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# Reorganization of thoracic surgery activity in a national high-volume comprehensive cancer centre in the Italian epicentre of coronavirus disease 2019

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Since the identification of the first clusters of patients who tested positive for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in mid-February 2020 in northern Italy, the number of confirmed cases of coronavirus disease 2019 (COVID-19) in Italy increased quickly. Three months after the first registered patient, more than 227 364 positive cases had been identified through 20 May 2020 [1]. The death toll was higher than 32 330, with the majority of the deaths occurring among the elderly, an age group that represents a precious resource for the other generations [2].

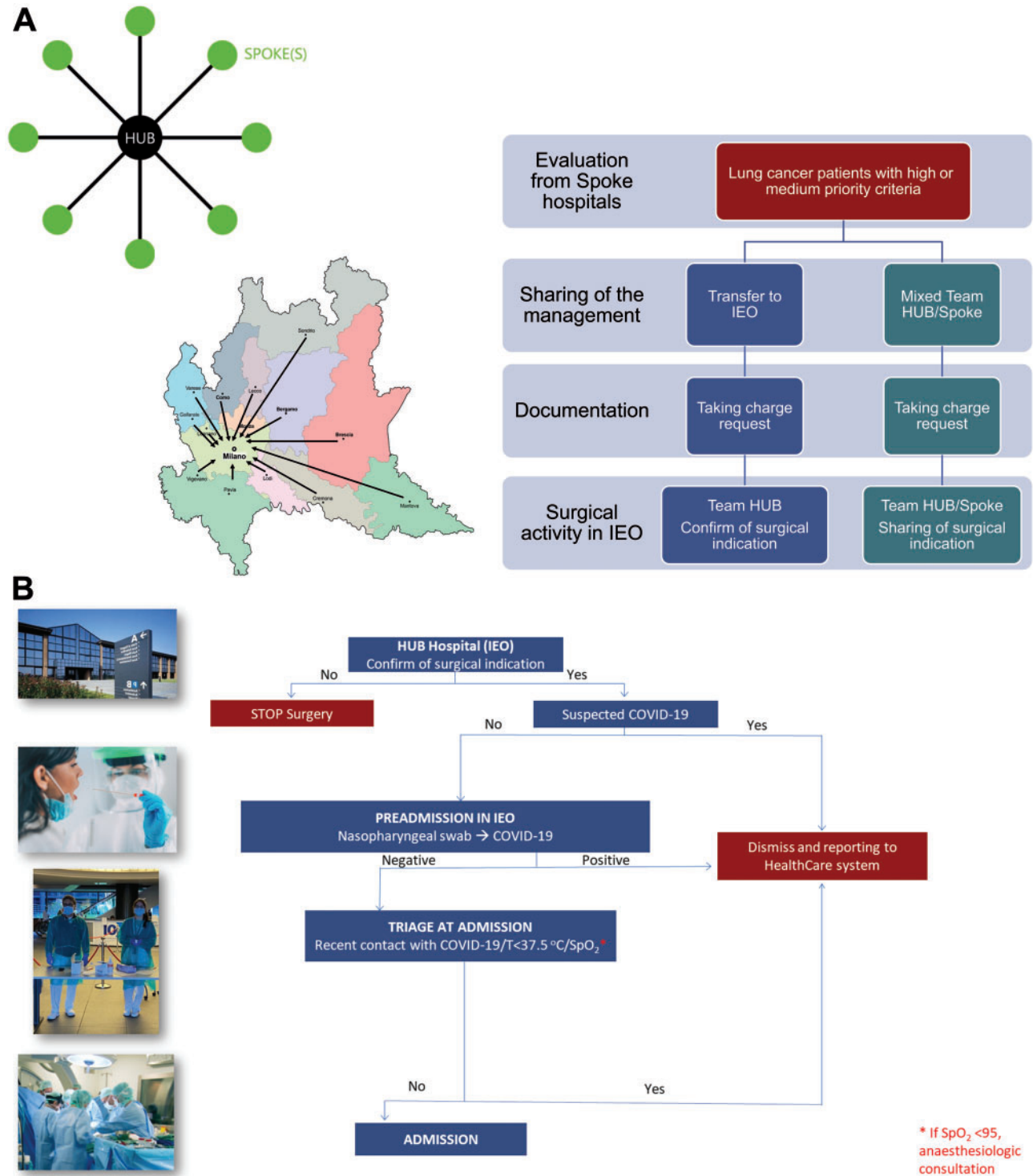
Since the beginning of the outbreak, it was clear that the major problem was the inadequate capacity of intensive care units (ICU). With more than 10 million inhabitants, Lombardy has registered Italy's highest incidence of patients with COVID-19 and remains the epicentre of the Italian epidemic. Consequently, the Lombardy Health System has been working under extreme pressure. In addition to the increasing lack of ICU beds, we were also faced with a scarcity of subintensive care unit beds and with the need to develop dedicated pathways for the potentially SARS-CoV-2-positive patients crowding the emergency departments. Because of this massive patient overload, surgical departments have been forced to progressively reduce surgical volumes by cancelling elective non-emergency interventions to preserve both personal and protective equipment for patients with COVID-19 and healthcare workers [3]. The regional healthcare authorities imposed these restrictions on all hospitals in Lombardy. They also suspended outpatient visits starting 9 March 2020 [4].

The cancellation of surgical procedures has raised many concerns, especially in the field of thoracic oncology. To avoid the complete interruption of thoracic oncological surgical activity, which can be extremely detrimental to patient care, Lombardy designed a hub-and-spoke system whereby selected patients are diverted to dedicated oncological hub hospitals [5]. This hub

approach is unique and different from any other experience described in the recent literature on COVID-19 healthcare management. On 10 March 2020, all Lombardy hospitals were asked to check the waiting lists for cancer surgery and identify those patients whose prognosis may rapidly worsen with progression to inoperable disease. At the same time, the European Institute of Oncology [Istituto Europeo di Oncologia (IEO) IRCCS] was asked to accommodate all patients whose surgical treatment was undelayable while the facilities directly involved in the COVID-19 epidemic were consequently transformed into COVID-19 hospitals [6]. The thoracic surgery division of the IEO, which performs more than 450 lung resections for cancer per year, is the largest in Italy, with a 30-day mortality <1%, even though its surgeons perform extremely challenging surgical procedures in highly compromised patients. We established selection criteria for patients scheduled for thoracic surgery according to newly published guidelines [7]. High priority was given to patients with cT2 cN0 disease or resectable cT3/T4 cN0/N1/N2 naive from treatment (or after induction chemotherapy). Medium priority was assigned to patients with resectable cT1a cN0 lesions. Low priority was given to patients with pure ground-glass opacities.

Even though the original endpoint was the management of patients with lung cancer by the hub centres, the thoracic surgery division of the IEO developed a wholly different and, in some ways, extremely unconventional strategy, not yet described in the published literature. Thoracic oncological operations were performed by mixed teams, including surgeons from both the IEO and the spoke hospitals (Fig. 1A). This approach allowed surgical teams from spoke institutes (switched to COVID-19 clinics) to operate within the IEO Comprehensive Cancer Centre, maintaining the doctor–patient relationship. The spoke surgical teams were checked for fever and/or contact with COVID-19 patients.

Based on the critical concept of social distancing, healthcare management in the IEO was progressively modified to limit



**Figure 1:** (A) The hub-and-spoke system for lung cancer patients. (B) Tailored management of lung cancer surgical patients in the IEO, European Institute of Oncology IRCCS, Milan, Italy. COVID-19: coronavirus disease 2019; IEO: Istituto Europeo di Oncologia.

access to the hospital for any reason. Routine follow-up consults for disease-free patients were cancelled. Phone calls and/or on-line exchange of clinical documentation proved useful to reassure patients and avoid outpatient visits, except in the presence of suspicious new symptoms and/or additional clinical-radiological signs of disease progression. The IEO constantly reviews and

adopts emergency measures to prevent the internal spread of infection with SARS-CoV-2. Triage of patients with respiratory symptoms and/or fever is essential to avoid exposure of other patients and healthcare providers.

At the time of hospital admission, therefore, only the patient was allowed access. If the patient was not self-sufficient, he or

she could be accompanied by one healthy relative if strictly necessary. Each patient, accompanying person, and all healthcare personnel had to pass the fever measurement point and wear a surgical mask. One relative (always the same relative) per patient was allowed a 1-h visit per day to reduce the negative psychological impact of hospitalization on the lung cancer patient. In addition, relatives would not be allowed to visit if they had a temperature and/or contact with other COVID-19 patients, and they had to wear masks.

Patients with lung cancer who become infected with COVID-19 are at high risk of poor outcomes (due to advanced age, heart disease, emphysema). Moreover, thoracic surgical procedures can both impair lung function and expose the anaesthesiological, surgical and nursing teams to aerosolized viral particles (double-lumen endotracheal tube placement, bronchoscopy, lung surgery with parenchymal air leaks, postoperative respiratory physiotherapy) [8]. At the beginning of the COVID-19 epidemic, Italy adopted a non-discriminative testing strategy that included both symptomatic and asymptomatic patients. However, after only few days, a large number of patients were hospitalized for severe COVID-19. Consequently, the Italian Ministry of Health opted to make the tests available only to symptomatic individuals in need of hospital treatment. Nonetheless, this decision resulted in a biased selection and delayed treatment for patients with COVID-19 [9]. Despite the current lack of robust data and with the ultimate aim of keeping the number of in-hospital COVID-19 patients as low as possible, the IEO has currently resolved to test all lung cancer surgery candidates for a baseline COVID-19, because early identification may result in tailored management (Fig. 1B) [10]. Besides, in patients with a swab test negative for the virus and new ground-glass opacities detected on chest computed tomography scans, regardless of new respiratory symptoms, a bronchoscopy with bronchoalveolar lavage for COVID-19 is performed to increase the sensitivity of the swab test. From 10 April 2020 to 11 May 2020, even if the results of triage by temperature measuring and asking for recent respiratory symptoms were negative, 137 entirely asymptomatic patients (scheduled for EBUS-guided mediastinal staging or lung cancer surgery) had COVID-19 swabs. Of these, 16 (11.7%) patients had a positive COVID-19 swab result and were rescheduled for surgery. In 1 patient (0.7%) with a negative swab test result, bronchoscopy with bronchoalveolar lavage was positive for COVID-19. Patients with positive test results were reported to the regional health authorities and placed under home quarantine (if asymptomatic). After 15 days and 2 negative swab test results, the patients were rescheduled for surgery.

Because the situation is rapidly evolving, we should observe, wait for and adjust healthcare strategies as best as possible, while carefully monitoring the current and long-term effects of the COVID-19 pandemic. However, it is mandatory to balance the benefits of lockdown measures with the substantial negative implications for cancer patients. Delayed thoracic oncological surgical procedures will cause lung cancer progression and might result in tumours that can no longer be resected, leading to worse survival outcomes. Therefore, a delay in thoracic surgical

procedures should be avoided, and suspected lung cancer patients should be advised to maintain their scheduled appointments. As with all duties, we need to change our behaviour and promptly develop new strategies to treat lung cancer in the best way possible.

In conclusion, the COVID-19 pandemic should be held responsible not only for the direct death toll but also for the future worsened survival outcomes in thoracic oncology patients.

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