



# Pattern of cancer patient referral and organisational model of an interventional pulmonology programme during the COVID-19 pandemic

To the Editor:

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection and its related disease (coronavirus disease 2019 (COVID-19)) have heavily impacted cancer pathways, with population-based modelling studies predicting a substantial increase in the number of avoidable cancer deaths, mainly due to a diagnostic delay [1–3]. While the utility of bronchoscopy for the microbiological confirmation of the SARS-CoV-2 infection has been evaluated, the feasibility and safety of a diagnostic programme aimed at guaranteeing timely invasive procedures to patients with suspected or known thoracic malignancies during the COVID-19 pandemic has not yet been thoroughly assessed [4–6]. In a literature review, we found a single important study that described an organisational model for bronchoscopic procedures during the first wave of the pandemic, when no published guidelines were available [7]. However, it could not analyse the referral pattern over time as it covered a short time frame (2 months), included a relatively small number of cancer patients (126), and did not detail how patients and staff were screened for the SARS-CoV-2 infection [7].

The aim of the present study was to describe the pattern of cancer patients' referral, the organisational model and rate of transmission of the SARS-CoV-2 to healthcare workers (HCWs) of an interventional pulmonology unit of a tertiary referral centre.

A new interventional pulmonology unit was established at Policlinico Gemelli (Rome, Italy) on 1 June 2020, at the end of the first wave of the COVID-19 pandemic. To guarantee a fully functional invasive diagnostic and therapeutic programme, we used a complex organisational model that followed the “Plan, Do, Check, Act” approach, and took into account strategies regarding patient and HCW screening for SARS-CoV-2 infection, distribution of personal protective equipment (PPE), anaesthesia protocols and the characteristics of the operating theatre (figure 1a). As for the HCWs, we applied a systematic testing regimen including a rapid antigenic test on a nasopharyngeal swab (NPS) every 15 days, as well as a RT-PCR test on a NPS in cases of dubious or positive rapid antigenic test or unforeseen exposure to a COVID-19 patient (figure 1a). A prospective database was used to record the number, type, anaesthesia setting, outcomes and complications of the invasive procedures, as well as the results of the surveillance of the SARS-CoV-2 infection based on NPS in HCWs and patients. The outcomes of the study were: 1) the frequency and type of invasive procedures for oncological patients; and 2) the rate of the SARS-CoV-2 infection in the HCWs and the patients accessing the programme.

During the study period (1 June 1 2020 to 31 January 2021), 513 invasive procedures were performed in patients with suspected/known malignancies. Most of the procedures (407 out of 513, 79%) were diagnostic/staging advanced bronchoscopy procedures (endobronchial ultrasound (EBUS), endoscopic ultrasound with



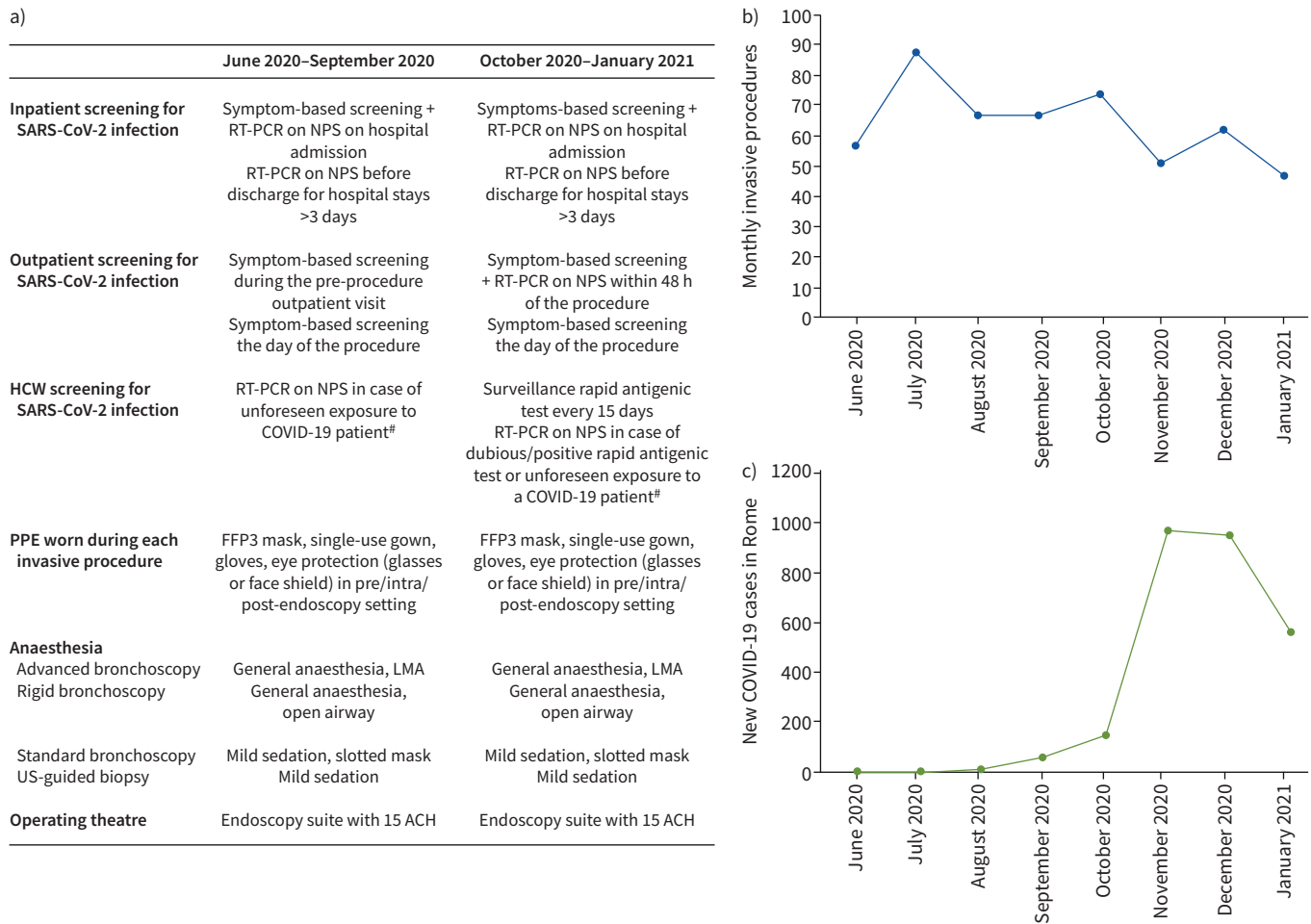
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**An interventional pulmonary programme can be carried out safely for both cancer patients and HCWs during the #COVID19 pandemic. However, a worrisome reduction of new cancer patient referral occurs during periods of high community spread of the virus.** <https://bit.ly/2PRWNXo>

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**FIGURE 1** a) Organisational model for access to the interventional diagnostic and therapeutic invasive procedures and their execution during the COVID-19 pandemic in patients with thoracic malignancies. b) Run chart of monthly invasive procedures and c) number of new COVID-19 cases recorded in Rome, Italy, on the first day of each month during the study period. HCW: healthcare worker; PPE: personal protective equipment; US: ultrasound; NPS: nasopharyngeal swab; LMA: laryngeal mask airway; ACH: air changes per hour. <sup>#</sup>: unforeseen exposure to a COVID-19 patient typically indicates the execution of an invasive procedure on a patient whose SARS-CoV-2 testing was negative in the 48 h before the procedure but became positive in the 7 days after the procedure.

bronchoscope and guided bronchoscopy) (351 out of 513, 68%) or ultrasound-guided percutaneous needle biopsy (56 out of 513, 11%). The overall number of procedures (279 *versus* 234), mainly the frequency of procedures carried out to obtain the first diagnosis of malignancy (227 *versus* 180), was higher in the first 4 months, when the virus transmission rate in the Rome was low, in comparison with the last 4 months, which coincided with the second wave of the pandemic (figure 1b and c). COVID-19-related symptoms or signs or positive SARS-CoV-2 molecular tests were not observed in the HCWs employed during the study. The surveillance protocol helped detect six patients awaiting bronchoscopy who had a positive SARS-CoV-2 RT-PCR test on NPS despite being asymptomatic; their invasive programme was postponed until molecular test conversion. Among the 146 inpatients who underwent two SARS-CoV-2 molecular tests as per our institution protocol in cases of hospital stays of >3 days (figure 1a), the test results were concordant in 142 (97.3%) and discordant (negative on admission but positive on anticipated discharge) in four (2.7%). Notably, these four patients underwent the invasive testing (rigid bronchoscopy for stent placement in one patient, ultrasound-guided needle biopsy of a supraclavicular lymph node in one patient, guided bronchoscopy in one patient and EBUS-TBNA in one patient) with a mean time of 36 h between the procedure and the positive NPS test result.

Our epidemiological study shows that invasive procedures for cancer patients decreased by 16% during the second wave of the pandemic, although the staff of the unit were not employed in the COVID-19 wards to guarantee healthcare continuity regardless of the SARS-CoV-2 community spread. In an attempt to understand the referral patterns observed during the study, we discussed with many cancer patients the

reasons possibly causing a delay in their access to the hospital services during the phases of high community spread of the virus, and identified three important factors. While the fear of acquiring the SARS-CoV-2 infection in the hospitals was most commonly cited, following the advice of the public authorities to remain home unless indispensable and self-isolating themselves for the fear of being infectious in the presence of mild respiratory symptoms were important factors as well. Unfortunately, the reduction (21%) was mainly relevant for patients with suspected malignancies who should have undergone the first diagnostic/staging invasive procedure. This finding is particularly worrisome as the poor prognosis of lung cancer frequently depends on a delayed diagnosis leading to the disease being identified at advanced stages [3]. No differences were detected in the referral of patients with previously diagnosed cancer needing a diagnostic (*i.e.* bronchoalveolar lavage for suspected infection during the exposure of a systemic therapy) or a therapeutic procedure (*i.e.*, rigid bronchoscopy for stent placement) in the setting of a defined oncological programme.

None of the HCWs developed SARS-CoV-2 infection during the study period. This finding is remarkable, as bronchoscopy is among the invasive procedures considered at the highest risk of airborne transmission [8, 9]. Furthermore, four of the patients who underwent the invasive testing were probably infected during the procedure, as they were found to have a positive RT-PCR NPS within the subsequent 36 h. One of them, in particular, underwent a rigid bronchoscopy, which is by far the endoscopic procedure associated with the highest risk of viral transmission as it provides a direct communication between the patient's airway and the endoscopy suite [8, 9]. Given these results, we infer that the systematic and correct use of the PPE, and the execution of the procedures in an endoscopy suite that was adequately ventilated and carefully disinfected after each procedure, significantly reduced the biological risk [8, 9].

Finally, a screening programme for SARS-CoV-2 infection, which we managed to improve during the study period thanks to the progressive increase in testing capability in Italy, is key for both the HCWs and the patients. However, the sensitivity of the RT-PCR for SARS-CoV-2 ranges between 70% and 85% in symptomatic patients, and might be lower in asymptomatic individuals based on a low viral load [10, 11]. These diagnostic sensitivity values might partly explain why four inpatients who underwent two RT-PCR tests were found to have discordant test results (negative on admission but positive on anticipated discharge). It is, therefore, crucial that PPE is worn systematically and appropriately during interventional pulmonology activity, even if the pre-procedure molecular screening is negative.

In conclusion, our study suggests that an interventional pulmonary programme can be carried out safely for both the cancer patients and HCWs during the COVID-19 pandemic, keeping in mind that a worrisome reduction of new cancer patients' referral occurs during periods of high community spread of the virus.

**Rocco Trisolini**<sup>1</sup>, **Daniele Magnini**<sup>1</sup>, **Vanina Livi**<sup>1</sup>, **Fausto Leoncini**<sup>1</sup>, **Lucia M. Porro**<sup>2</sup>, **Maria C. Flore**<sup>2</sup>, **Daniela Paioli**<sup>1</sup> and **Giovanni Sotgiu**<sup>3</sup>

<sup>1</sup>Interventional Pulmonology Unit, Fondazione Policlinico Universitario A. Gemelli IRCCS, Catholic University of the Sacred Heart, Rome, Italy. <sup>2</sup>Pulmonology Unit, Catholic University of the Sacred Heart, Rome, Italy. <sup>3</sup>Clinical Epidemiology and Medical Statistics Unit, Dept of Medical, Surgical and Experimental Sciences, University of Sassari, Sassari, Italy.

Correspondence: Rocco Trisolini, Interventional Pulmonology Unit, Fondazione Policlinico Universitario A. Gemelli IRCCS, Catholic University of the Sacred Heart, Largo F. Vito 1, Rome 00168, Italy.

E-mail: rocco.trisolini@policlinicogemelli.it

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