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The impact of coronavirus disease 2019 on the practice of thoracic oncology surgery: a survey of members of the European Society of Thoracic Surgeons (ESTS)

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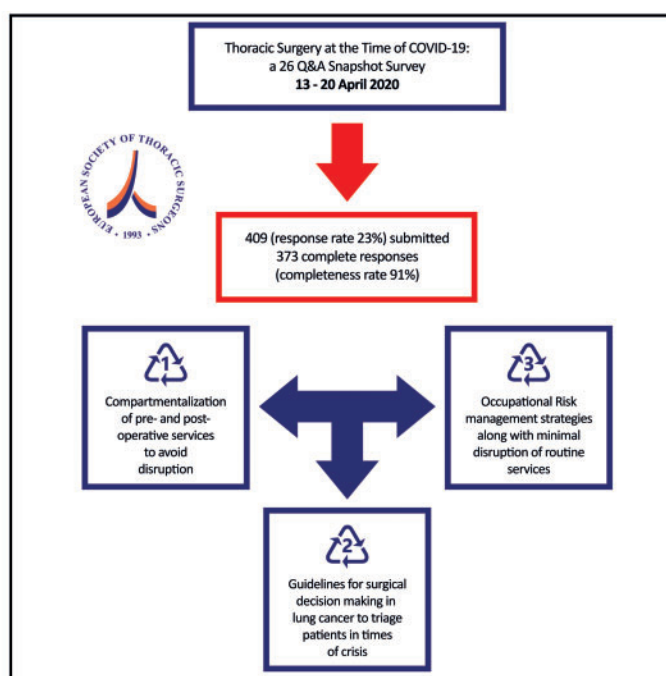
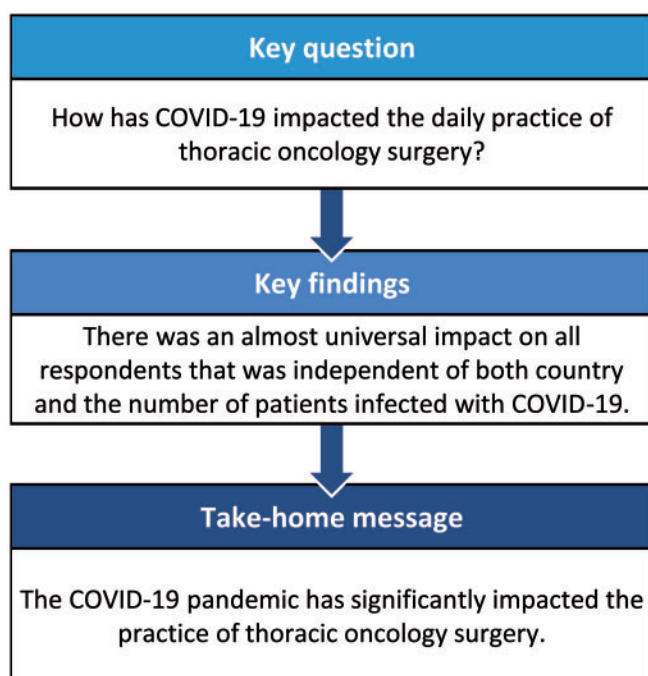
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Abstract

OBJECTIVES: There is widespread acknowledgement that coronavirus disease 2019 (COVID-19) has disrupted surgical services. The European Society of Thoracic Surgeons (ESTS) sent out a survey to assess what impact the COVID-19 pandemic has had on the practice of thoracic oncology surgery.

[†]The first two authors contributed equally to this study.

METHODS: All ESTS members were invited (13–20 April 2020) to complete an online questionnaire of 26 questions, designed by the ESTS learning affairs committee.

RESULTS: The response rate was 23.0% and the completeness rate was 91.2%. The number of treated COVID-positive cases per hospital varied from fewer than 20 cases (30.6%) to more than 200 cases (22.7%) per hospital. Most hospitals (89.1%) postponed surgical procedures. All hospitals performed patient screening with a nasopharyngeal swab, but only 6.7% routinely tested health care workers. A total of 20% of respondents reported that multidisciplinary meetings were completely cancelled and 66%, that multidisciplinary decisions were not different from normal practice. Trends were recognized in prioritizing surgical patients based on age (younger than 70), type of surgery (lobectomy or less), size of tumour (T1–2) and lymph node involvement (N1). Sixty-three percent of respondents reported that surgeons were involved in daily care of COVID-19-positive patients. Fifty-three percent mentioned that full personal protective equipment was available to them when treating a COVID-19-positive patient.

CONCLUSIONS: The COVID-19 pandemic has created issues for the safety of health care workers, and surgeons have been forced to change their routine practice. However, there was no consensus about surgical priorities in lung cancer patients, demonstrating the need for the production of specific guidelines.

Keywords: (MEsh) Survey • Organization and administration • Thoracic surgery • Coronavirus disease 2019 • Pandemic

ABBREVIATIONS

COVID-19	Coronavirus disease 2019
CT	Computed tomography
ESTS	European Society of Thoracic Surgeons
PPE	Personal protective equipment
WHO	World Health Organization

INTRODUCTION

On 31 December 2019, the World Health Organization (WHO) was informed of a cluster of patients presenting with pneumonia in China. This disease, which was termed coronavirus disease 2019 (COVID-19) and was caused by the SARS-CoV-2 virus, spread worldwide, becoming a pandemic on 11 March 2020 [1]. Because COVID-19 has been found to be highly transmittable with a mortality of 0.3–15.06% [2], many countries have taken measures to limit the spread of the virus [3]. To deal with infected patients requiring mechanical ventilation, hospitals have created surge capacity with routine clinical practice severely disrupted [4]. Operating room personnel and equipment have been redeployed to critical care and COVID-19 wards. In some cases, operating rooms have been transformed into additional intensive care facilities [5].

The European Society of Thoracic Surgeons (ESTS) designed a questionnaire to assess how the COVID-19 pandemic has impacted the practice of thoracic oncology surgery by its members. The findings represent a snapshot of a specific period of the pandemic. They also reflect a specific situation during different phases of the pandemic [3]. The results of this survey will be disseminated to help thoracic surgeons appropriately manage their oncology practice during the COVID-19 pandemic.

MATERIALS AND METHODS

All ESTS members (1780 as of March 2020) received an e-mail informing them about the survey. They were invited to complete the questionnaire using a commercially available format (www.surveymonkey.com) over 7 days from 13 April 2020 to 20 April 2020.

The survey was designed by the ESTS learning affairs committee and comprised 26 questions. Five questions assessed the background and specific practice of the surgeon and 21 questions assessed the impact of COVID-19 on his or her thoracic surgical practice. Three questions related to multidisciplinary meetings and treatment decisions; 3 questions, to patient screening; 2 questions, to preoperative assessment; 2 questions, to preoperative patient contact; 3 questions, to surgical planning; 2 questions, to protective equipment; 4 questions, to postoperative care and contact; and 2 questions, to the surgeon's personal situation. One final open-ended question explored thoughts about the future. The results of each question are presented in tables or bar charts, and the most important findings are presented in this manuscript. The other findings are presented in electronically available [Supplementary Material, Tables S1 and S2](#).

RESULTS

Of 1780 surgeons, 409 (response rate 23%) submitted 373 complete responses (completeness rate 91%).

CONTEXT PART

Demographics and hospitals

Question 1: In which country do you practice? (Answer rate 383/409, 93.6%)

A total of 298 (77.8%) participants were from Europe, 39 (10.2%) from Asia, 20 (5.3%) from North America, 17 (4.5%) from South America, 8(2%) from Africa and 1 (0.2%) from Oceania (Fig. 1).

Question 2: In which type of institution do you practice? (Answer rate 405/409, 99%)

The majority of the respondents worked in academic hospitals ([Supplementary Material, Fig. S1](#)) ($n=290$, 71.6%). Supraregional (non-academic) and regional (non-academic) hospitals were 11.6% ($n=47$) and 12.59% ($n=51$), respectively.

Question 3: How many COVID-19 positive patients is your hospital treating? (Answer rate 405/409, 99%)

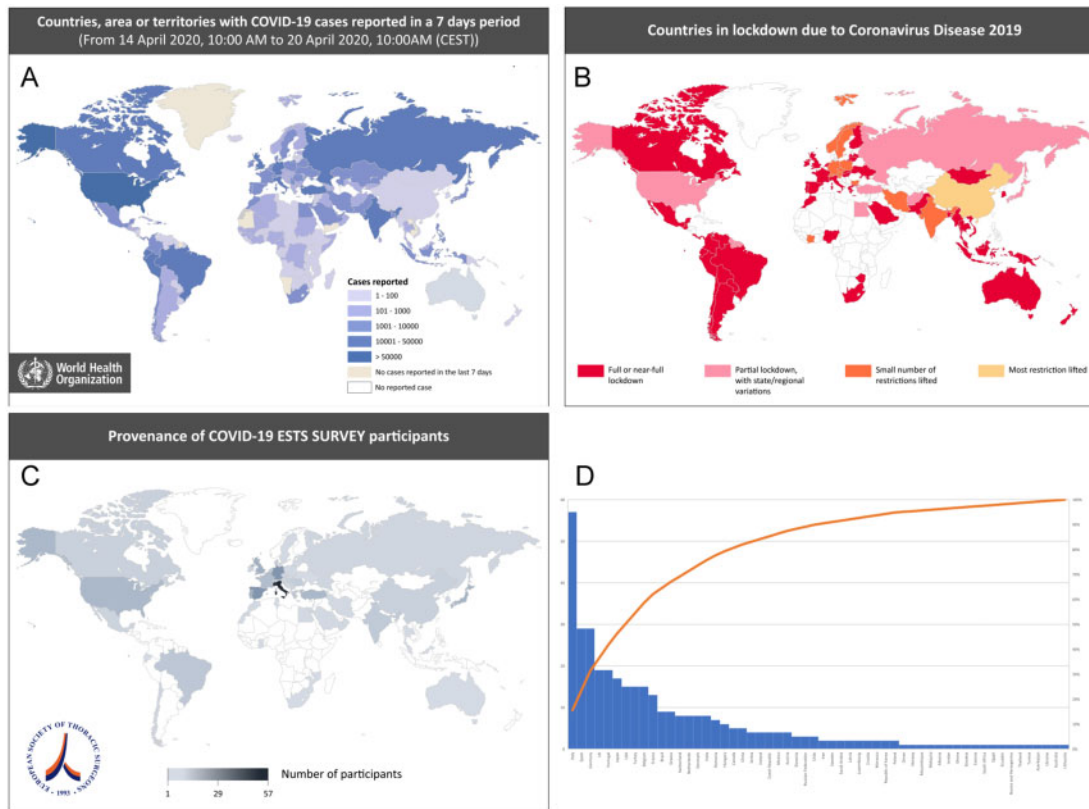


Figure 1: Impact of coronavirus disease 2019 (COVID-19) worldwide and the European Society of Thoracic Surgeons (ESTS) survey response. **(A)** World Health Organization (WHO) map describes the countries, areas or territories with COVID-19 cases reported during the 7 days from 14 April 2020 to 20 April 2020 [reproduced from <https://covid19.who.int/> at WHO Coronavirus Disease (COVID-19) Dashboard; WHO permission ref 349467/2020]. **(B)** Countries in lockdown due to COVID-19 during the same period described in the WHO map. **(C and D)** All countries, areas or territories participating in the COVID-19 survey and their relative contributions.

The majority of respondents worked in hospitals treating no more than 20 patients with COVID-19 (30.6%). Conversely, 22.7% reported that their hospital was treating more than 200 infected patients (Supplementary Material, Fig. S2).

Question 4: How is the COVID-19 pandemic affecting normal functioning of your hospital? (Answer rate 405/409, 99%)

Most of the respondents answered that the functioning of the hospital was considerably (55.3%) or extremely (16.3%) affected (Supplementary Material, Fig. S3).

Question 5: Are the health care personnel tested in your hospital? (Answer rate 405/409, 99%)

Only 50% of health care workers were tested at their hospitals when symptomatic and 11% were not tested at all; 32% of respondents reported that workers were tested after being in contact with COVID-positive patients.

IMPACT OF CORONAVIRUS DISEASE 2019 PANDEMIC ON THORACIC SURGERY PATIENT CARE

Results are presented in Fig. 2.

Multidisciplinary tumour board

Question 6: How are multidisciplinary tumour meetings organized today? (Answer rate 405/409, 99%)

A total of 48.9% of respondents were using web-based platforms. Interestingly, when answers were stratified by the number of treated COVID-19 positive patients per hospital, no differences were seen in distribution (Fig. 3A).

Question 7: Are multidisciplinary decisions influenced by the COVID-19 pandemic situation? (Answer rate 400/409, 97.7%)

The majority of respondents (66%) answered that treatment decisions were not influenced by COVID-19, but multidisciplinary decisions were clearly more influenced by the situation in hospitals treating more than 100 patients with COVID-19 (Fig. 3B).

Question 8: Given the current COVID-19 crisis please select which of the following hypothetical patients you would prioritize for surgery? (Answer rate 401/409, 98%)

We provided 5 case scenarios to be triaged (Fig. 4). The majority prioritized fit and younger patients with a cancer at risk of progression. Surgical management of slowly growing and smaller cancers, especially in older patients, tended to be deferred.

Coronavirus disease 2019 screening

Question 9: What thoracic surgical patients are being screened for COVID-19 in your department? (Answer rate 405/409, 99%) (Fig. 2)

The answers were variable with the same proportion of respondents reporting screening for all patients (25%), in-patients only (24%) or symptomatic patients only (23%).

Question 10: How are thoracic surgical patients screened for COVID-19 in your department? (Answer rate 400/409, 97.7%) (Fig. 2)

The majority (54%) responded that a nasopharyngeal swab alone was used for screening; 30% used a combination of swab and computed tomography (CT) chest imaging.

Question 11: Does the result of a COVID-19 positive test influence the surgical treatment of your patient? (Answer rate 398/409, 97.3%) (Fig. 2)

A total of 7% of respondents would proceed to surgery regardless of a positive test result. The majority stated a positive test result would be an indication to postpone surgery by 2 weeks in all patients (59%) or those with symptoms (19%).

Preoperative workup

Question 12: How is the preoperative oncological workup influenced by the COVID-19 pandemic situation? (Answer rate 400/409, 97.7%) (Fig. 2)

A total of 45% of participants answered that all examinations were available as usual. However, 56% reported that endobronchial or other examinations were delayed or unavailable. CT-guided biopsies were less frequently available in more severely affected hospitals (Fig. 5A).

Question 13: Which of the following preoperative functional tests are not available due to the COVID-19 pandemic situation? (Answer rate 394/409, 96.3%) (Fig. 2)

Although all tests were available as normal for most participants (64%), the diffusing capacity for carbon monoxide and cardiopulmonary exercise tests were not available in more than 20% of cases.

When answers were stratified by the number per hospital of treated patients whose test results were positive for COVID-19, investigations were clearly more delayed or unavailable in hospitals treating more than 100 patients with COVID-19 (Fig. 5B).

Outpatient clinic: preoperative

Question 14: How is your preoperative contact with the patient influenced by the COVID-19 pandemic situation? (Answer rate 398/409, 97.3%) (Fig. 2)

Preoperative meetings with patients were still conducted face to face for 54% of respondents; 47% used telephone or video consultations when possible.

Question 15: Do you talk about COVID-19 with your patients preoperatively? (Answer rate 395/409, 96.5%) (Fig. 2)

Most respondents discussed with their patients the higher risk of surgery in the context of COVID-19 infection. However, 15% reassured their patients not to worry and 8.6% did not discuss COVID-19 infection preoperatively.

Planning

Question 16: How is your surgical planning affected by the COVID-19 pandemic situation? (Answer rate 400/409, 97.7%) (Fig. 2)

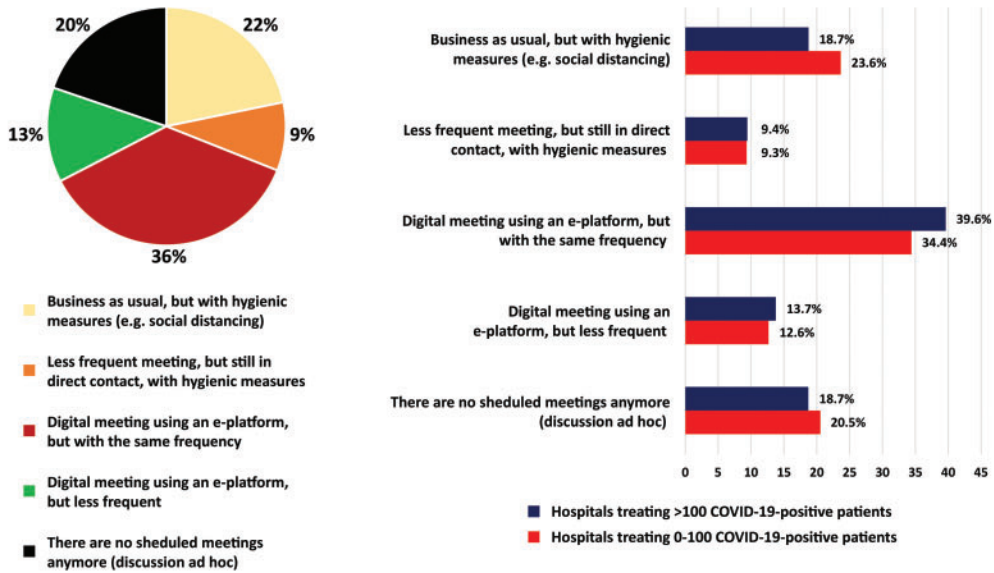
Almost half of the participants (47.5%) answered that only medically or oncologically urgent operations were performed due to shortage of staff and intensive care unit beds. In hospitals treating more patients who were positive for COVID-19, surgical planning was clearly more affected (Fig. 6A).

Question 17: How do you feel about the affected planning? (Answer rate 397/409, 97%) (Fig. 2)

MULTIDISCIPLINARY THORACIC BOARD		Number of participants
Question 6: How are multidisciplinary thoracic meetings organised today?	Business as usual, but with hygienic measures (eg social distancing)	41/409 (10%)
	Less frequent meeting, but still in direct contact, with hygienic measures	9/436 (2%)
	Digital meeting using an e-platform, but with the same frequency	36/202 (18%)
	Digital meeting using an e-platform, but less frequent	12/844 (52%)
	There are no scheduled meetings anymore (discussion at hoc)	20/200 (87%)
Question 7: Are multidisciplinary decisions influenced by the COVID-19 pandemic situation?	Not at all	21/236 (9%)
	Yes, to the treatment decision itself, but a degree of treatment urgency is mentioned	54/508 (218)
	Yes, in locally advanced stages (H4) patients are more scheduled for systemic therapy	15/236 (63)
	Yes, in locally advanced stages patients are less scheduled for systemic therapy and more for radiotherapy therapy	4/208 (18)
	Yes, in locally advanced stages patients are less scheduled for systemic therapy and more for surgery	4/258 (17)
	Yes, in early stages patients scheduled for locoregional therapy get more radiation therapy and less surgery	8/258 (33)
	Yes, patients scheduled for locoregional therapy get less radiation therapy and more surgery	1/206 (6)
Question 8: Given the current COVID-19 crisis please select which of the following hypothetical patients you would prioritise for surgery?	SEE FIGURE	
CASE 1	80 year old patient with slowly growing partly solid T1aM0 peripheral lung cancer	
CASE 2	65 year old patients with normal pulmonary function and no comorbidities with 3 on RUL cancer	
CASE 3	75 year old patient with compromised pulmonary function, P5, central cancer candidate to right pneumonectomy	
CASE 4	70 year old patient with single station N2 disease and right upper lobe cancer	
CASE 5	55 year old patient with normal pulmonary function tests, N1 disease, cancer in the right lower lobe	
COVID-19 SCREENING		
Question 9: What thoracic surgical patients are being screened for COVID-19 in your department?		
	Only symptomatic patients in the emergency department	12/506 (50)
	All symptomatic patients (inpatient and outpatient)	23/236 (93)
	Symptomatic patients and certain inpatient contacts depending on underlying pathology	4/208 (18)
	All inpatient contacts only	34/206 (96)
	All patients (inpatient and outpatient)	24/506 (98)
Question 10: How are thoracic surgical patients screened for COVID-19 in your department?		
Multiple	Nasopharyngeal swab	90/776 (364)
	Chest CT	37/412 (150)
Answers	Blood test for antibodies	4/506 (18)
	Sputum	3/498 (14)
	Bronchoscopes/lavage	3/398 (16)
	Other	4/246 (28)
Question 11: Does the result of a test influence the surgical treatment of your patient?		
	No, in all cases, we will operate, but taking necessary precautions and protection equipment when needed	7/498 (28)
	Yes, a COVID-19 positive elective patient with symptoms will not be operated on for 14 days and will be rescheduled afterwards	19/335 (77)
	Yes, every COVID-19 positive elective patient (with or without symptoms) will not be operated on for 14 days and will be rescheduled afterwards	59/306 (236)
	Yes, COVID-19 positive elective patient with symptoms will not be operated on anymore and other options will be suggested	6/636 (24)
	Yes, every COVID-19 positive elective patient (with or without symptoms) will not be operated on anymore and other options will be suggested	3/776 (15)
	Yes, even in COVID-19 positive urgent cases, we will try to find a non-surgical solution	1/206 (2)
PREOPERATIVE WORKUP		
Question 12: How is the preoperative oncological workup influenced by the COVID-19 pandemic situation?		
	Not at all, all investigations are available in a normal time frame	44/736 (179)
	Only PET-CT investigations are delayed or unavailable	13/236 (53)
	Only endobronchial investigations (bronchoscopy, EBUS) are delayed or unavailable	30/506 (122)
	PET-CT and endobronchial investigations (bronchoscopy, EBUS) are delayed or unavailable	14/506 (58)
	CT guided biopsy is not routinely available	5/236 (21)
Question 13: Which of the following preoperative functional tests are not available due to the COVID-19 pandemic situation?		
	All investigations are available as normal	63/458 (250)
	Sporadically with or without arterial blood gas analysis	21/376 (85)
	Diffusing capacity of lung for carbon monoxide (DLCO)	20/506 (81)
	Cardiac tests (ECG, Echocardiogram, stress test)	3/308 (13)
	Cardiopulmonary exercise test (CPET)	21/836 (86)
	VO2 max	10/606 (42)
OUTPATIENT CLINIC: PREOP		
Question 14: How is your preoperative contact with the patient influenced by the COVID-19 pandemic situation?		
	Business as usual, but with hygienic measures (eg social distancing, surgical mask for surgeon and/or patient)	53/776 (214)
	I try to avoid direct contact with patients and I have as much tele- or video contacts as possible	16/306 (68)
	All preoperative patient contacts are through tele- or video calls	5/636 (20)
Question 15: Do you talk about COVID-19 with your patients preoperatively?		
	No, this has nothing to do with their disease	8/616 (34)
	Yes, I don't want to, but patients ask about potential higher risks, and I tell them not to worry	15/448 (63)
	Yes, I don't want to, but patients ask about potential higher risks, and I tell them morbidity and mortality is higher	47/598 (188)
	Yes, I don't want to, but patients ask about potential higher risks, and I tell them we don't know that yet	28/336 (112)
PLANNING		
Question 16: How is your surgical planning affected by the COVID-19 pandemic situation?		
	Not at all, business as usual	2/506 (10)
	Slightly reduced capacity; some elective benign surgeries have been postponed, but no effect on inpatient care or ICU beds	17/506 (70)
	Moderately: more surgeries have been postponed, less staff and ICU beds available	24/506 (98)
	Considerably: only medically urgent or oncologically urgent surgeries are executed, minimal staff and ICU beds available	47/506 (188)
	Extremely: only emergency surgeries are executed, otherwise no staff and no ICU beds	8/606 (32)
Question 17: How do you feel about the affected planning?		
	I agree with the current situation, this is what needs to be done	55/676 (221)
	I think we could even reduce thoracic surgery capacity for some time when needed	16/306 (68)
	I do not agree because my patients need more care than I can offer them, but I am forced because of lack of resources (protective material, ICU beds,...)	8/506 (34)
	I do not agree because my patients need more care than I can offer them, but I am forced because of lack of staff (anesthetists, OR nurses,...)	6/536 (26)
	I do not agree because my patients need more care than I can offer them, but I am forced because of lack of staff (anesthetists, OR nurses,...) and resources (protective material, ICU beds,...)	12/836 (51)
Question 18: Are you and/or your thoracic surgery colleagues involved in the daily care of COVID-19 positive patients?		
	No, none of us is taking care of these	37/348 (149)
	Yes, some of us, but only surgical patients	25/318 (101)
	Yes, only patients from our department	7/626 (30)
	Yes, special COVID shifts for other departments (e.g. ICU, IMC, emergency department)	29/826 (113)
SURGERY		
Question 18: What kind of personal protective equipment (PPE) measures are taken during a COVID-19 negative thoracic surgical procedure?		
	Standard OR equipment only for all staff	40/836 (165)
	FFP2 mask + glasses for all staff in the room	13/208 (62)
	FFP2 mask, glasses, gown and face shield for anesthetist only and FFP2 mask + glasses for the surgical team	17/548 (70)
	FFP2 mask, glasses, gown and face shield for anesthetist and surgical team when always are opened (eg. sleeve lobectomy, tracheal surgery)	8/776 (35)
	FFP2 mask, glasses, gown and face shield for all staff in the room	15/248 (60)
	Other (please specify)	4/536 (18)
Question 20: What kind of personal protective equipment (PPE) measures are taken during a COVID-19 positive thoracic surgical procedure?		
	Standard OR equipment only for all staff	1/526 (6)
	FFP2 mask + glasses for all staff in the room	7/348 (29)
	FFP2 mask, glasses, gown and face shield for anesthetist only and FFP2 mask + glasses for the surgical team	16/208 (64)
	FFP2 mask, glasses, gown and face shield for anesthetist and surgical team when always are opened (eg. sleeve lobectomy, tracheal surgery)	12/218 (51)
	FFP2 mask, glasses, gown and face shield for all staff in the room	53/426 (211)
	Other (please specify)	8/616 (34)
POSTOPERATIVE CARE		
Question 21: How is intensive Care / Post Anesthesia Care availability for thoracic surgery patient affected by the COVID-19 pandemic situation?		
	Not at all, business as usual	31/816 (135)
	Patients who standardly go to these units for a longer period stay there for a shorter period	14/836 (56)
	Patients who standardly go to these units for one night are sent earlier to the ward, but some places are available	36/276 (136)
	There are no extra care patients available. Patients must go to the ward after surgery	13/306 (50)
Question 22: Does chest drain management for your thoracic surgery patients during this COVID-19 pandemic differ from your standard management?		
	No, same system and same protocol used	81/116 (322)
	No, we now use different chest drainage system	4/298 (17)
	Yes, we do not discharge patients home with chest tube anymore	3/536 (14)
	Yes, we have changed the removal criteria protocol	3/296 (15)
	We do not use water seal anymore	2/276 (9)
	We increased the use of portable digital devices	5/606 (20)
Question 23: Do discharge criteria for your thoracic surgery patients during this COVID-19 pandemic differ from your standard criteria?		
	No, same traditional or enhanced recovery protocol	59/208 (235)
	Yes, most patients are discharged earlier than usual (mostly because of bed capacity and fear of COVID-19 infection)	27/148 (108)
	Yes, most patients are discharged later than usual (mostly because of social distancing measures at home)	5/798 (23)
	Yes, some patients are discharged earlier and some later than usual	8/646 (32)
FOLLOW UP		
Question 24: How is your postoperative contact with the patient influenced by the COVID-19 pandemic situation?		
	Business as usual, but with hygienic measures (eg social distancing, surgical mask for surgeon and/or patient)	46/238 (184)
	I try to avoid direct contact with patients and I have as much tele- or video contacts as possible	41/598 (167)
	All postoperative patient contacts are through tele- or video calls	30/536 (42)
	I don't see my patients postoperatively. They are immediately sent to their family doctors	1/206 (5)
SITUATION		
Question 25: Anyone of your Department were tested positive to COVID-19?		
Multiple	Yes	56/648 (226)
Answers	No	32/378 (129)
	Physician/Surgeon	20/808 (85)
	Nurse	20/808 (85)
	Health Assistant	11/576 (46)
	Other (Please Specify)	2/201 (8)
Question 26: How do you feel about the affected planning?		
	Nothing different, I do what I can for my patients	28/326 (113)
	I feel I can do a lot for other colleagues and patients, since there is shortage of staff	17/236 (69)
	I feel I am not giving the best care for my thoracic surgery patients	15/248 (60)
	Mixed feelings: I cannot give the best care for my own patients, but I can help a lot of patients in urgent need	39/336 (157)

Figure 2: Questionnaire results on the impact of coronavirus disease 2019 on thoracic surgical practice (questions 6–26).

A How are multidisciplinary (tumour) meetings organized today?



B Are multidisciplinary decisions influenced by the COVID-19 pandemic situation?

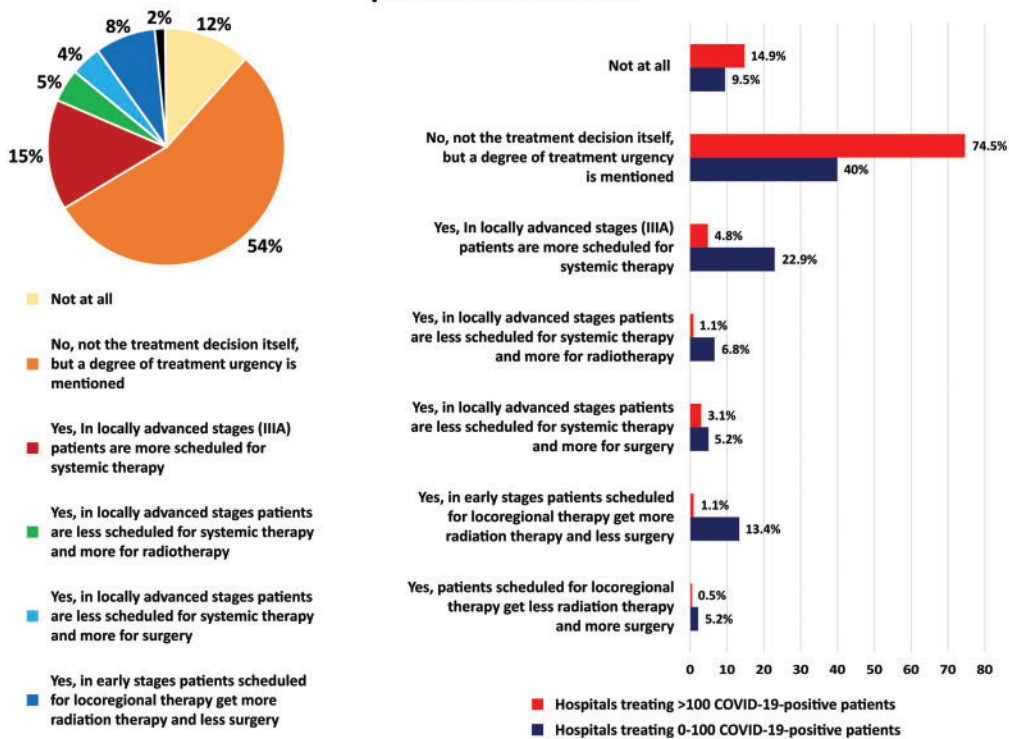


Figure 3: Multidisciplinary tumour boards. **(A)** Organization of multidisciplinary tumour boards stratified by impact per hospital. **(B)** Influence of the COVID-19 pandemic situation on multidisciplinary decisions stratified by impact per hospital. COVID-19: coronavirus disease 2019.

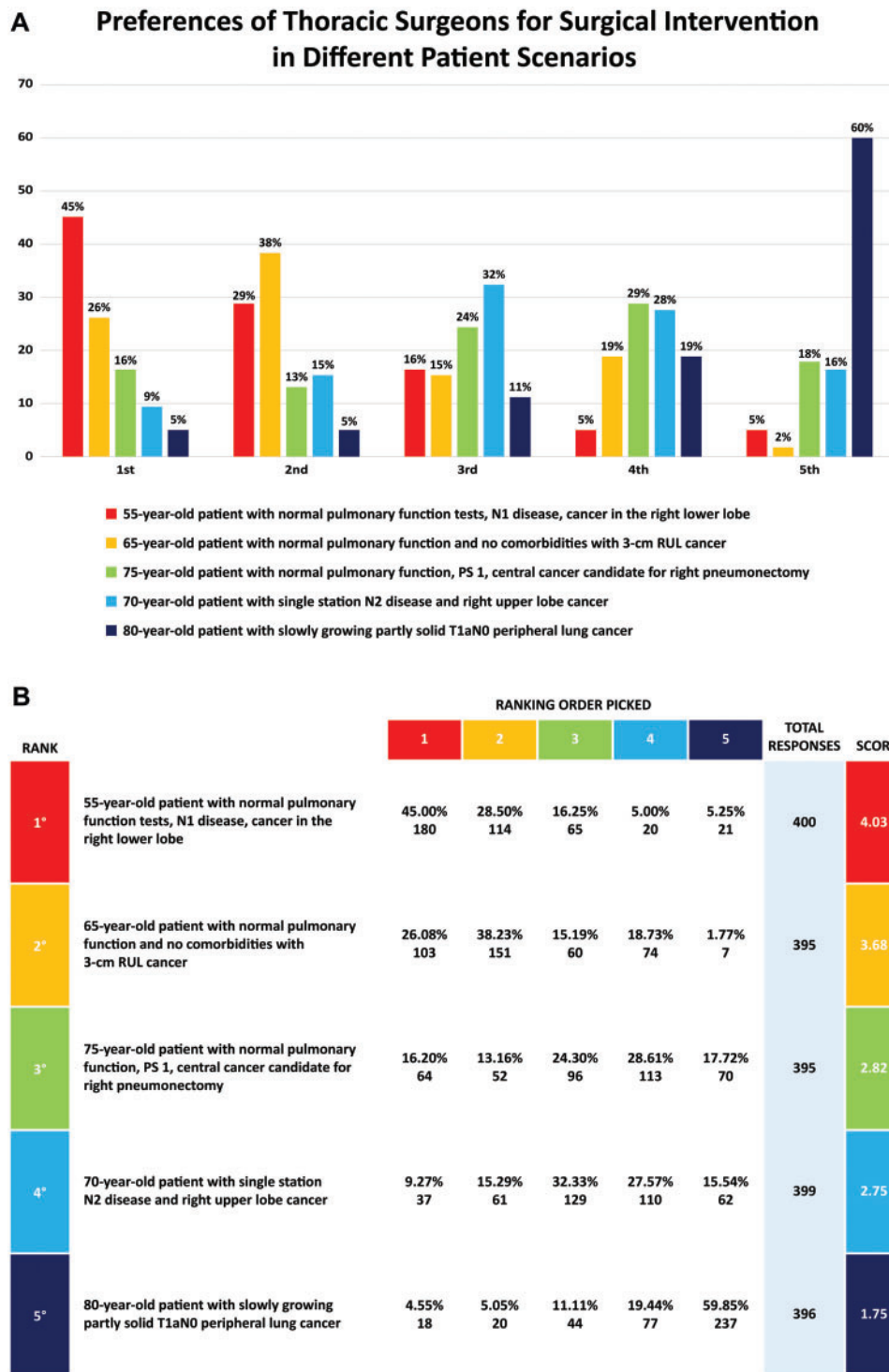


Figure 4: Distribution of the answers in prioritizing clinical scenarios (related to question 8). (A) Clustered columns of each preference choose by every participant. (B) Double-entry table with the number of answers and their ranking order according to the percentage of each answer compared to the total responses (azure column) and overall score. RUL: right upper lobe.

Fifty-six percent of participants agreed with the reorganization of services. Only a minority of respondents (28.0%) felt forced to agree due to a lack of resources, but the answers from those at hospitals treating fewer patients who tested positive for COVID-19 were generally more positive (Fig. 6B).

Question 18: Are you and/or your thoracic surgery colleagues involved in the daily care of COVID-19 positive patients? (Answer rate 399/409, 97.5%) (Fig. 2)

The majority of respondents (63%) were involved in the daily care of patients with positive test results for COVID-19; surgeons in hospitals treating more patients with test results positive for COVID-19 were clearly more involved (Fig. 6C).

Surgery

Question 19: What kind of personal protective equipment (PPE) measures are taken during a COVID-19 negative thoracic surgical procedure? (Answer rate 399/409, 97.5%) (Fig. 2)

A total of 41% of respondents reported that all staff in the operating room used only standard equipment whereas the other respondents used filtering facepiece mask, aerosol filtration type 2 masks and other PPE measures.

Question 20: What kind of PPE measures are taken during a COVID-19 positive thoracic surgical procedure? (Answer rate 395/409, 96.5%) (Fig. 2)

Over half of the respondents (53%) used full PPE.

Postoperative care

Question 21: How is intensive care/postanaesthesia care availability for thoracic surgery patient affected by the COVID-19 pandemic situation? (Answer rate 377/409, 92.1%) (Fig. 2)

A total of 36% of respondents indicated no issue with intensity therapy unit bed numbers. The remaining respondents experienced reduced critical care capacity.

Question 22: Does chest drain management for your thoracic surgery patients during this COVID-19 pandemic differ from your standard management? (Answer rate 397/409, 97%) (Fig. 2)

The majority of participants (81%) stated they used the same system and the same chest drain protocol.

Question 23: Do discharge criteria for your thoracic surgery patients during this COVID-19 pandemic differ from your standard criteria? (Answer rate 398/409, 97.3%) (Fig. 2)

The majority of the respondents (59%) did not alter postoperative protocols. However, 30% tended to discharge patients earlier than usual (mostly because of bed capacity and concerns of COVID-19 infection).

Follow-up

Question 24: How is your postoperative contact with the patient influenced by the COVID-19 pandemic situation? (Answer rate 398/409, 97.3%) (Fig. 2)

One in 10 respondents switched to tele- or video consultations only. The other respondents were still seeing some patients in person.

Personal situation

Question 25: Anyone of your Department were tested positive to COVID-19? (Answer rate 399/409, 97.5%) (Fig. 2)

Almost half of the respondents had a team member who had contracted COVID-19 infection (32% were physicians/surgeons). [Supplementary Material, Table S1](#) displays the proportion of COVID-19-positive personnel in thoracic surgery units from countries with more than 10 respondents in relation to the respective WHO COVID-19 lockdown day at the time of the survey.

Question 26: How do you feel as a thoracic surgeon during this pandemic? (Answer rate 399/409, 97.5%) (Fig. 2)

The majority of respondents (54%) felt unable to offer the best care for their patients.

Future thoughts (answer rate 86/409, 21%)

We received 86 comments. A total of 52% were remarks or questions on the current health care situation; 20% expressed hopeful sentiments; and 19% expressed fear or worries for the future ([Supplementary Material, Table S2](#)).

DISCUSSION

This survey explored the current practice among thoracic surgeons practicing during the COVID-19 pandemic during the second week of April 2020. The response rate of 23% was especially high, considering that only 1 response per institution was requested. This result may reflect the need among surgeons for more information and guidance about working through the pandemic. Indeed, another recent survey reflected a significant level of concern among health care workers regarding COVID-19 [6].

The ESTS is a European society, but more than one-fifth of the responses came from outside Europe, meaning this survey offers a global perspective. The survey also captured a wide demographic. Although the majority of respondents were from academic institutions, there was a wide range in the numbers of COVID-positive patients being managed. Overall, almost 90% of hospitals were postponing operations and had less critical care capacity, meaning almost all respondents were impacted in one way or another [7].

Screening of thoracic surgical patients was mainly conducted with a nasopharyngeal swab and was complemented by CT scanning in one-third of the cases. Single-swab testing might be considered a concern because the false negative rate in symptomatic patients is ~20% but can rise to 100% in asymptomatic patients [8]. There was also a wide variety in levels of testing. This result, of course, may reflect national governmental policy and is largely dependent on the test capacity per country/region (ranging from 453 to 32 414 tests per million inhabitants for countries represented in this survey) [9]. Surgery for patients whose test results were positive for the virus would almost always be postponed for at least 2 weeks, which is based on viral load modelling [10].

Although surgeons continue to see patients in person, there has been a significant shift to other forms of remote consultation. This approach is a big decision for most surgeons to make. It means that the basics of clinical assessment can be lost—including the ability to assess the patient, to undertake exercise testing and to build rapport. However, this situation is not unique to thoracic surgery: a survey among maxillofacial surgeons revealed similar practices [11].

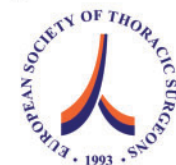
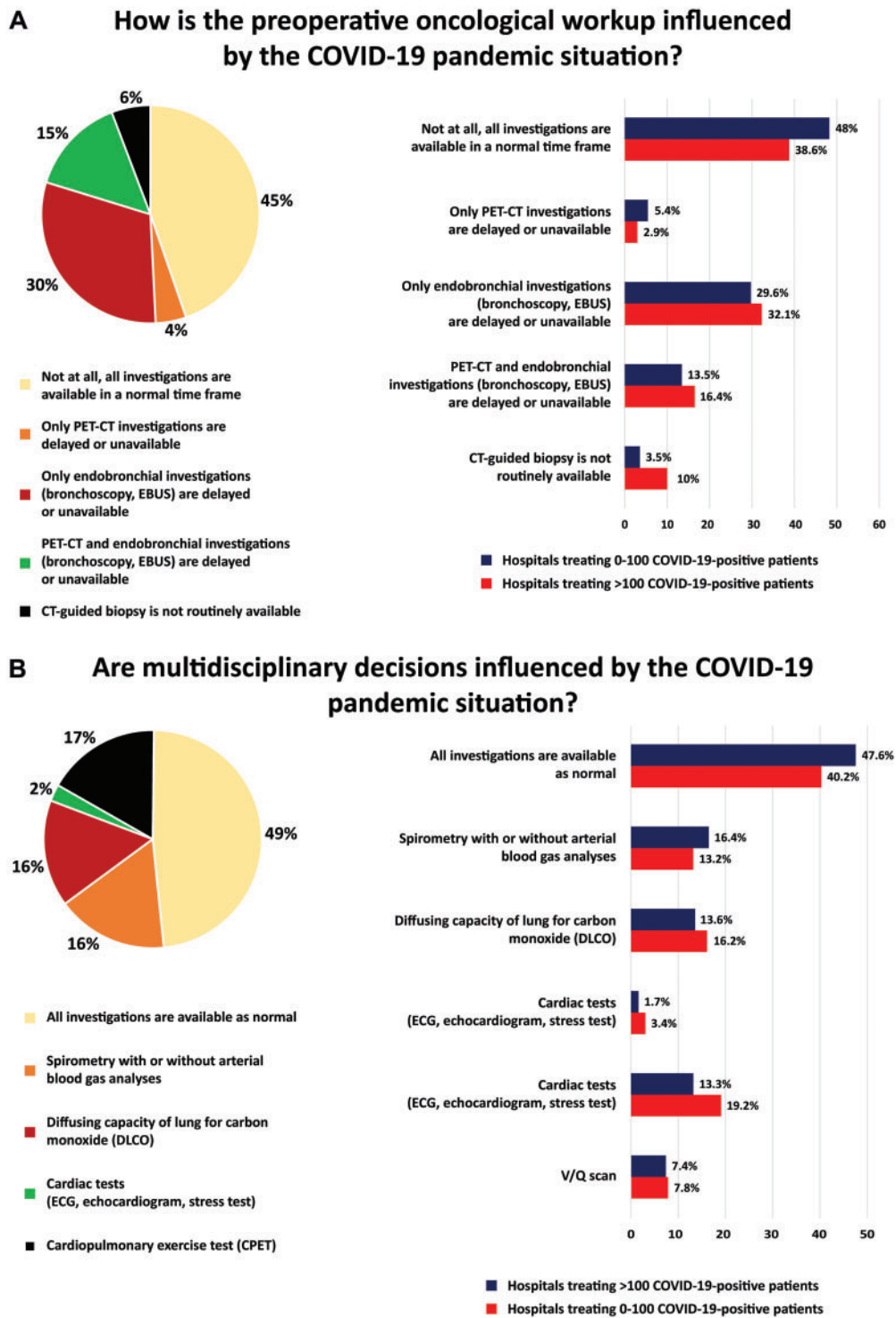


Figure 5: Organization of preoperative workup stratified by impact per hospital. **(A)** Oncological workup. **(B)** Preoperative functional tests. COVID-19: coronavirus disease 2019; CPET: cardiopulmonary exercise testing; DLCO: diffusing capacity of the lung for carbon monoxide; EBUS: endobronchial ultrasound bronchoscopy; ECG: electrocardiography; PET-CT: positron emission tomography-computed tomography; V/Q: ventilation/perfusion.

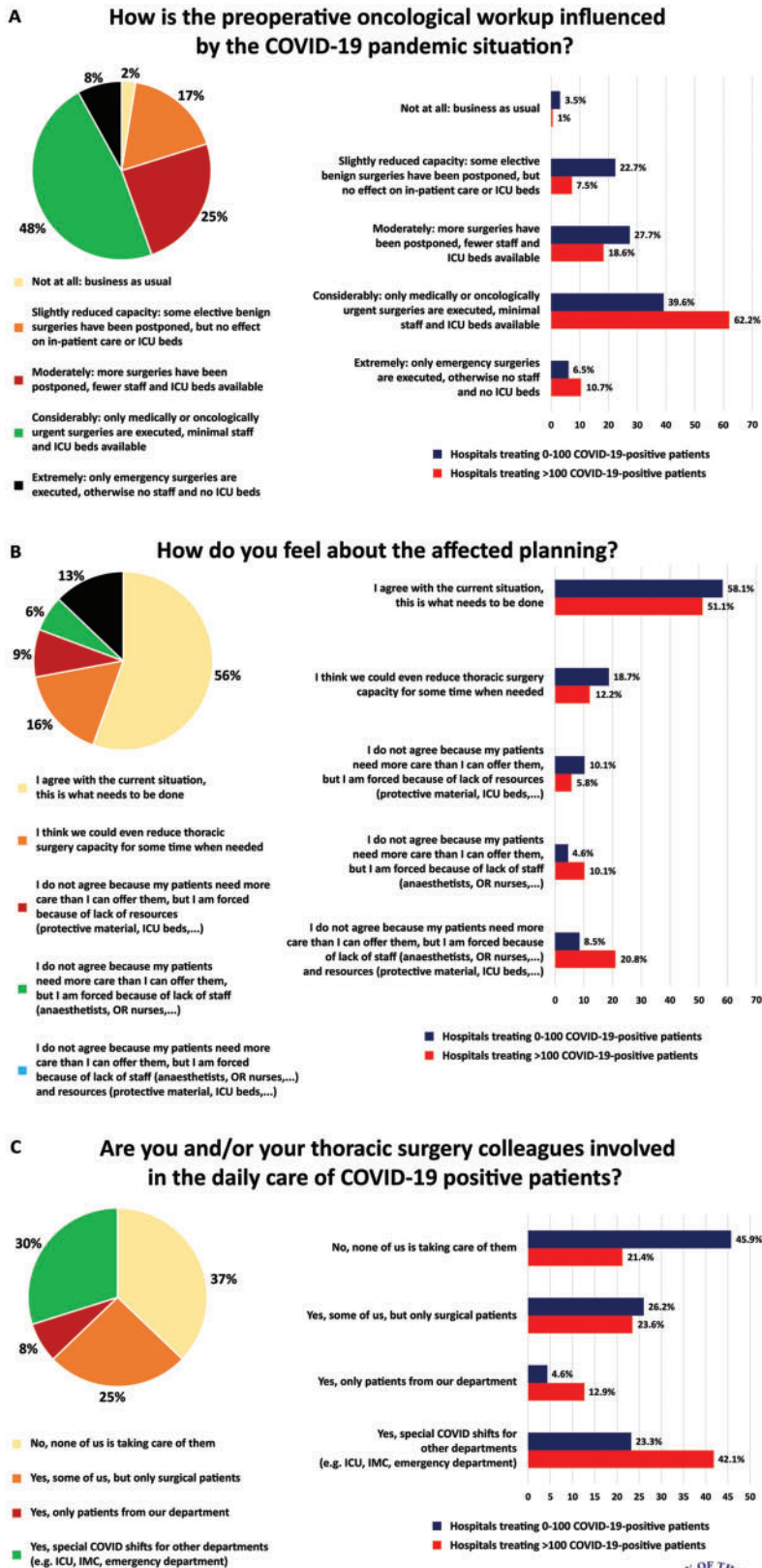


Figure 6: Planning. **(A)** How is surgical planning affected by the coronavirus disease 2019 pandemic? **(B)** How do you feel about the affected planning? **(C)** Are you and/or your colleagues involved in daily care of coronavirus disease 2019-positive patients? ICU: intensive care unit; IMC: intermediate care; OR: operating room.



The preoperative component of thoracic oncology surgery has demonstrated resilience through the pandemic. Most hospitals preoperative assessment processes were not impacted or had to make minor changes. Although hospitals treating more patients who had test results positive for SARS-CoV-2 (the virus that causes COVID-19) were more limited. In accordance with current European Society for Medical Oncology guidelines, accurate staging continued to have a high priority although there was no mention of functional assessment [12]. There was evidence that the multidisciplinary meetings have adapted to the pandemic. Although there is no formal consensus on prioritizing surgical patients, a remarkable concordance in practice has emerged. Patients with low-grade cancer should be deferred when surgical capacity is lacking. Additionally, small localized malignant lesions have been considered for stereotactic radiotherapy. This practice is followed because it is perceived to entail a lower risk of severe respiratory complications and reduced utilization of critical care resources. Locally advanced N2 disease, with a poor prognosis, is not considered a priority. Other treatment options (including neoadjuvant treatment, which would allow deferring surgery until after the crisis, or definitive chemoradiation) could be utilized in these patients. Conversely, locally advanced N1 disease was perceived as a high surgical priority.

In reality, trying to prioritize a list of surgical patients, with constrained resources, can be extremely difficult because most organizations only provide COVID-19 recommendations with general principles categorized as high, medium and low priority [12–14]. Given that this system provides little differentiation between lung cancer patients being considered for surgery, daily practice remains difficult despite these recommendations.

Most surgeons feel that the risk of surgery during the current COVID-19 pandemic is higher, although many are clear that they do not know the exact magnitude of the added risk. Indeed, there is currently a lack of information in the literature regarding the perioperative course of patients who have test results positive for COVID-19, but an early report seems to confirm increased risk during this period [15].

It may therefore be considered alarming that 15% of participants are telling their patients ‘not to worry’ when they are being asked to give consent for surgery. Good surgical practice dictates that patients should be fully informed regarding surgical risk.

The perioperative surgical period was impacted to a much greater extent. This outcome is understandable when two-thirds of respondents were involved in the daily care of COVID-19 positive patients and even more in hospitals treating a large number of COVID-19 positive patients. Half of the respondents did not have access to full PPE when caring for these patients. These results are in line with the results of a survey of the Royal College of Surgeons where 57% of the responders described shortages of PPE [16]. PPE is clearly important for keeping health care professionals safe and well. Inadequate PPE was found to be a risk factor for COVID-19 infection among orthopaedic surgeons in Wuhan [17]. Given the fact that thoracic surgeons are exposed to aerosol-generating procedures, the risk may be much greater [18]. This observation, combined with the paucity of testing, means that health care workers continue to work with a sense of significant personal threat.

Postoperative care might be considered against the small numbers of patients proceeding with surgery. However, a potentially significant finding is that 4 of 5 respondents have not

adapted the management of chest drains, despite the fact that some societies recommend the use of a digital or a closed filter system [19]. There is a reasonable concern that aerosol production by an air leak could spread the viral load, but evidence on this topic is lacking [20].

With clear changes in the surgical journey, it can be appreciated why 54.4% of responders were concerned they were unable to provide the best care for their patients and were worried about their own emotional health. Indeed stress-related symptoms are being regularly reported in frontline health care workers during the COVID-19 pandemic [21, 22].

Limitations

This survey has some limitations. The questions are related only to the practice of thoracic oncology surgery. The effect of the pandemic on other thoracic surgical patients remains relevant and fully warrants further investigation. Because responses will also ultimately change as the pandemic progresses [23], we plan to take a second survey at a later date to gain further data. The fact that some respondents felt there was no answer that accurately described their specific situation should be considered when interpreting the overall results of this survey. Finally, the representativeness of this survey should be carefully considered when interpreting the results. The majority of the respondents’ hospitals were treating large numbers of patients with COVID-19 at the time of the survey. This situation may not represent the situation present in hospitals less affected by the pandemic.

CONCLUSION

In conclusion, this survey provides evidence that the practice of thoracic oncological surgery has been severely impacted globally. It illustrates important factors such as protection for health care workers and changes to the standard management of patients with lung cancer. The results also suggest a lack of consensus among thoracic surgeons related to the treatment of patients as the pandemic progresses.

To ensure that the quality of care provided for patients remains high, we suggest that there is an urgent need for guidelines that adjust for pressures on services and resources and also for the risk of perioperative infection. In addition to oncology surgery, there is a need to investigate how other aspects of thoracic surgery practice may have been impacted, including the areas of trauma, benign elective work and the management of acute and infective work.

SUPPLEMENTARY MATERIAL

[Supplementary material](#) is available at *EJCTS* online.

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Author contributions

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