



Supplementary Fig. S1 Kaplan-Meier survival curves of cancer patients with COVID-19 stratified by cancer types.

Supplementary Table S1 Clinical indicators and complications definitions

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| Karnofsky Score | Performance | A medically derived metric from 0 to 100 that reflects a person's ability to perform certain ordinary tasks in order to determine a patient's suitability for therapy or to evaluate a patient's progress after a therapeutic procedure with 100 being completely intact, 70 being unable to carry on these normal activities, 50 indicating a need for considerable assistance, 40 being totally disabled, and hospitalization recommended for scores of |
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| | 30 or less. |
| ECOG performance status score | The ECOG Scale of Performance Status is used to measure how the disease impacts a patient's daily living abilities (known to physicians and researchers as a patient's performance status). 0—Fully active, able to carry on all pre-disease performance without restriction. 1—Restricted in physically strenuous activity but ambulatory and able to carry out work of a light or sedentary nature, e.g., light house work, office work. 2—Ambulatory and capable of all selfcare but unable to carry out any work activities; up and about more than 50% of waking hours. 3—Capable of only limited selfcare; confined to bed or chair more than 50% of waking hours. 4—Completely disabled; cannot carry on any selfcare; totally confined to bed or chair. 5—Dead |
| Nutrition Risk Screening 2002 | Nutrition Risk Screening 2002 (NRS2002) a tool for assessing the nutritional risk of inpatients recommended by the European Society Parenteral & Enteral Nutrition (ESPEN). Total score ≥ 3 : patients are at nutritional risk and need to develop a nutrition support plan. Total score < 3 : review weekly nutrition risk screening. |
| Stage IV | Patients with metastatic cancer. |
| Adjuvant therapy | chemo/radiotherapy plus targeted/ immunotherapy. |
| Severe pneumonia | Adults meet any of the following criteria: <ol style="list-style-type: none"> 1. Shortness of breath, RR\geq30 times/min; 2. At rest, oxygen saturation \leq93%; 3. Arterial partial oxygen pressure (PaO₂)/oxygen absorption concentration (FiO₂) \leq300mmHg (1mmHg= 0.133kpa). <p>Correction of PaO₂/FiO₂ at high altitudes (over 1000 m) should be made according to the following formula: PaO₂/FiO₂ x [atmospheric pressure (mmHg) /760].</p> <p>Pulmonary imaging showed significant progression of ></p> |

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| | <p>lesions within 24-48 hours.</p> <p>Children meet any of the following criteria:</p> <ol style="list-style-type: none"> 1. Shortness of breath (<2 months old, RR≥60 times/min; 2-12 months old, RR≥50 times/min; 1-5 years old, RR≥40 times/min; >5 years old, RR≥30 times/min), excluding the influence of fever and crying; 2. At rest, oxygen saturation ≤92%; 3. Assisted breathing (moaning, flapping of nose wing, three concave signs), cyanosis, intermittent apnea; 4. Drowsiness and convulsions; 5. Food resistance or feeding difficulties, with signs of dehydration. |
| ARDS | <p>Onset: new or worsening respiratory symptoms within one week of known clinical insult.</p> <p>Chest imaging: bilateral opacities, not fully explained by effusions, lobar or lung collapse, or nodules.</p> <p>Origin of oedema: respiratory failure not fully explained by cardiac failure or fluid overload. Need objective assessment to exclude hydrostatic cause of oedema if no risk factor present.</p> <p>Oxygenation (adults):</p> <ul style="list-style-type: none"> • Mild ARDS: $200 \text{ mmHg} < \text{PaO}_2/\text{FiO}_2 \leq 300 \text{ mmHg}$ (with PEEP or CPAP $\geq 5 \text{ cmH}_2\text{O}$, or non-ventilated) • Moderate ARDS: $100 \text{ mmHg} < \text{PaO}_2/\text{FiO}_2 \leq 200 \text{ mmHg}$ with PEEP $\geq 5 \text{ cmH}_2\text{O}$, or non-ventilated) • Severe ARDS: $\text{PaO}_2/\text{FiO}_2 \leq 100 \text{ mmHg}$ with PEEP $\geq 5 \text{ cmH}_2\text{O}$, or non-ventilated) • When PaO_2 is not available, $\text{SpO}_2/\text{FiO}_2 \leq 315$ suggests ARDS (including in non-ventilated patients) |
| Acute heart failure | <p>Using age-related amino-terminal pro-brain natriuretic peptide cut-points of 450, 900, and 1800 pg/mL for ages <50, 50-75, and >75, which yielded 90% sensitivity and 84% specificity for acute heart failure.</p> |

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| Cardiac injury | Serum levels of cardiac biomarkers (e.g. cardiac troponin I) were >the 99th percentile upper reference limit, or new abnormalities were shown in electrocardiography and echocardiography. |
| Acute liver injury | Jaundice with a total bilirubin level of ≥ 3 mg/dl and an acute increase in alanine aminotransferase of at least five times the upper limit of the normal range and/or an increase in alkaline phosphatase of at least twice the upper limit of the normal range. |
| Acute kidney injury | Identified on the basis of the highest serum creatinine level according to the kidney disease improving global outcomes classification. |
| Sepsis | <p>Adults: life-threatening organ dysfunction caused by a dysregulated host response to suspected or proven infection, with organ dysfunction.</p> <p>Signs of organ dysfunction include: altered mental status, difficult or fast breathing, low oxygen saturation, reduced urine output, fast heart rate, weak pulse, cold extremities or low blood pressure, skin mottling, or laboratory evidence of coagulopathy, thrombocytopenia, acidosis, high lactate or hyperbilirubinemia.</p> |

Supplementary Table S2 Laboratory and radiographic findings in cancer patients with COVID-19

| Variables | Normal range | All patients (n=109) | Recovered (n=86) | Deceased (n=23) | P value |
|-----------------------------------|---------------------|-----------------------------|-------------------------|------------------------|----------------|
| Hematologic | | | | | |
| Leukocyte count, $\times 10^9/L$ | 3.5-9.5 | 5.52 [4.31, 7.23] | 5.53 [4.38, 6.92] | 5.46 [3.17, 10.41] | 0.85 |
| > $9.5 \times 10^9/L$ (%) | | 14 (12.8) | 8 (9.3) | 6 (26.1) | 0.074 |
| Neutrophil count, $\times 10^9/L$ | 1.8-6.3 | 3.86 [2.65, 5.58] | 3.75 [2.66, 5.40] | 4.16 [2.34, 8.46] | 0.459 |
| > $6.3 \times 10^9/L$ (%) | | 22 (20.2) | 14 (16.3) | 8 (25.0) | 0.095 |
| Lymphocyte count, $\times 10^9/L$ | 1.1-3.2 | 0.91 [0.56, 1.32] | 1.00 [0.66, 1.38] | 0.56 [0.28, 0.76] | 0.001 |
| < $1.1 \times 10^9/L$ (%) | | 67 (61.5) | 48 (56.8) | 19 (82.6) | 0.035 |
| Platelet count, $\times 10^9/L$ | 125-350 | 192.00 [128.00, 251.00] | 199.00 [159.00, 255.00] | 112.00 [35.00, 175.00] | <0.001 |
| < $125 \times 10^9/L$ (%) | | 27 (24.8) | 12 (14.0) | 15 (60.8) | <0.001 |
| Hemoglobin, g/L | 115-150 | 118.00 [99.00, 129.00] | 119.00 [104.25, 129.75] | 107.00 [65.00, 119.50] | 0.004 |
| <120 g/L (%) | | 49 (45.0) | 35 (40.7) | 14 (60.9) | 0.136 |
| Coagulation function | | | | | |
| D-dimer, ug/ml FEU | <0.5 | 1.07 [0.42, 2.53] | 0.75 [0.36, 2.22] | 2.49 [1.16, 7.69] | 0.001 |
| >1 ug/ml FEU (%) | | 59 (54.1) | 40 (46.5) | 19 (82.6) | 0.002 |
| Fibrinogen, g/L | 2.00-4.00 | 4.72 [3.63, 5.82] | 4.79 [3.65, 5.97] | 4.48 [2.24, 5.45] | 0.126 |
| >4 g/L (%) | | 76 (68.9) | 60 (69.8) | 16 (65.0) | 0.883 |

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|-----------------------------------|------------|----------------------------|----------------------------|----------------------------|--------|
| Prothrombin activity, % | 75.0-125.0 | 87.00 [79.50, 95.50] | 89.50 [85.00, 96.00] | 75.00 [65.00, 83.00] | <0.001 |
| <75 g/L (%) | | 22 (18.7) | 10 (11.6) | 12 (47.6) | 0.001 |
| Biochemical liver function | | | | | |
| Aspartate aminotransferase, U/L | ≤40 | 27.00 [19.00, 39.00] | 25.00 [18.25, 33.50] | 37.00 [26.50, 49.00] | 0.009 |
| >40 U/L (%) | | 26 (23.9) | 16 (18.6) | 10 (43.5) | 0.027 |
| Total bilirubin, umol/L | ≤21.1 | 9.90 [6.70, 13.80] | 8.90 [6.32, 13.35] | 10.80 [9.85, 20.15] | 0.005 |
| >21.1 umol/L (%) | | 11 (10.1) | 5 (5.8) | 6 (26.1) | 0.013 |
| Direct bilirubin, umol/L | ≤8.0 | 4.40 [2.80, 7.30] | 3.85 [2.60, 5.47] | 7.30 [4.75, 11.60] | <0.001 |
| >8 umol/L (%) | | 19 (17.4) | 11 (12.8) | 8 (34.8) | 0.031 |
| Albumin, g/L | 35.0-52.0 | 35.10 [31.30, 37.90] | 36.00 [32.40, 39.80] | 31.60 [28.95, 34.25] | <0.001 |
| <35 g/L (%) | | 53 (48.6) | 35 (40.7) | 18 (78.3) | 0.003 |
| Pre-albumin, mg/L | 200-400 | 167.00 [99.25, 244.25] | 180.00 [126.00, 255.00] | 89.50 [79.00, 115.25] | 0.001 |
| <200 mg/L (%) | | 46 (63.9) | 35 (58.3) | 11 (91.7) | 0.062 |
| Total cholesterol, mmol/L | <5.18 | 3.39 [2.88, 4.15] | 3.46 [2.96, 4.29] | 2.94 [2.31, 3.42] | 0.003 |
| >5.18 mmol/L (%) | | 8 (7.3) | 7 (8.1) | 1 (4.6) | 0.866 |
| Lactose dehydrogenase, U/L | 135-214 | 278.00 [195.00, 402.50] | 243.00 [181.50, 355.75] | 400.50 [285.25, 537.50] | 0.005 |
| >214 U/L (%) | | 60 (55.6) | 53 (50.0) | 17 (77.3) | 0.04 |
| Cholinesterase, U/L | 5320-12920 | 5760.00 [4208.75, 6815.00] | 5949.00 [4674.25, 6940.75] | 4552.00 [3887.25, 5502.50] | 0.027 |
| <5320 U/L (%) | | 29 (40.3) | 21 (35.0) | 8 (66.7) | 0.086 |

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| Glucose, mM | 3.9-6.1 | 5.96 [5.35, 7.57] | 5.85 [5.29, 7.22] | 6.82 [5.88, 8.00] | 0.043 |
| >6.1 mM (%) | | 48 (44.4) | 33 (38.8) | 15 (65.2) | 0.043 |
| Biochemical renal function | | | | | |
| Sodium, mmol/L | 136-145 | 140.20 [137.10, 141.70] | 140.45 [137.50, 142.05] | 137.70 [135.50, 140.60] | 0.033 |
| >145 mmol/L (%) | | 6 (5.5) | 4 (4.7) | 2 (8.7) | 0.81 |
| Calcium, mmol/L | 2.20-2.55 | 4.08 [3.76, 4.42] | 4.05 [3.80, 4.37] | 4.23 [3.72, 4.58] | 0.53 |
| <2.2 mmol/L (%) | | 87 (79.8) | 64 (74.4) | 23 (100.0) | 0.015 |
| Biochemical cardiac function | | | | | |
| High-sensitivity cardiac troponin I, pg/ml | ≤15.6 | 4.70 [1.50, 14.55] | 3.65 [1.00, 9.90] | 24.40 [5.50, 209.10] | 0.001 |
| >15.6 pg/ml (%) | | 21 (23.1) | 9 (12.5) | 12 (62.8) | <0.001 |
| N-terminal pro-brain natriuretic peptide, pg/ml | <486 | 217.00 [83.50, 530.25] | 139.00 [66.00, 369.00] | 1040.00 [439.00, 1833.50] | <0.001 |
| >486 pg/ml (%) | | 25 (27.2) | 12 (16.4) | 13 (68.4) | <0.001 |
| Inflammation-related indices | | | | | |
| High sensitive C reaction protein, mg/L | <10 | 40.40 [5.40, 83.10] | 25.50 [4.00, 64.80] | 90.30 [55.40, 145.10] | <0.001 |
| >10 mg/L (%) | | 74 (69.2) | 53 (62.4) | 21(95.5) | 0.006 |
| Serum ferritin, ug/L | 30-400 | 647.30 [323.40, 1888.65] | 547.95 [273.30, 1100.77] | 2225.60 [1231.80, 4081.20] | <0.001 |
| >400 ug/L (%) | | 38 (64.4) | 24 (54.5) | 14 (93.3) | 0.017 |
| Interleukin-6, pg/ml | <7.0 | 15.69 [4.08, 37.45] | 10.43 [3.47, 22.60] | 52.89 [27.77, 67.57] | <0.001 |
| >7 pg/ml (%) | | 59 (65.6) | 45 (59.2) | 14 (100.0) | 0.008 |

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|-----------------------------------------|-----------|-------------------------|-------------------------|---------------------------|--------|
| Interleukin-2 receptor, U/ml | 223-710 | 666.00 [420.00, 941.00] | 614.00 [396.00, 842.00] | 1265.50 [789.00, 1604.50] | 0.002 |
| ≥710 U/L (%) | | 35 (41.2) | 26 (35.6) | 9 (75.0) | 0.024 |
| Interleukin 8, pg/ml | <62 | 12.40 [7.20, 20.55] | 11.55 [6.95, 18.40] | 26.10 [10.20, 59.20] | 0.016 |
| >62 U/mL (%) | | 8 (9.2) | 5 (6.8) | 3 (23.1) | 0.175 |
| Interleukin 10, pg/ml | <9.1 | 4.90 [4.90, 8.05] | 4.90 [4.90, 6.15] | 10.30 [8.30, 16.00] | <0.001 |
| >9.1 pg/ml (%) | | 14 (16.1) | 7 (9.5) | 7 (53.8) | <0.001 |
| Procalcitonin, ng/ml | 0.02-0.05 | 0.08 [0.05, 0.29] | 0.06 [0.05, 0.14] | 0.39 [0.13, 0.67] | <0.001 |
| >0.05 ng/ml (%) | | 66 (68.8) | 46 (61.3) | 20 (95.2) | 0.007 |
| Chest computed tomography scan features | | | | | |
| Bilateral | | 81 (86.2) | 72 (85.7) | 9 (90.0) | 1 |

Data are presented as number/total (percentage) or median (interquartile range); p values were calculated by Mann-Whitney U test, χ^2 test, or Fisher's exact test, as appropriate. COVID-2019, coronavirus disease 2019.

Supplementary Table S3 Cause of death in included patients

| Cause of death* | No. (%) |
|-----------------------------|-----------|
| Respiratory failure | 10 (43.5) |
| Septic shock | 5 (21.7) |
| Multiple organ failure | 3 (13.0) |
| Acute heart failure | 3 (13.0) |
| Acute myocardial infarction | 1 (4.3) |
| Others | 1 (4.3) |

*indicated that 20 cancer patients died of COVID-19 and 3 cancer patients died of cancer.

Supplementary Table S4 Death records of three patients who died of cancer

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| 1# | <p>Condition at admission: abdominal pain, multiple punctate hemorrhagic spots on the skin, ultrasound showed low density shadow in the left intrahepatic lobe and intrahepatic bile duct gas accumulation, positive for COVID-19 nucleic acid.</p> <p>Diagnosis on admission: COVID-19, advanced gastric cancer.</p> <p>Cause of death: septic shock and DIC caused by advanced gastric cancer</p> |
| 2# | <p>Condition at admission: fatigue, shortness of breath, coughing, CT showing patchy consolidation, bone marrow suppression after chemotherapy, cerebral thrombosis.</p> <p>Diagnosis on admission: COVID-19, acute myeloid leukemia (M5), Cerebral venous thrombosis.</p> <p>Cause of death: VTE -PVE</p> |
| 3# | <p>Condition at admission: coughing, nausea and vomiting, CT showing patchy</p> |

consolidation, Grade IV myelosuppression, severe granulocytosis, and severe immunosuppression.

Diagnosis on admission: COVID-19, acute lymphoblastic leukemia.

Cause of death: septic shock

Supplementary Table S5 Competing risk model of factors analysis on the risk factors associated with death in cancer patients with COVID-19

| Patient characteristics and findings | Competing Risk Model-Adjusted | |
|--------------------------------------|-------------------------------|----------------|
| | HR (95% CI) | <i>P</i> value |
| Tumor stage IV | 4.18 (1.61-10.80) | 0.003 |
| Recent adjuvant therapy | 3.21 (1.24-83.00) | 0.016 |
| NRS2002 score (≥ 3) | 9.29 (2.63-32.80) | <0.001 |
| High risk type | 7.34 (1.10-48.80) | 0.039 |