/mL ^c	0.08 (0.05-0.14)	0.06 (0.05-0.13)	0.23 (0.13-1.29)	0.0001
Median interleukin-6, pg/mL ^d	9.5 (5.8-14.4)	9.3 (5.8-14.2)	11.8 (6.8-49.0)	0.23
Median calcium, mM ^e	2.1 (2.0-2.2)	2.1 (2.0-2.2)	2.0 (1.9-2.1)	0.020
Radiologic findings				
Groud-glass opacity	132/190 (69%)	117/170 (69%)	15/20 (75%)	0.76
Pachy shadowing	50/190 (26%)	47/170 (28%)	3/20 (15%)	0.34
Bilateral infiltration	173/190 (91%)	153/170 (90%)	20/20 (100%)	0.29
Consolidation	10/190 (5%)	10/170 (6%)	0	0.56

Data are median (IQR) or n/N (%), where N is the number of patients with available data.

NLR=neutrophil-lymphocyte ratio.

^aData about haemoglobin were missing for eight patients.

^bData about albumin were missing for 32 patients.

^cData about procalcitonin were missing for 35 patients.

^dData about interleukin-6 were missing for 82 patients.

^eData about calcium were missing for 32 patients.

Supplementary Table 6. Treatments and complications of patients with cancer and COVID-19

	All patients (n=205)	Solid tumor (n=183)	Hematological malignancy (n=22)	p value
Median duration of hospital stay, days	19 (12-33)	19 (12-33)	21 (7-30)	0.38
Treatments				
Intravenous antibiotics	144 (70%)	127 (69%)	17 (77%)	0.61
Antiviral medication	192 (94%)	171 (93%)	21 (95%)	1.00
Interferon	71 (35%)	64 (35%)	7 (32%)	0.95
Oseltamivir	44 (21%)	43 (23%)	1 (5%)	0.077
Umifenovir	145 (71%)	127 (69%)	18 (82%)	0.34
Ribavirin	52 (25%)	49 (27%)	3 (14%)	0.28
Lopinavir/ritonavir	49 (24%)	47 (26%)	2 (9%)	0.14
Intravenous immunoglobulin	60 (29%)	49 (27%)	11 (50%)	0.044
Intravenous corticosteroids	62 (30%)	50 (27%)	12 (55%)	0.017
Oxygen therapy	150 (73%)	129 (70%)	21 (95%)	0.025
Mechanical ventilation				
None	173 (84%)	157 (86%)	16 (73%)	
Non-invasive	11 (5%)	9 (5%)	2 (9%)	0.22
Invasive	21 (10%)	17 (9%)	4 (18%)	
Admission to ICU	30 (15%)	27 (15%)	3 (14%)	1.00
CCRT	5 (2%)	5 (3%)	0	0.96
Complications	126/199 (63%)	108 (61%)	18/22 (82%)	0.094
ARDS	23/199 (12%)	17/177 (10%)	6/22 (27%)	0.037
Acute renal failure	13/199 (7%)	9/177 (5%)	4/22 (18%)	0.059
Septic shock	11/199 (6%)	9/177 (5%)	2/22 (9%)	0.78
Abnormal liver function	34/199 (17%)	27/177 (15%)	7/22 (32%)	0.10
Coagulopathy	18/199 (9%)	13/177 (7%)	5/22 (23%)	0.048
Secondary infection	26/199 (13%)	21/177 (12%)	5/22 (23%)	0.28
Arrhythmia	5/199 (3%)	3/177 (2%)	2/22 (9%)	0.17
Others ^a	34/199 (17%)	27/177 (15%)	7/22 (32%)	0.10

Data are median (IQR) or n/N (%), where N is the number of patients with available data.

ICU= Intensive-care unit; CCRT=continuous renal replacement therapy; ARDS=acute respiratory distress syndrome.

^aStroke, acute heart failure, myocardial ischemia, electrolyte disturbance, and other complications.

Supplementary Table 7. Interaction effects between variables involved in multivariable logistic regression analysis

Factor	OR (95% CI)	p value
Chemotherapy within 4 weeks (vs not receiving)	4.90 (1.75-13.70)	0.0024
Cancer type (vs solid tumor)	2.10 (0.40-10.95)	0.38
Chemotherapy within 4 weeks × Cancer type	1.25 (0.13-11.78)	0.85

Factor	OR (95% CI)	p value
Chemotherapy within 4 weeks	..	1.00
Time since cancer diagnosis (vs >5 years)		
<1 year	2.79 (0.60-13.04)	0.19
1-5 years	2.80 (0.92-8.58)	0.071
Chemotherapy within 4 weeks × Time since cancer diagnosis (<1 year)	..	1.00
Chemotherapy within 4 weeks × Time since cancer diagnosis (1-5 years)	..	1.00

Factor	OR (95% CI)	p value
Chemotherapy within 4 weeks (vs not receiving)	10.83 (2.45-47.82)	0.0017
Sex (vs female)	5.42 (1.70-17.21)	0.0042
Chemotherapy within 4 weeks × Sex	0.47 (0.07-3.05)	0.43

Factor	OR (95% CI)	p value
Cancer type (vs solid tumor)	3.45 (0.32-36.98)	0.31
Time since cancer diagnosis (vs >5 years)		
<1 year	6.21 (1.87-20.64)	0.0029
1-5 years	3.32 (1.12-9.89)	0.031
Cancer type × Time since cancer diagnosis (<1 year)	0.81 (0.05-13.56)	0.88
Cancer type × Time since cancer diagnosis (1-5 years)	0.72 (0.04-12.31)	0.82

Factor	OR (95% CI)	p value
Cancer type (vs solid tumor)	8.81 (1.67-46.44)	0.010
Sex (vs female)	4.66 (1.96-11.11)	0.0005
Cancer type × Sex	0.19 (0.03-1.43)	0.11

Factor	OR (95% CI)	p value
Sex (vs female)	0.76 (0.13-4.41)	0.76
Time since cancer diagnosis (vs >5 years)		
<1 year	2.06 (0.42-10.24)	0.38
1-5 years	1.06 (0.22-5.10)	0.94
Sex (vs female) × Time since cancer diagnosis (<1 year)	9.67 (0.94-99.82)	0.057
Sex (vs female) × Time since cancer diagnosis (1-5 years)	6.32 (0.69-58.35)	0.10

Supplementary Table 8. Multivariable logistic regression analysis adjusted for study center

Factor	OR	95% CI	p value
Sex (vs female)	3.95	1.59-9.82	0.003
Chemotherapy within 4 weeks (vs not receiving)	3.50	1.15-10.71	0.028
Cancer type			
Solid tumor	1 (ref)
Hematological malignancy	2.04	0.64-6.53	0.23
Time since cancer diagnosis			
<1 year	2.61	0.68-9.99	0.16
1-5 years	1.72	0.58-5.13	0.33
>5 years	1 (ref)

Note: the generalized liner mixed-effect models (GLMMs) was used for adjusting the differences between study centers.

Supplementary Table 9. Bivariate logistic regression of factors associated with in-hospital death

Factor	Univariable OR (95% CI)	p value	Multivariable OR (95% CI)	p value
Cancer type				
Breast	1 (ref)	..	1 (ref)	..
colorectum	3.52 (0.80-15.57)	0.097	2.99 (0.40-22.38)	0.29
lung	4.11 (0.92-18.35)	0.064	1.71 (0.23-13.02)	0.60
thyroid	0.82 (0.08-8.55)	0.87	1.11 (0.08-15.09)	0.94
stomach	4.11 (0.71-23.86)	0.12	2.13 (0.18-25.69)	0.55
hematological malignancy	8.54 (2.00-36.45)	0.0038	3.51 (0.52-23.53)	0.20
Others	2.85 (0.75-10.80)	0.12	1.66 (0.27-10.16)	0.58
Sex (vs female)	3.86 (1.80-8.25)	0.0005	3.04 (1.07-8.64)	0.037
Chemotherapy within 4 weeks (vs not receiving)	6.51 (2.78-15.28)	<0.0001	3.62 (1.17-11.17)	0.025
Time from diagnosis				
<1 year	7.10 (2.45-20.52)	0.0003	3.21 (0.84-12.32)	0.089
1-5 years	3.30 (1.21-8.96)	0.019	2.02 (0.67-6.03)	0.21
>5 years	1 (ref)	..	1 (ref)	..