Effect of COVID-19 pandemic lockdowns on planned cancer surgery for 15 tumour types in 61 countries: an international, prospective, cohort study

*COVIDSurg Collaborative**

Summary

Background Surgery is the main modality of cure for solid cancers and was prioritised to continue during COVID-19 outbreaks. This study aimed to identify immediate areas for system strengthening by comparing the delivery of elective cancer surgery during the COVID-19 pandemic in periods of lockdown versus light restriction.

Methods This international, prospective, cohort study enrolled 20 006 adult (≥18 years) patients from 466 hospitals in 61 countries with 15 cancer types, who had a decision for curative surgery during the COVID-19 pandemic and were followed up until the point of surgery or cessation of follow-up (Aug 31, 2020). Average national Oxford COVID-19 Stringency Index scores were calculated to define the government response to COVID-19 for each patient for the period they awaited surgery, and classified into light restrictions (index <20), moderate lockdowns (20–60), and full lockdowns (>60). The primary outcome was the non-operation rate (defined as the proportion of patients who did not undergo planned surgery). Cox proportional-hazards regression models were used to explore the associations between lockdowns and non-operation. Intervals from diagnosis to surgery were compared across COVID-19 government response index groups. This study was registered at ClinicalTrials.gov, NCT04384926.

Findings Of eligible patients awaiting surgery, 2003 (10·0%) of 20 006 did not receive surgery after a median follow-up of 23 weeks (IQR 16–30), all of whom had a COVID-19-related reason given for non-operation. Light restrictions were associated with a 0·6% non-operation rate (26 of 4521), moderate lockdowns with a 5·5% rate (201 of 3646; adjusted hazard ratio [HR] 0·81, 95% CI 0·77–0·84; p<0·0001), and full lockdowns with a 15·0% rate (1775 of 11 827; HR 0·51, 0·50–0·53; p<0·0001). In sensitivity analyses, including adjustment for SARS-CoV-2 case notification rates, moderate lockdowns (HR 0·84, 95% CI 0·80–0·88; p<0·001), and full lockdowns (0·57, 0·54–0·60; p<0·001), remained independently associated with non-operation. Surgery beyond 12 weeks from diagnosis in patients without neoadjuvant therapy increased during lockdowns (374 [9·1%] of 4521 in light restrictions, 317 [10·4%] of 3646 in moderate lockdowns, 2001 [23·8%] of 11 827 in full lockdowns), although there were no differences in resectability rates observed with longer delays.

Interpretation Cancer surgery systems worldwide were fragile to lockdowns, with one in seven patients who were in regions with full lockdowns not undergoing planned surgery and experiencing longer preoperative delays. Although short-term oncological outcomes were not compromised in those selected for surgery, delays and non-operations might lead to long-term reductions in survival. During current and future periods of societal restriction, the resilience of elective surgery systems requires strengthening, which might include protected elective surgical pathways and long-term investment in surge capacity for acute care during public health emergencies to protect elective staff and services.

Funding National Institute for Health Research Global Health Research Unit, Association of Coloproctology of Great Britain and Ireland, Bowel and Cancer Research, Bowel Disease Research Foundation, Association of Upper Gastrointestinal Surgeons, British Association of Surgical Oncology, British Gynaecological Cancer Society, European Society of Coloproctology, Medtronic, Sarcoma UK, The Urology Foundation, Vascular Society for Great Britain and Ireland, and Yorkshire Cancer Research.

Lancet Oncol 2021

Published Online October 5, 2021 https://doi.org/10.1016/S1470-2045(21)00493-9

*Collaborating authors are listed in the appendix

Correspondence to:
Mr Aneel Bhangu, NIHR Global Health Research Unit on Global Surgery, Institute of Translational Medicine, University of Birmingham, Birmingham, UK
a.a.bhangu@bham.ac.uk

or

Mr James Glasbey, NIHR Global Health Research Unit on Global Surgery, Institute of Translational Medicine, University of Birmingham, Birmingham, UK
j.glasbey@bham.ac.uk

See Online for appendix

Introduction

During the COVID-19 pandemic, government restrictions have aimed to control community SARS-CoV-2 transmission and included reducing population movement, closing public facilities, and restricting gatherings.[1] Restrictions have varied worldwide in stringency, with the most severe leading to so-called lockdowns.[2] Although public and media attention has largely focussed on the economic impact of lockdowns, the broader effects on general health are poorly understood.[3] Lockdowns might have had collateral effects beyond controlling community SARS-CoV-2 rates alone, due to changes in both public behaviour and health system performance.[4] These might have disproportionate effects on vulnerable and

Research in context

Evidence before this study

Guidance from health ministries and national surgical associations prioritised time-dependent cancer surgery to continue during societal restrictions related to COVID-19. We searched PubMed and Embase on Feb 12, 2021, without date limits, for prospective, multicountry studies describing non-operation rates for patients planned to undergo elective surgery during national or regional COVID-19 lockdowns using primary data. We used the search terms "COVID-19", "SARS-CoV-2", "coronavirus", "lockdown" and "pandemic", in combination with "surgery" and "non-operation", "cancellation", "postponement" or "delays", and applied no language restrictions. Several modelling studies estimated total elective surgeries cancelled due to COVID-19, but no primary studies described the impact of lockdowns on non-operation rates for patients due to undergo curative cancer surgery.

Added value of this study

There is limited evidence of the collateral effects of COVID-19 pandemic lockdowns outside of modelling studies. Uniquely, this international study prospectively enrolled patients with a decision for curative surgery awaiting surgery during the SARS-CoV-2 pandemic and tracked their care pathways prospectively. It included data from the 15 most common solid cancer types across all country-income settings, providing wide generalisability to global policy. The analysis allowed a direct comparison of full and moderate lockdowns to light restrictions, accounting for their dynamic nature, where different patients from the same country were exposed to different lockdown states.

Implications of all the available evidence

This study has direct policy, organisational, and clinical implications. It has revealed the fragility of elective cancer surgery systems to lockdowns, particularly health systems in lower-middle-income countries. This study demonstrates the need for system strengthening in elective surgery across all settings to mitigate against impending COVID-19 lockdowns and future pandemics. This should include both global reorganisation to provide protected COVID-19-free elective surgical pathways (and staffing) that sustainably allow safe surgery to continue, and improved surge capacity for acute care during public health emergencies. The potential long-term effects for patients who underwent delayed surgery may require closer follow-up for metastatic disease. This study could inform policy makers' planning regarding the collateral effects of societal restrictions.

marginalised communities.[5,6] Understanding these effects will justify expenditure on targeted system strengthening, as further societal restrictions are predicted at a global level.

In the first COVID-19 waves (ie, the 12 weeks of peak disruption), at least 21 million elective operations were cancelled globally, partly due to concerns over post-operative SARS-CoV-2 infection and partly due to capacity issues within hospitals.[7,8] There was, however, general guidance from health ministries and national surgical associations that time-dependent surgery should continue.[9] This included curative cancer surgery, which is a priority among the oncology community and a high-value topic for society.[10,11] Surgery remains the primary method of cure for most solid cancers.

Since surgical databases and cancer registries do not capture prospective decision making, they lack fidelity to detect patients who did not undergo planned surgery. In the case of curative surgery, these are the patients who might have suffered the most harm.[12,13] Resection margins alone are an inadequate marker of success, as selection bias in patients who are able to undergo surgery risks underestimating harm from treatment delays, and neglects whole-system effects. We planned the prospective COVIDSurg Cancer study to address these areas and provide an accurate, whole-system analysis of the impact of COVID-19 on planned cancer surgery. Understanding any harms could allow for immediate local and national policy changes, in preparation for future societal restrictions.

For the **protocol** see https://globalsurg.org/cancercovidsurg/

Methods

Study design and participants

This international, multicentre, prospective cohort study included adult patients (≥18 years) with a diagnosis of a surgically curable cancer during the COVID-19 pandemic. The study was conducted in accordance with a preregistered protocol (NCT04384926). Local principal investigators were responsible for obtaining clinical audit, institutional review board, or ethical approval in line with local and national regulations. In most settings, a waiver of individual patient consent was obtained. In other countries, formal written or verbal consent was required based on recommendations of local ethics and governance committees. Data were collected online and stored on a secure server running the Research Electronic Data Capture (REDCap) web application.[14]

Any hospital worldwide that performed elective cancer surgery in an area affected by the COVID-19 pandemic was eligible to participate. Patients listed for surgery to cure a solid cancer were included in each centre for 3 months from local emergence of COVID-19, defined on a centre-by-centre basis as the date where first notification of SARS-CoV-2 cases occurred in the local area (between Jan 21 and April 14, 2020). Participating centres identified all patients with a decision for surgery (or would have had a decision for surgery under normal, prepandemic circumstances) from multidisciplinary team meetings, tumour board, outpatient clinics, or local equivalents. Previous international outcomes studies from our group have shown that this method achieves greater than

95% case ascertainment and greater than 98% data accuracy during external validation.[15] If a specialty within a hospital was unable to confirm consecutive enrolment, their data were excluded from analysis. Patients' care pathways were followed up until the point of surgery or until cessation of follow-up at Aug 31, 2020. This date was selected to ensure all patients had a minimum of 12-weeks follow-up. Where a patient underwent surgery, outcome data was collected up to 30 days after surgery. Where patients remained non-operated, their last known status was recorded.

The 15 most common solid cancer types were included in this study, including colorectal, oesophageal, gastric, head and neck (oral, oropharyngeal, laryngeal, hypopharyngeal, salivary, thyroid, paranasal sinus, skin), thoracic (lung, pleural, mediastinal, chest wall), liver, pancreatic, prostate, bladder, renal and upper urinary tract urothelial, gynaecological (uterine, ovarian, cervical, vulval, vaginal), breast, soft-tissue sarcoma, bony sarcoma, and intracranial malignancies. Participating centres could contribute data for either single or multiple cancers. Early cancers that were planned to be managed with endoscopic surgery alone (eg, transurethral resection of bladder tumour, transanal endoscopic microsurgery) were excluded. Patients who were suspected to have an operable cancer, but were later identified to have a non-cancerous condition (eg, on postoperative histopathology), or were treated as benign and unexpectedly identified to be malignant on postoperative histopathology were also excluded.

Definition of lockdowns

We used the Oxford COVID-19 Stringency Index to define each country's national government response to COVID-19. This index is a composite of 19 indicators including measures and behavioural interventions related to containment and closure, economic response, and health systems. Each indicator is scored using an ordinal scale (0 to 2, 3, 4, or 5), with an overall score calculated by adding together individual indicator scores (appendix p 56). Total scores can range from 0 (no restrictions) to 100 (most stringent restrictions). The index has been previously validated by demonstrating associations with population SARS-CoV-2 infection rates and mobile phone mobility data.[1]

The average national Oxford COVID-19 Stringency Index scores were calculated for each patient for the period they waited for surgery. To define cutoffs that were reflective of real-world policy, we sampled reported lockdown dates from a sample of high-income countries, upper-middle-income countries (UMICs), and lower-middle-income countries (LMICs; appendix p 55). Dates were taken from national policy, media, and press sources. On the date of transition into lockdown, the point estimate for the COVID-19 Stringency Index score was extracted (appendix p 55). This point estimate was used to classify patients into three stringency groups: light restrictions (index <20), moderate lockdowns (20–60), and full lockdowns (>60). These groups allowed a direct comparison of full and moderate lockdowns to light restrictions, accounting for their dynamic nature, whereby different patients from the same country were exposed to different lockdown states. For each patient, a median average score while waiting for surgery and the number of weeks in full lockdown were calculated and used in analyses. Full details are given in the appendix (pp 2, 57–58).

Definition of SARS-CoV-2 rates

The case notification rate was calculated at an individual patient level as a median average between the date of local emergence of COVID-19 and the date of surgery or cessation of follow-up via the Our World in Data portal.[16] A high COVID-19 burden area was classified as a median of at least 25 cases per 100 000 per 14 days, representing WHO recommendations at the time of the study (ie, in keeping with first pandemic wave levels). Case rates were used for exploratory analyses only, and stratified by World Bank income tertile (appendix p 58).[17,18]

Other definitions

The World Bank index (2019/20 update) was used to classify countries and patients into three groups based on Gross National Income per capita (US$) calculated using the Atlas method: high-income countries, UMICs, and LMICs (including patients from both low-income countries and LMICs). Data on baseline patient status was collected for the purpose of adjustment for case-mix in exploring associations between lockdowns and surgical capacity (appendix p 59).

Patients were classified into three groups according to their neoadjuvant treatment group: (1) no neoadjuvant therapy (ie, straight to surgery); (2) neoadjuvant therapy, standard care (where the treating clinician administered neoadjuvant treatment in accordance with their usual care); (3) neoadjuvant therapy, COVID-19 decision (where the treating clinician administered a neoadjuvant treatment where this would not typically be indicated). To estimate the impact of lockdown on treatment delays, the relationship between lockdowns and the interval from diagnosis to decision for surgery to surgery was measured. The interval from date of diagnosis to the date of surgery was calculated in whole weeks to identify points of system friction (appendix p 60).

Outcomes

A resilient elective surgical care system is defined as a hospital or network of hospitals that is able to maintain both its capacity and safety during public health crises.[19] As a measure of the ability of surgical systems to maintain their capacity, the primary outcome measure was the non-operation rate. This non-operation rate was defined as an eligible patient (ie, with a plan to undergo surgery) not undergoing their planned operation during

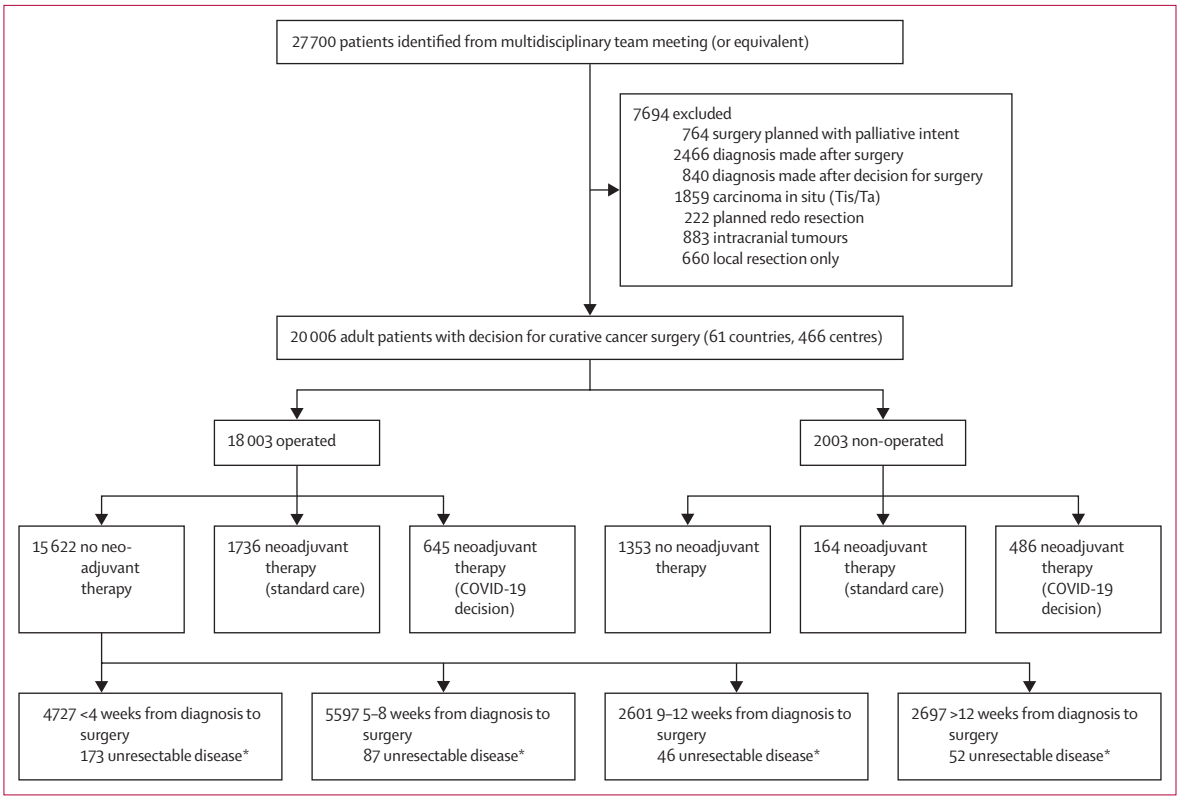


Figure 1: **Flowchart of included patients**
*Found clinically, radiologically, or during surgery.

the study window. Patients were classified as being operated if they underwent surgery, regardless of whether there was a change to the planned urgency (eg, from elective to emergency) or intent (eg, from curative to palliative). Patients who died or progressed to unresectable disease before surgery were classified as non-operated, so these did not act as competing risks.

For patients who did not receive their surgery as planned during the follow-up window, the treating clinical team selected one or more reasons that the patient had not had surgery. These reasons included those explicitly COVID-19 related (eg, decision to delay surgery due to patient risk during COVID-19), and those non-COVID-19 related (eg, delay due to other unrelated medical or surgical condition). More than one reason for non-operation could be selected for each patient, representing the complexity of decision making (full details are given in the appendix p 61).

Secondary outcome measures related to safety of surgery were presented for patients who underwent surgery during the follow-up period: (1) resection margin status for those selected for surgery; (2) resectable disease at the time of surgery; (3) preoperative cancer complication requiring emergency surgery; (3) 30-day postoperative SARS-CoV-2 infection rate; (4) 30-day postoperative mortality rate; (5) new detection of metastatic disease up to a maximum of 30 days after surgery. As neoadjuvant therapy has a complex interplay with treatment interval, an a-priori decision was made to only include patients who went straight to surgery (no neoadjuvant therapy) in exploration of the effects of treatment delay on secondary outcomes (appendix p 62).

Statistical analysis

The full statistical method is presented in the appendix (p 63). Cox proportional hazards regression modelling was used to explore associations between lockdowns and the primary outcome, presented as adjusted hazard ratios (HRs) and 95% CIs. Operation was included as the outcome event, and no censoring was performed for death or progression to unresectable disease to deal with competing risks, given individuals had the same follow-up time (ie, describing sub-distribution rather than cause-specific hazards). An α level was set at 0·05 (5%) for interpretation of significance. Several preplanned sensitivity analyses were conducted for the primary analysis to examine robustness of findings; namely, (1) including elective operations only in the definition of the primary outcome; (2) accounting for an interaction effect between World Bank income group and COVID-19 stringency index group; and (3) accounting for local SARS-CoV-2 case notification rates, stratified by World Bank income group. Two further sensitivity analyses were performed to

ensure that differences in cancer case-mix across income settings were not responsible for residual confounding; these included, (1) cancer location removed from the model; and (2) patients older than 50 years only. A secondary analysis was used to explore the incremental effect of weeks in lockdown on a patient's likelihood of non-operation. Intervals from diagnosis to surgery were compared across COVID-19 government response index groups. We only analysed the interval between diagnosis and surgery for patients who did not receive neo-adjuvant therapy to avoid confounding due to legitimate delays to surgery in patients who receive neo-adjuvant therapy. All analyses were carried out using R, version 3.1.1 (packages finalfit, tidyverse, ggsurvplot).

Role of the funding source

The funders of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report.

Results

20 006 patients were eligible for inclusion in 466 hospitals in 61 countries (figure 1). Of these patients, 1891 (9·5%) were from 17 UMICs and 2249 (11·2%) were from 12 LMICs. A wide range of patients, tumours, and operations were included. The most common tumour types included were breast (n=3896; 19·5%), head and neck (n=3517; 17·6%), colon (n=3428; 17·1%), and gynaecological (n=2169; 10·8%). Distribution of patients and cancers across income groups and countries is shown in the appendix (pp 8–9).

Of patients planned for cancer surgery during the COVID-19 pandemic, 4521 (22·6%) of 20 006 were awaiting surgery during a period of light restrictions, 3646 (18·2%) during moderate lockdowns, and 11 827 (59·1%) during full lockdowns (n=12 missing data; appendix p 4). The proportion of patients awaiting surgery in full lockdowns was higher in areas with high than low community SARS-CoV-2 case notification rates and in UMICs and LMICs than in high-income countries (appendix p 10). Patients awaiting surgery during light restrictions had a lower mean number of weeks in full lockdown (2·4 weeks [SD 1·7]) compared with patients awaiting surgery during moderate (5·5 weeks [2·9]) or full lockdowns (12·7 weeks [5·4]; p<0·0001, from one-way ANOVA).

Most patients (16 975 [84·8%] of 20 006) had a plan to progress straight to surgery (no neoadjuvant therapy), with 1900 (9·5%) receiving standard care neoadjuvant therapy, and 1131 (5·7%) receiving a COVID-19 decision for neoadjuvant therapy. During full lockdowns, patients were more likely to have a COVID-19 decision for neoadjuvant therapy than during moderate lockdowns or light restrictions (appendix p 3).

During the COVID-19 pandemic, 2003 (10·0%) of 20 006 patients did not undergo their planned surgery by the end of follow-up (figure 2; appendix p 12). Patients awaiting surgery during periods of light restrictions had a lower rate of non-operation (26 [0·6%] of 4521) than those in moderate lockdowns (201 [5·5%] of 3646) or full lockdowns (1775 [15·0%] of 11 827; appendix p 5).

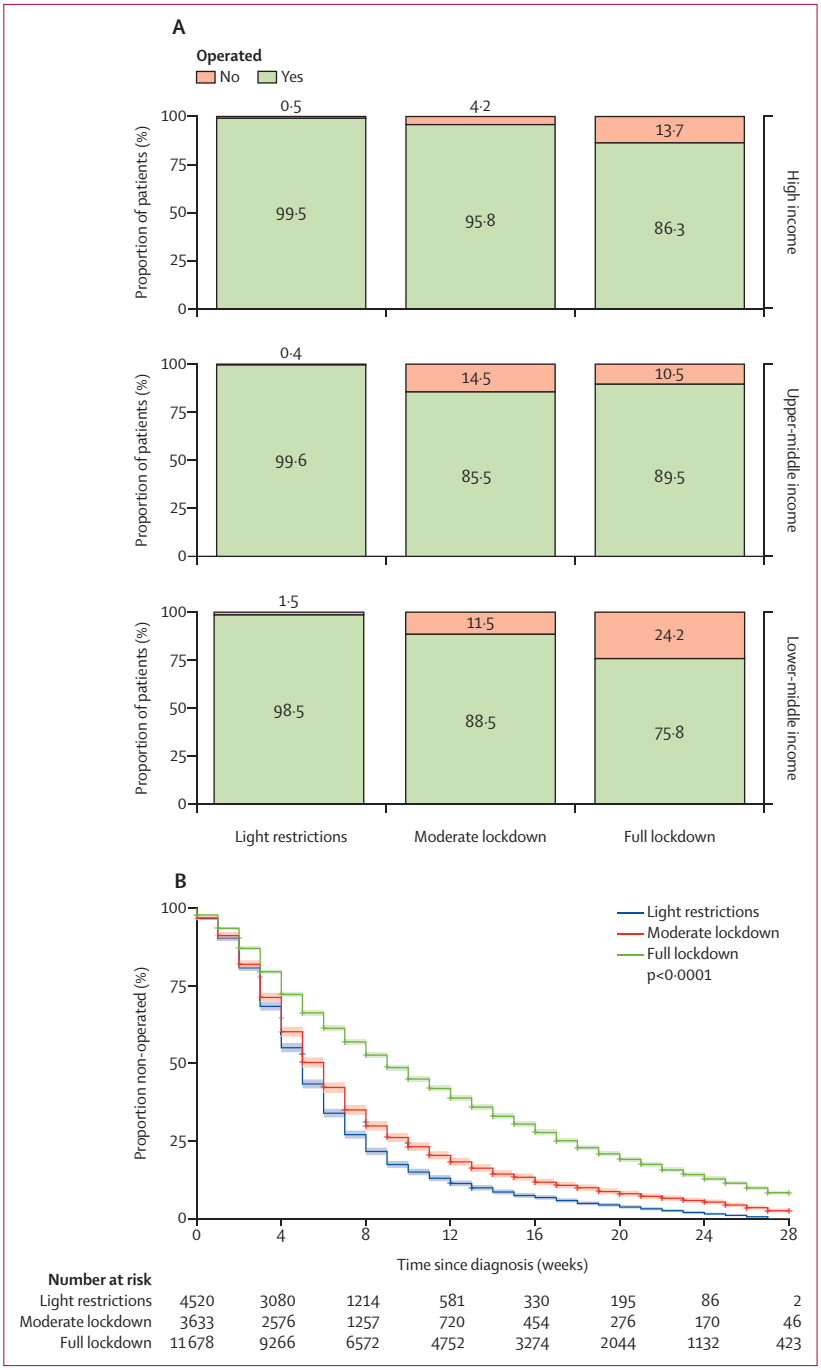


***Figure 2*: Effects of lockdowns on surgical capacity**
(A) Differences in resilience of surgical systems across income settings by COVID-19 stringency index group. Percentages represent proportion operated by group. (B) Kaplan-Meier plot demonstrating proportion of patients remaining non-operated over time from cancer diagnosis grouped by COVID-19 stringency index group. Plot censored at 28 weeks maximum follow-up from cancer diagnosis. Shading represents this represents the 95% CI, using the statistical package ggsurvplot.

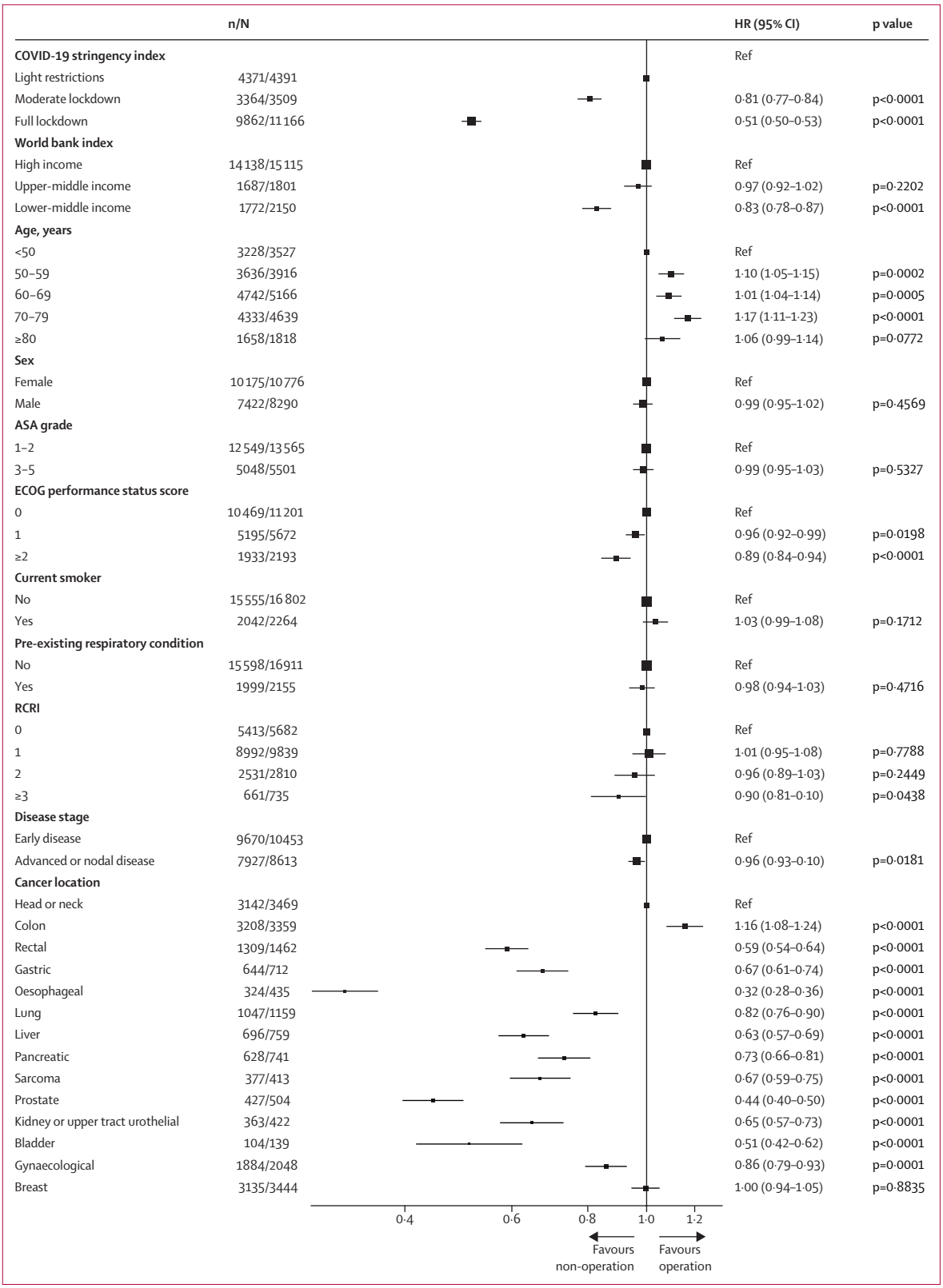


Figure 3: **Multivariable Cox proportional hazards model of factors associated with non-operation during COVID-19**

19 832 in dataframe, 19 066 in model, 766 missing. 17 597 (91·8%) of 19 066 patients included in this model were operated by the end of follow-up. Missing data are described in the appendix (p 10), as well as the full model (p 12). ASA=American Society of Anesthesiologists Physical Status Classification System. ECOG=Eastern Cooperative Oncology Group. RCRI=Revised Cardiac Risk Index.

1775 (88·7%) of 2003 patients who remained non-operated were in regions with full lockdowns (appendix p 11). The baseline rate of non-operation was low across all income settings during periods of light restrictions (22 [0·5%] of 4089 in high-income countries; one [0·4%] of 228 in UMICs; three [1·5%] of 204 in LMICs), and high during periods of full lockdown (1188 [13·7%] of 8644 in high-income countries; 139 [10·5%] of 1329 in UMICs; 448 [24·2%] of 1854 in LMICs). At 12 weeks after diagnosis, 581 [12·8%] of 4520 patients under light restrictions remained non-operated, 720 (19·9%) of 3622 patients during moderate lockdowns, and 4752 (40·7%) of 11678 patients during full lockdowns (figure 2). After multivariable adjustment, both moderate (HR 0·81, 95% CI 0·77–0·84; p<0·0001) and full lockdowns (HR 0·51, 0·50–0·53; p<0·0001) were associated with a lower likelihood of a patient receiving their planned cancer surgery (figure 3; appendix p 10). This was consistent across planned sensitivity analyses (appendix pp 13–16). The overall level of missingness was low (<1%) for all variables included in the models.

Being in an LMIC, increasing frailty (Eastern Cooperative Oncology Group 1 or ≥2), comorbidity (Revised Cardiac Risk Index ≥3), and having locally advanced or nodal disease, or both, were all independently associated with increased likelihood of non-operation. There was significant variability in the likelihood of non-operation by cancer site. Where the primary outcome definition was revised to include elective surgery only, both UMICs and LMICs were observed to have a higher adjusted non-operation rates than high-income countries (appendix p 13). The effect of lockdown on non-operation differed by income group, with LMICs broadly less likely to operate at a given level of lockdown compared with the high-income group (appendix p 15). Patients waiting for surgery in LMICs during full lockdowns were most likely to remain non-operated compared with patients in LMICs during light restrictions (HR 0·41, 95% CI 0·38–0·44; p<0·0001; appendix p 16). In the secondary analysis, waiting for surgery for 5–6 weeks or more in full lockdown was associated with a reduced likelihood of a patient undergoing their cancer operation compared with 0 weeks in full lockdown (5–6 weeks in full lockdown HR 0·86, 95% CI 0·80–0·93, p<0·0001; appendix p 6).

Patients younger than 50 years were less likely than patients 50 years and older to receive their planned surgery across several sensitivity analyses. Patients planned to have surgery aged younger than 50 years were more commonly from LMICs than UMICs or high-income countries commonly from LMICs (appendix pp 18–19). In a sensitivity analysis including only patients older than 50 years, the effect of lockdowns on surgical capacity remained consistent with the primary result (ie, moderate and full lockdowns were associated with a significant increase in the odds of non-operation compared with light restrictions; appendix p 20).

Increasing SARS-CoV-2 case notification rates were associated with increasing non-operation rates (appendix p 21). Both moderate and full lockdowns were consistently associated with an increased likelihood of non-operation, even after adjustment for local SARS-CoV-2 rates (appendix p 22). The largest magnitude of effect was seen when transitioning from light restrictions or moderate lockdowns to full lockdowns across all income and SARS-CoV-2 case notification rate groups. LMICs were particularly fragile to increasing SARS-CoV-2 rates and full lockdowns, with a non-operation rate of 381 (58·7%) of 649 (appendix p 21).

By the end of the follow-up (median 23 weeks, IQR 16–30), 2003 patients had not undergone planned surgery. 453 (22·6%) of 2003 patients had been formally re-staged. Detection of new metastatic disease is shown in the appendix (p 26).

Of non-operated patients for whom data were available (n=2001; two missing data), all had at least one COVID-19-related reason provided for non-operation (table 1); most commonly this involved a team decision to delay surgery during COVID-19 due to individual patient risk (1456 [72·8%] of 2001). 533 (26·6%) of 2001 patients were provided an alternative treatment modality as a result of COVID-19. 306 (15·3%) patients had at least one non-COVID-19-related reason provided for non-operation.

	All patients
COVID-19 related	
Multidisciplinary team decision to delay surgery due to patient risk during COVID-19	1456 (72·8%)
Change to alternative treatment modality because of COVID-19	533 (26·6%)
Patient choice to avoid surgery during COVID-19 pandemic	460 (23·0%)
Ongoing neoadjuvant therapy (COVID decision)	378 (18·9%)
No bed, critical care bed, or operating room space available due to COVID-19	299 (14·9%)
Change of recommendations in society guidelines related to COVID-19	220 (11·0%)
Patient unable to travel to hospital related to COVID-19	140 (7·0%)
Collateral impact on supporting services causing delay	24 (1·2%)
Patient delayed due to SARS-CoV-2 infection	23 (1·1%)
Died of COVID-19 while waiting for surgery	14 (0·6%)
Total	2001 (100·0%)
Non-COVID-19 related	
Progression to unresectable disease	179 (8·9%)
Delay due to other unrelated medical or surgical condition	59 (2·9%)
Died unrelated to COVID-19 while waiting for surgery	34 (1·7%)
Patient unable to afford surgery	24 (1·2%)
Patient choice to avoid surgery unrelated to COVID-19	35 (1·7%)
Total	306 (15·3%)

We anticipated that decisions to delay or cancel surgery during COVID-19 would be complex. Therefore, selecting more than one reason for non-operation during the follow-up window for each patient was permitted. One patient could have both one or more COVID-19-related and non-COVID-19-related reasons selected. Where it was unclear whether a reason was directly COVID-related (eg, disease progression) this was classified as not COVID-19-related. Two patients (0·1%) had no reasons given for non-operation during the follow-up window selected (missing data). Proportions are therefore expressed as a percentage of 2001 non-operated patients and with data available.

Table 1: **Reasons that patients did not received planned surgery**

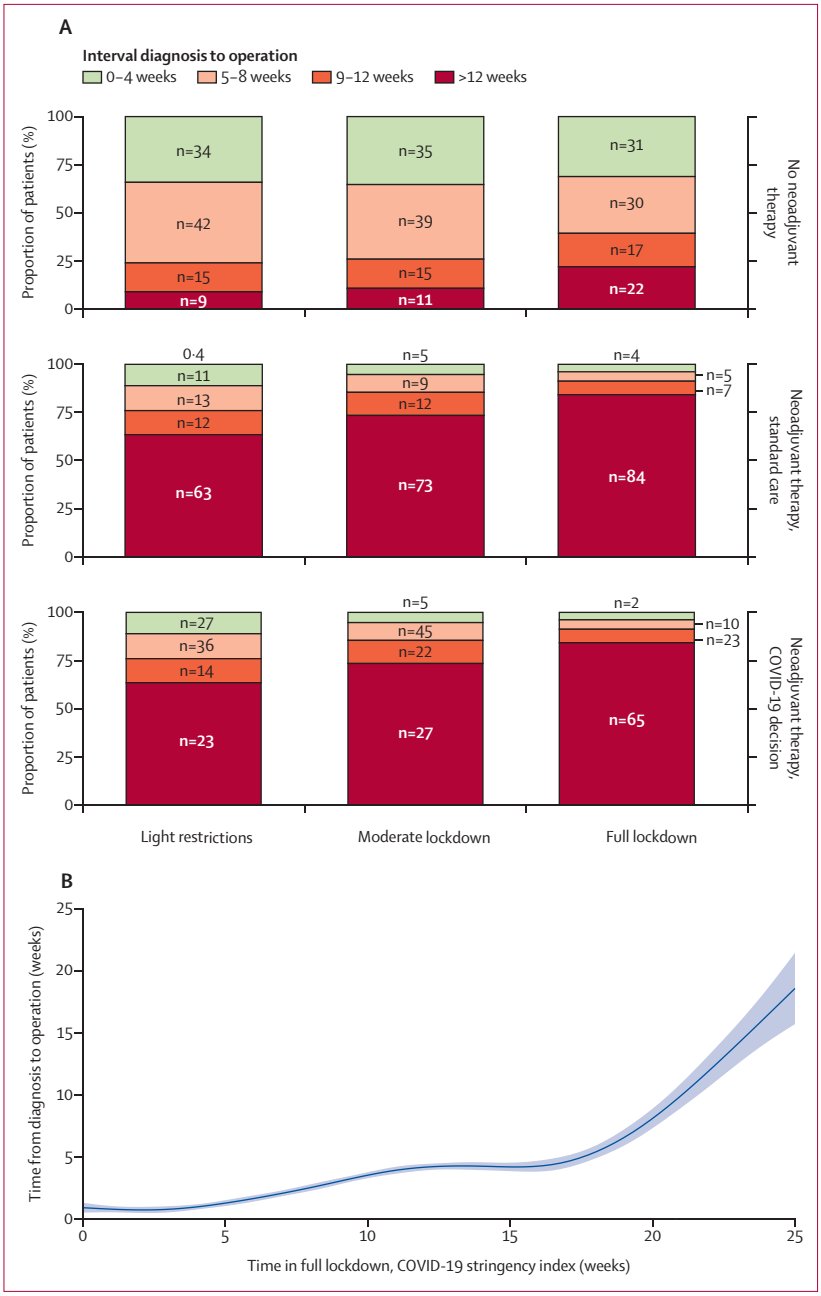


Figure 4: **Lockdown and delay to surgery**
(A) Delay from diagnosis to surgery during lockdowns (according to COVID-19 stringency index group) by neoadjuvant therapy group. Percentages represent proportion of operated patients who were in each interval from diagnosis to operation group. (B) Weeks in full lockdown and interval from cancer diagnosis to operation. Plot displays patients who went straight to surgery (no neoadjuvant therapy only). Full lockdown defined as a COVID-19 stringency index score of more than 60. Plotted line represents a smoothed conditional mean from a fitted generalised additive model. The shaded area denotes bounds of the 95% CI.

179 (8·9%) patients progressed to unresectable disease. 48 (2·4%) patients died before their planned surgery (14 due to COVID-19-related complications, and 34 due to non-COVID-19-related causes).

Delays from diagnosis to operation were observed during full lockdowns for operated patients (n=18 003) across all neoadjuvant treatment groups (figure 4). In patients who went straight to surgery (no neoadjuvant therapy; 15 622 [86·3%] of 18 003), full lockdown was associated with 2001 [23·8%] of 11 827 patients not receiving surgery within 12 weeks of diagnosis compared with 317 (10·4%) of 3646 patients during moderate lockdowns, and 374 (9·1%) of 4521 patients under light restrictions (appendix p 25). For these patients, each additional week in lockdown was associated with treatment delay (p<0·0001; figure 4). Increasing SARS-CoV-2 case notification rates were also associated with increased delays beyond 12 weeks across income groups, with the longest delays observed in UMICs and LMICs during periods with high SARS-CoV-2 rates (appendix p 23). The point of system friction was different across different income groups (appendix p 7). Full lockdown was associated with an increased interval from decision to surgery across all settings compared with both light restrictions and moderate lockdown (figure 4; appendix p 24).

In patients who went straight to surgery (n=15 622), postoperative histopathological and clinical outcomes during light restrictions, moderate lockdowns, and full lockdowns were similar (table 2). Characteristics and outcomes of patients by interval from diagnosis to operation are in the appendix (pp 25–26). Variation in outcomes by income group are shown in the appendix (p 27).

Discussion

The design of this study allowed a holistic overview of different health systems' surgical capacity and outcomes during lockdowns. The analysis allowed a direct comparison during full and moderate lockdowns to periods with light restrictions, taking account of the dynamic nature of government policies, where different patients from the same country were exposed to different lockdown states. During full lockdowns, one in seven patients did not receive their planned operation, all of whom had a pandemic-related reason for non-operation. This finding was robust, and consistent in sensitivity analyses. In a secondary analysis, awaiting surgery in a full lockdown for greater than 6 weeks was associated with an increased likelihood of non-operation. These data reveal the fragility of elective cancer surgery to lockdowns, which was independent of both local SARS-CoV-2 rates and case-mix. Patients with cancer in LMICs, of increasing frailty, or with advanced disease were most vulnerable to lockdown effects. Capacity for major elective cancer should be part of every country's strategy to address whole-population health needs and prevent further collateral harm.

Identifying at-risk groups allows targeted system strengthening during both COVID-19 lockdowns and future pandemics. Firstly, vulnerable patient groups (eg, those with a poorer performance score, more cardiac comorbidities, or advanced cancers) were all less likely to receive surgery. Secondly, certain operation types that

require more intensive perioperative care, including those for oesophageal and pancreatic cancer, were at increased risk of cancellation. Thirdly, patients in LMICs were less likely to undergo surgery during lockdowns and SARS-CoV-2 surges, which included a high proportion of young patients (<50 years). Protected elective surgical capacity might include protected COVID-19-free pathways (including dedicated surgical, anaesthetic, and theatre staff) within larger hospitals, or smaller bespoke elective surgery units that function as part of cancer treatment networks.[20] This also requires long-term investment in surge capacity for the acute care workforce and formal operational planning to manage public health emergencies without major disruption to elective care (further details are in the appendix p 64). Together, protected elective surgical capacity might allow essential elective surgery to continue despite external system shocks.[20]

The least resilient systems were in LMIC settings, exacerbating resource scarcity and capacity issues that were present prepandemic in the management of non-communicable diseases.[11,21] Elective cancer surgery systems in LMICs are typically under pressure from a high burden of expedited and emergency presentations.[11,15,21] This pressure was seen in our study, where the likelihood of non-operation was higher in both UMICs and LMICs, despite patients being younger and having fewer comorbidities. These young patients were more frequently affected by financial and geographical causes for non-operation, revealing a particularly vulnerable group. Measures to strengthen the security of global elective cancer surgery must be implemented across all settings, and as a priority in LMICs.[6] Despite data demonstrating the safety of neoadjuvant treatment during COVID-19, the overall rate of neoadjuvant therapy as standard care or a COVID-19 decision was low (15·2%). This low rate might represent safety concerns or highlight capacity issues elsewhere in the cancer care pathway.[22] Developing robust pathways from diagnosis through to definitive surgical treatment, supported by public health teams and financial protection mechanisms, will help to create both pandemic-proof and more equitable systems.

Although we did not find an increase in the positive resection margin rate or new metastatic disease associated with increasing delays, these were highly selected patients and with short-term follow-up only. The high proportion of patients who did not receive planned surgery reveals the true extent of potential harm. This part of our analysis focussed on patients who were treated without neoadjuvant therapy, who are likely to represent the group at highest risk from unplanned delays. Evidence from modelling studies and meta-analyses suggest that 4-week incremental delays before surgery are associated with increased rates of recurrence and excess mortality.[13] Taken together, patients who experienced a delay to surgery during the COVID-19 pandemic might warrant strategies that support closer follow-up for metastatic disease. It is possible that there will be a reverse trend towards worsening cancer survival rates over the next 5 years as a consequence of these capacity issues, although the present study was not designed to directly capture these long-term effects. We acknowledge that for some cancer types, neoadjuvant therapy has equivalent outcomes to the adjuvant application of the same treatment and might be a reasonable strategy to safely delay treatment where this is required (eg, endocrine therapy for oestrogen-receptor-positive breast cancers).[23] The impact of changes to neoadjuvant treatment pathways and both short-term and long-term oncological outcomes requires further exploration.

This study had several further limitations. First, effects seen during lockdowns could be interpreted as normal practice, which would have occurred outside of the pandemic era. We dealt with this by including an internal comparison (light restrictions), which is akin to normal conditions and carried a non-operation rate of 0·5%. We also collected clinicians' reasons for non-operation, which

	Light restrictions (n=4152)	Moderate lockdown (n=3057)	Full lockdown (n=8402)	Total* (N=15 622)	p value†
Margin status					
R0	3471 (83·7%)	2619 (85·8%)	7238 (86·3%)	13 328 (85·5%)	0·0011
R1	381 (9·3%)	223 (7·4%)	581 (6·9%)	1185 (7·7%)	..
R2	79 (1·9%)	61 (2·0%)	157 (1·9%)	297 (1·9%)	..
Pathology unavailable	214 (5·2%)	147 (4·8%)	407 (4·8%)	768 (4·9%)	..
Missing	7	7	19	33	..
Resectable disease at time of surgery					
Resectable	4069 (98·0%)	2967 (97·1%)	8213 (97·8%)	15 249 (97·7%)	0·045
Unresectable	81 (2·0%)	90 (2·9%)	187 (2·2%)	358 (2·3%)	..
Unknown	2	0	2	4	..
Pre-operative cancer-related complication requiring emergency surgery‡					
Elective	4071 (98·2%)	2989 (97·8%)	8199 (97·8%)	15 259 (97·9%)	0·27
Emergency	74 (1·8%)	67 (2·2%)	185 (2·2%)	326 (2·1%)	..
30-day SARS-CoV-2 infection rate‡					
No	4083 (98·3%)	3039 (99·4%)	8362 (99·5%)	15 484 (99·2%)	<0·0001
Yes	69 (1·7%)	18 (0·6%)	40 (0·5%)	127 (0·8%)	..
30-day postoperative mortality rate‡					
No	4080 (98·3%)	3016 (98·7%)	8307 (99·0%)	15 403 (98·8%)	0·0045
Yes	70 (1·7%)	41 (1·3%)	84 (1·0%)	195 (1·2%)	..
Missing	2	0	11	13	..
New detection of metastatic disease§					
No	2191 (98·3%)	1625 (98·3%)	4946 (98·2%)	8762 (98·2%)	0·87
Yes	38 (1·7%)	28 (1·7%)	93 (1·8%)	159 (1·8%)	..
Missing	7	5	15	27	..

Data are n (%) or n. Patients with metastatic disease at baseline removed from denominator (N=8957). Percentages presented by column total; missing data are excluded. R0=no microscopic or macroscopic disease. R1=microscopic disease at the margin. R2=macroscopic disease at the margin. *11 missing this data point. †χ^2 comparing light versus moderate versus full lockdowns for each outcome. ‡Subgroups defined in the appendix (p 62). §Detailed data on detection of new metastatic disease not collected for liver, pancreatic, breast, and gynaecological cancers.

Table 2: **Outcomes across COVID-19 stringency index groups for patients going straight to surgery (no neoadjuvant therapy)**

were overwhelmingly COVID-19 related. Second, we used the Oxford COVID-19 Stringency Index to define lockdowns,[1] calculated for each patient as the median average during their wait for surgery. Although this index has been validated, it is not yet widely used, and the COVIDSurg Collaborative is an early adopter of this metric for research purposes. This health policy measure demonstrated association with patient level outcomes in our dataset. However, we used an aggregate summary statistic that did not reflect all changes in policy during the study period. More work is required to understand the best method to apply this measure in future epidemiological studies. Third, as part of the exposure period to lockdowns occurred after study entry (ie, decision for surgery), this might have been subject to future information bias, where patients remaining non-operated for a longer time might have been more likely to await surgery during different lockdown states, therefore have a central tendency in their median average score.[24] Fourth, this study required prospective capture of team decision making, which might have been subject to biases, although the scale and diversity of the study mitigated against this. Fifth, definition of SARS-CoV-2 rates is dependent on testing performed and reported, so might vary at global scale.[17,18] We present exploratory analyses around SARS-CoV-2 rates stratified by income setting and provide sensitivity analyses to demonstrate that findings were robust. Sixth, we did not present more detailed analyses of between-country or within-country variation. Despite the large numbers in this study, individual numbers per country were low enough to risk type 1 error through multiple hypothesis testing. Seventh, in this analysis we did not explore different hospital types or delay in care for different cancers. There might have been hospitals that shutdown completely and did not take part in this study, meaning outcomes might have been worse. There might be specialty specific findings that allow future strategies to become stratified—eg, patients with rectal and prostate cancer might benefit from scaling up alternative neoadjuvant treatments; breast and gynaecological cancer surgery might be amenable to day case pathways; kidney, bladder, thoracic, and oesophagogastric surgery might require the advanced support of surgical units with critical care facilities; colon cancer could be performed in standalone surgical units. Eighth, we did not capture data on delays to diagnosis. Lockdowns are a system-level issue and high friction in diagnostic pathways was likely to have led to an increasing number of tumours left undetected in the community.[25] When considering resilience of a complete elective surgery system, there is a vital role of timely diagnostics in preventing harm, which might be just as important as delays between diagnosis and surgery. Finally, cancer care is just one component of a functioning health system. When making policy decisions about resourcing to improve resilience, cancer must be balanced with other high-burden conditions (eg, cardiovascular and cerebrovascular disease).[26]

At the time of publication, lockdowns of varying magnitude remain in place across many countries around the world, and further measures might be imposed related to novel variants of concern and variability in vaccine availability around the world (appendix p 64); however, threats to stable elective surgical systems are not limited to COVID-19; other viral pandemics, seasonal pressures, and natural disasters all affect surgical patients on an annual and recurring basis. The lessons from this study might be used to inform surgical system strengthening both during the COVID-19 pandemic and beyond.

Contributors

The writing group (JCG, AAde, AAdi, EA, APA, FA, JA, AMB, AC-C, JE, ME, MF, CF, GG, DG, EAG, EH, PH, IL, SW, HL, SL, EL, GMAG, HM, EJM, JM, DM, KM, MM, RM, DM, FN, FP, MP, PP, AR-DM, KR, ACR, RKS, RS, JFFS, NS, GDS, RS, SS, ST, EHT, RV, DN, AAB) and the statistical analysis group (JCG, KAM, DN, EH, AAB) contributed to writing, data interpretation, and critical revision of the manuscript. The writing group, operations committee, and dissemination committee contributed to study conception, protocol development, study delivery, and management. The collaborators contributed to data collection and study governance across included sites. All members of the writing group had full access to the data in the study, and JCG, KAM, DN, EH, and AAB verified the underlying data in the study. AAB or JCG and the writing committee had final responsibility for the decision to submit for publication. Detailed role descriptions of all contributing collaborating authors are shown in the appendix (pp 28–54).

Declaration of interests

All authors declare no competing interests.

Data sharing

Anonymised individual participant data will be made available upon request to the corresponding authors after the date of publication, with approval of the operations and dissemination committees, and completion of a data sharing agreement.

Acknowledgments

This research was part-funded by the National Institute for Health Research (NIHR; NIHR 16.136.79) using UK aid from the UK Government to support global health research. RS receives funding from the Economic and Social Research Council. JCG and AAB are funded by personal awards from the NIHR Academy. The views expressed in this publication are those of the authors and not necessarily those of the NIHR or the UK Government.

References

1 Hale T, Angrist N, Goldszmidt R, et al. A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker). *Nat Hum Behav* 2021; **5:** 529–38.
2 Han E, Tan MMJ, Turk E, et al. Lessons learnt from easing COVID-19 restrictions: an analysis of countries and regions in Asia Pacific and Europe. *Lancet* 2020; **396:** 1525–34.
3 Mansfield KE, Mathur R, Tazare J, et al. Indirect acute effects of the COVID-19 pandemic on physical and mental health in the UK: a population-based study. *Lancet Digit Health* 2021; **3:** e217–30.
4 Hamadani JD, Hasan MI, Baldi AJ, et al. Immediate impact of stay-at-home orders to control COVID-19 transmission on socioeconomic conditions, food insecurity, mental health, and intimate partner violence in Bangladeshi women and their families: an interrupted time series. *Lancet Glob Health* 2020; **8:** e1380–89.
5 Chakrabarti S, Hamlet LC, Kaminsky J, Subramanian SV. Association of human mobility restrictions and race/ethnicity-based, sex-based, and income-based factors with inequities in well-being during the COVID-19 pandemic in the United States. *JAMA Netw Open* 2021; **4:** e217373.
6 Haider N, Osman AY, Gadzekpo A, et al. Lockdown measures in response to COVID-19 in nine sub-Saharan African countries. *BMJ Glob Health* 2020; **5:** e003319.

7 COVIDSurg Collaborative. Elective surgery cancellations due to the COVID-19 pandemic: global predictive modelling to inform surgical recovery plans. *Br J Surg* 2020; **107:** 1440–49.

8 Nepogodiev D, Bhangu A, Glasbey JC, et al. Mortality and pulmonary complications in patients undergoing surgery with perioperative SARS-CoV-2 infection: an international cohort study. *Lancet* 2020; **396:** 27–38.

9 Burki TK. Cancer guidelines during the COVID-19 pandemic. *Lancet Oncol* 2020; **21:** 629–30.

10 Nepogodiev D, Moore R, Biccard B, et al. Prioritizing research for patients requiring surgery in low- and middle-income countries. *Br J Surg* 2019; **106:** e113–20.

11 Sullivan R, Alatise OI, Anderson BO, et al. Global cancer surgery: delivering safe, affordable, and timely cancer surgery. *Lancet Oncol* 2015; **16:** 1193–224.

12 Sud A, Jones ME, Broggio J, et al. Collateral damage: the impact on outcomes from cancer surgery of the COVID-19 pandemic. *Ann Oncol* 2020; **31:** 1065–74.

13 Hanna TP, King WD, Thibodeau S, et al. Mortality due to cancer treatment delay: systematic review and meta-analysis. *BMJ* 2020; **371:** m4087.

14 Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)--a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform* 2009; **42:** 377–81.

15 GlobalSurg Collaborative and National Institute for Health Research Global Health Research Unit on Global Surgery. Global variation in postoperative mortality and complications after cancer surgery: a multicentre, prospective cohort study in 82 countries. *Lancet* 2021; **397:** 387–97.

16 Roser M, Ritchie H, Ortiz-Ospina E, Hasell J. Coronavirus Pandemic (COVID-19) OurWorldInData.org2020. https://ourworldindata.org/coronavirus (accessed Dec 11, 2020).

17 Mohanan M, Malani A, Krishnan K, Acharya A. Prevalence of SARS-CoV-2 in Karnataka, India. *JAMA* 2021; **325:** 1001–03.

18 Mwananyanda L, Gill CJ, MacLeod W, et al. COVID-19 deaths in Africa: prospective systematic postmortem surveillance study. *BMJ* 2021; **372:** n334.

19 Kruk ME, Ling EJ, Bitton A, et al. Building resilient health systems: a proposal for a resilience index. *BMJ* 2017; **357:** j2323.

20 Glasbey JC, Bhangu A. Elective cancer surgery in COVID-19-free surgical pathways during the SARS-CoV-2 pandemic: an international, multicenter, comparative cohort study. *J Clin Oncol* 2020; **39:** 66–78.

21 Fitzmaurice C, Abate D, Abbasi N, et al. Global, regional, and national cancer incidence, mortality, years of life lost, years lived with disability, and disability-adjusted life-years for 29 cancer groups, 1990 to 2017: a systematic analysis for the Global Burden of Disease study. *JAMA Oncol* 2019; **5:** 1749–68.

22 Lee LY, Cazier JB, Angelis V, et al. COVID-19 mortality in patients with cancer on chemotherapy or other anticancer treatments: a prospective cohort study. *Lancet* 2020; **395:** 1919–26.

23 Dietz JR, Moran MS, Isakoff SJ, et al. Recommendations for prioritization, treatment, and triage of breast cancer patients during the COVID-19 pandemic. The COVID-19 pandemic breast cancer consortium. *Breast Cancer Res Treat* 2020; **181:** 487–97.

24 Farmer R, Mathur R, Bhaskaran K, Eastwood SV, Chaturvedi N, Smeeth L. Promises and pitfalls of electronic health record analysis. *Diabetologia* 2018; **61:** 1241–48.

25 Sud A, Torr B, Jones ME, et al. Effect of delays in the 2-week-wait cancer referral pathway during the COVID-19 pandemic on cancer survival in the UK: a modelling study. *Lancet Oncol* 2020; **21:** 1035–44.

26 Kansagra AP, Goyal MS, Hamilton S, Albers GW. Collateral effect of COVID-19 on stroke evaluation in the United States. *N Engl J Med* 2020; **383:** 400–01.

THE LANCET
Oncology

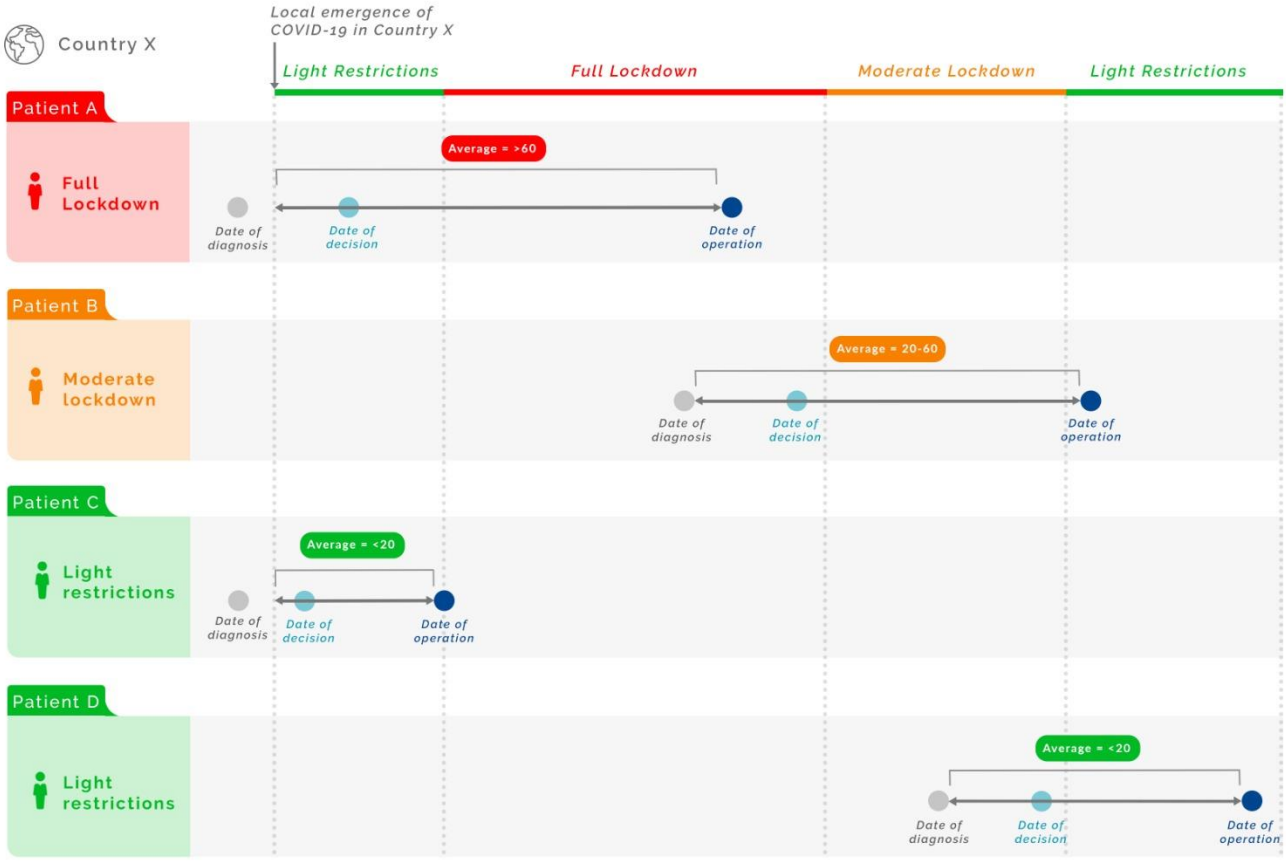
Supplementary appendix

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

Supplement to: COVIDSurg Collaborative. Effect of COVID-19 pandemic lockdowns on planned cancer surgery for 15 tumour types in 61 countries: an international, prospective, cohort study. *Lancet Oncol* 2021; published online Oct 5. http://dx.doi.org/10.1016/S1470-2045(21)00493-9.

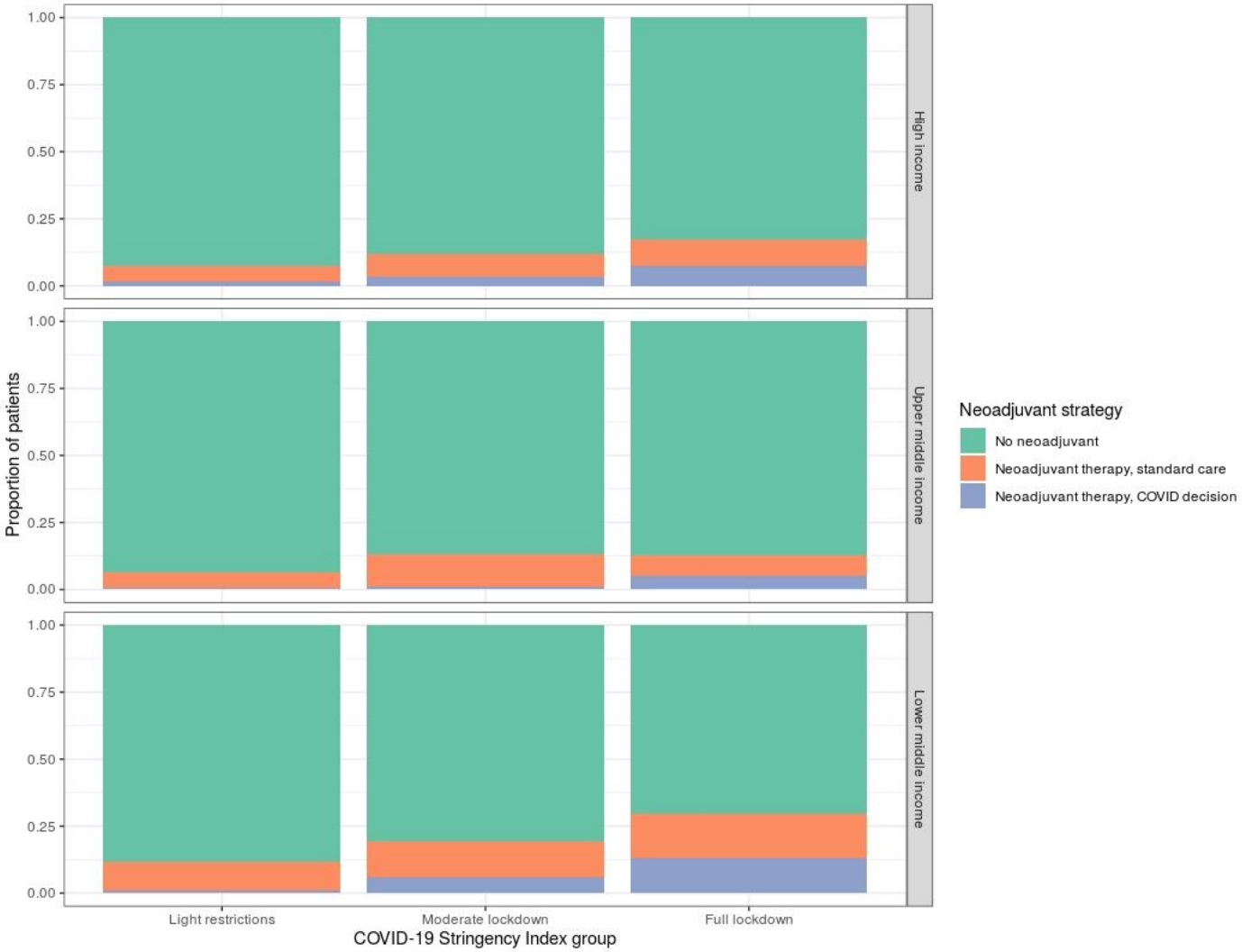
Web Appendix

Supplementary figure 1. COVID-19 government index response index classification.



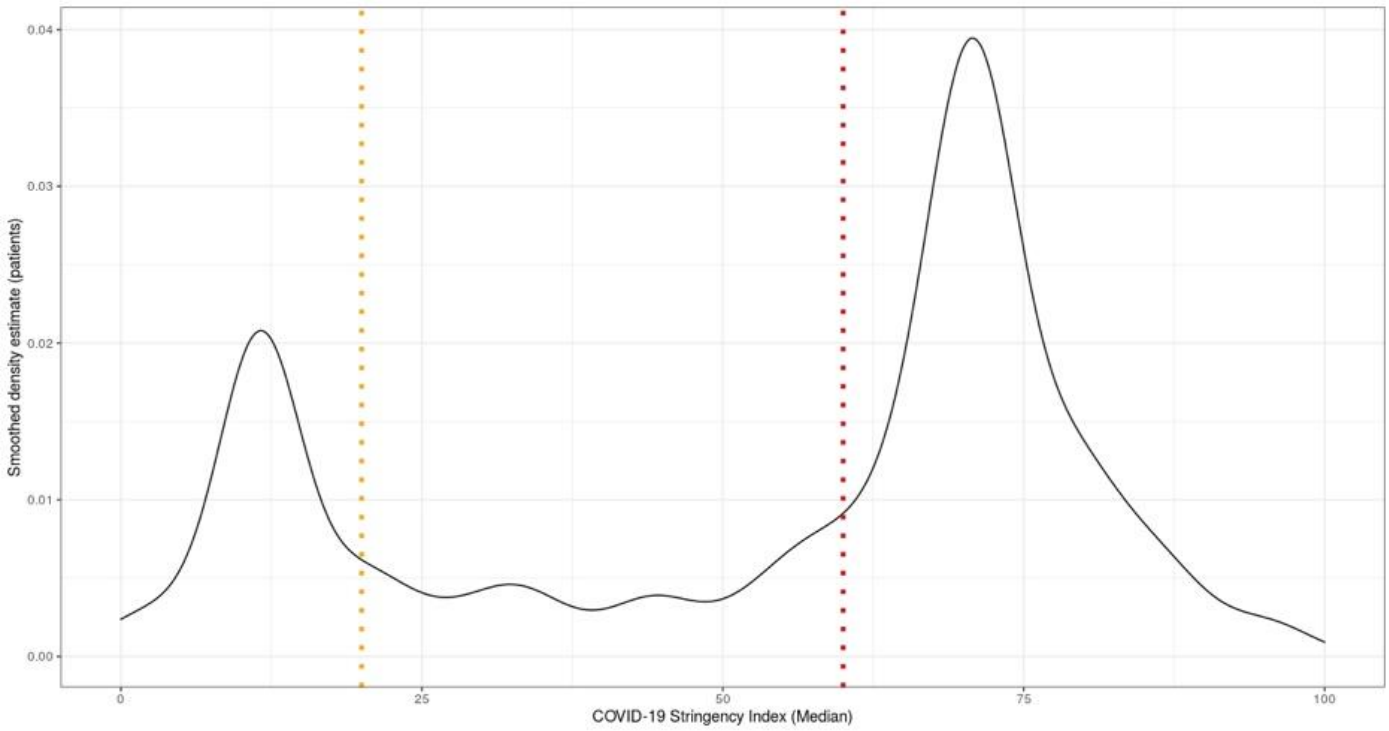
The median Oxford COVID-19 government response index score was calculated for each patient as a median average between local emergence of COVID-19 or data of diagnosis (whichever was latest) to the date of operation or cessation of follow-up if the patient remained non-operated. A representative example country is shown. The final classification is shown beneath each patient example.

Supplementary figure 2. Variation in use of neoadjuvant therapy across lockdowns across income groups



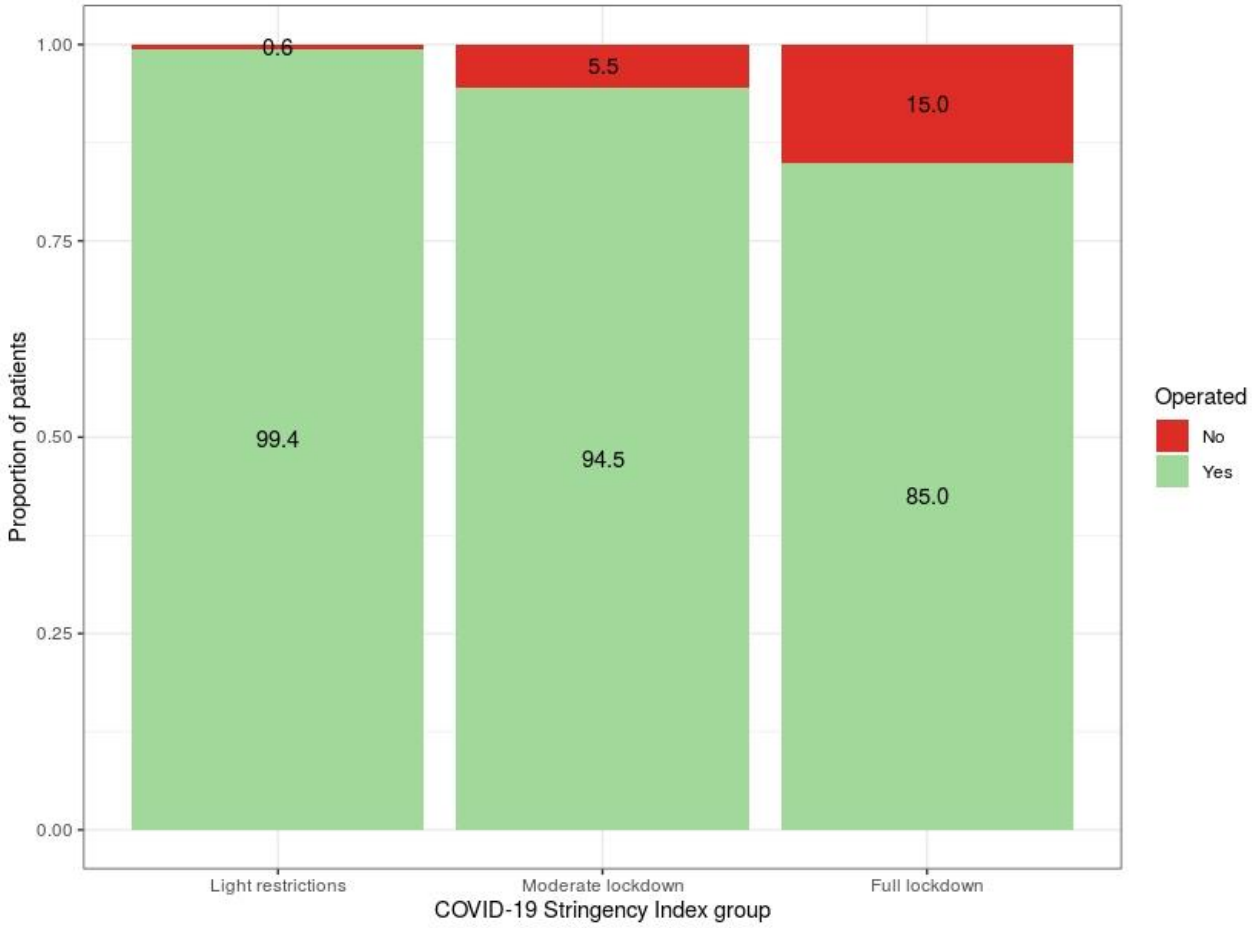
COVID=Coronavirus disease 2019.

Supplementary figure 3. Distribution of median COVID-19 Stringency Index scores



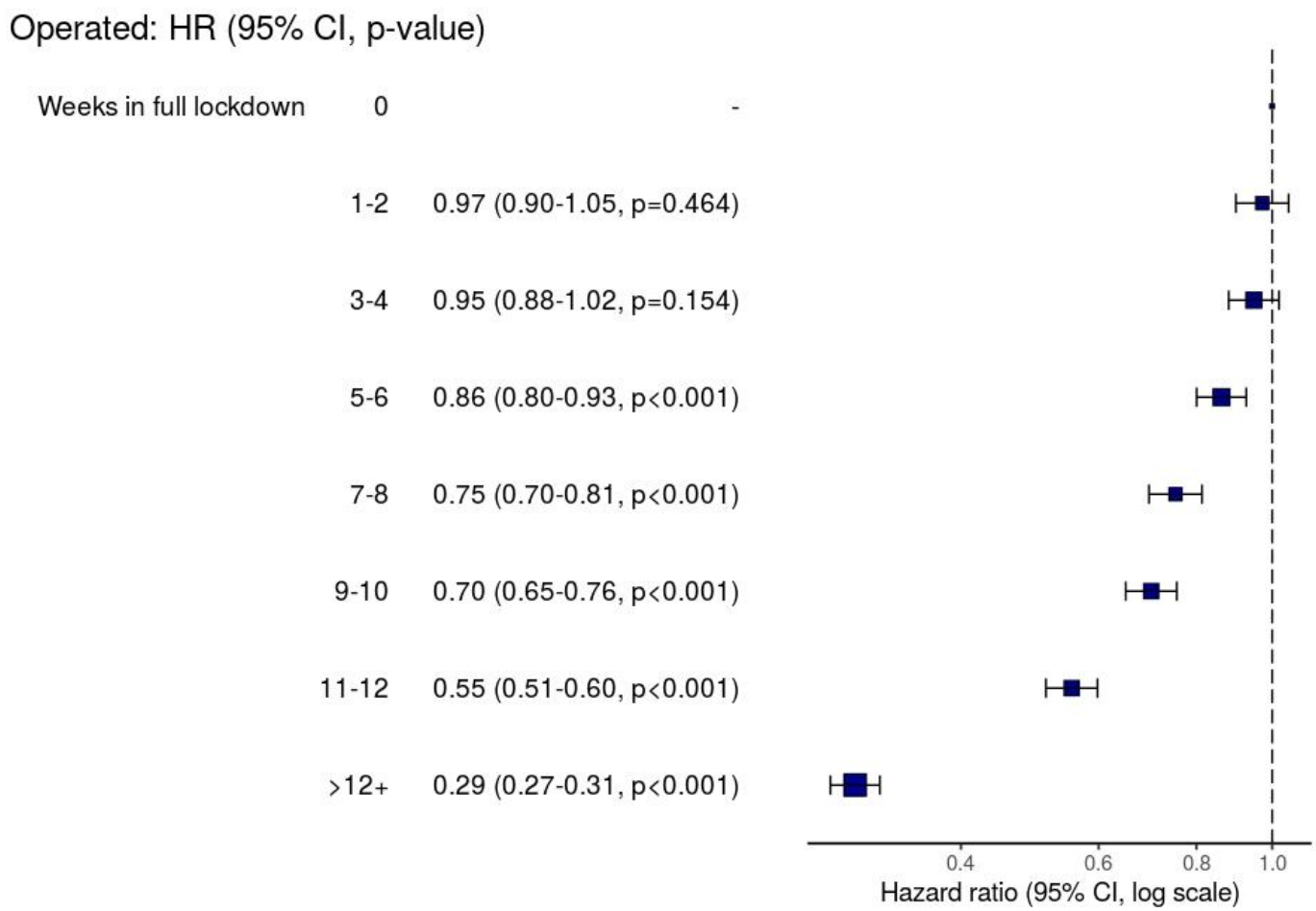
A median average COVID-19 stringency index score was calculated for each patient based on the date of first local COVID-19 cases up to the date of operation (operated patients) or cessation of follow-up (non-operated patients) in each included country (Supplementary figure 1). Patients were grouped based on their corresponding COVID-19 stringency index light restrictions (median index score <20 (orange)), moderate lockdown (median index score 20-60) and full lockdown (median index score >60 (red)).

Supplementary figure 4. Differences in overall surgical capacity during lockdowns



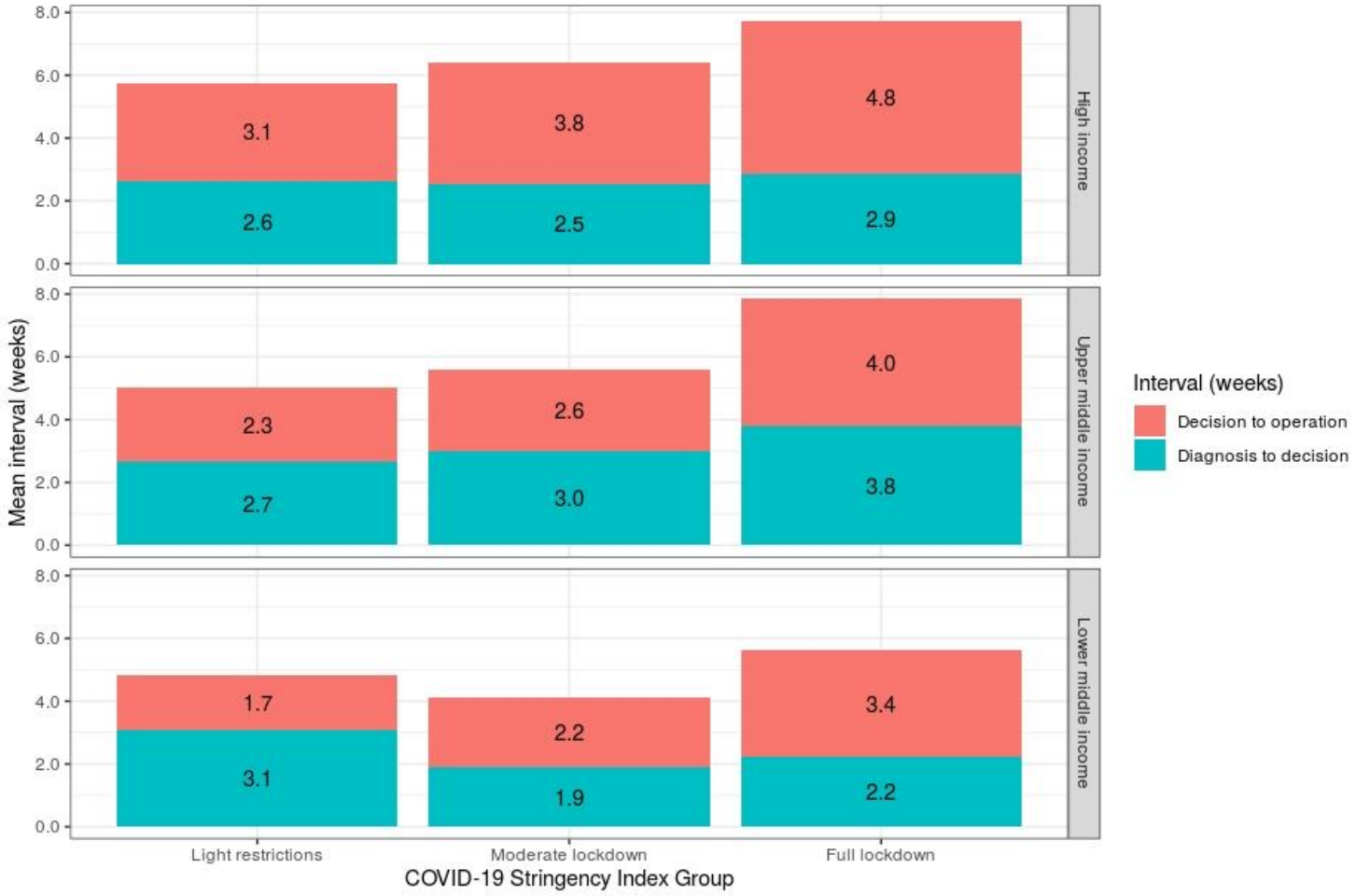
Percentages displayed represent proportion operated by group

Supplementary figure 5. Hazard ratio plot for secondary analysis of weeks in full lockdown



Surgical capacity defined as patients booked for surgery undergoing an operation during the follow-up window. Full lockdown defined as full weeks with COVID-19 stringency index score ≥60. Upon testing for a non-linear relationship between weeks in full lockdown and the outcome variable using a penalised spline on the exposure, a significant non-linear relationship was demonstrated (p<0.001). This was confirmed graphically using a spline plot. Therefore, weeks in lockdown were grouped in 2-week increments for the purpose of modelling. The same covariables were included in this secondary analysis as the primary model.

Supplementary figure 6. Variability in system friction from diagnosis to decision for surgery to operation



Plot displays patients that went straight to surgery (no neoadjuvant therapy only). Mean interval by group displayed. The point of system 'friction' was different across income and lockdown groups. Lockdown typically increased the interval from decision to operation across all settings. The interval from diagnosis to decision was a higher contributor to overall delay in UMICs and LMICs than in HICs.

Supplementary table 1a. Cancer types across World Bank income groups

Cancer location	High income	Upper middle income	Lower middle income	Total
Head and neck	2480 (15.6)	448 (23.7)	589 (26.2)	3517 (17.6)
Colon	2955 (18.6)	287 (15.2)	186 (8.3)	3428 (17.1)
Rectal	1235 (7.8)	138 (7.3)	139 (6.2)	1512 (7.6)
Gastric	515 (3.2)	119 (6.3)	89 (4.0)	723 (3.6)
Oesophageal	391 (2.5)	23 (1.2)	37 (1.6)	451 (2.3)
Thoracic	1172 (7.4)	10 (0.5)	10 (0.4)	1192 (6.0)
Liver	649 (4.1)	38 (2.0)	88 (3.9)	775 (3.9)
Pancreatic	571 (3.6)	77 (4.1)	128 (5.7)	776 (3.9)
Sarcoma	353 (2.2)	17 (0.9)	68 (3.0)	438 (2.2)
Prostate	511 (3.2)	13 (0.7)	13 (0.6)	537 (2.7)
Kidney or upper tract urothelial	389 (2.5)	22 (1.2)	31 (1.4)	442 (2.2)
Bladder	108 (0.7)	5 (0.3)	34 (1.5)	147 (0.7)
Gynaecological	1776 (11.2)	236 (12.5)	157 (7.0)	2169 (10.8)
Breast	2758 (17.4)	458 (24.2)	680 (30.2)	3896 (19.5)
Intracranial*	653 (2.9)	110 (3.7)	120 (4.7)	883 (3.2)

Percentages expressed of column total. Country income defined in accordance with World Bank income (2019/20) classifications. Lower middle income included patients from both lower-middle income and low-income countries. *Surgical intent data was unavailable for intracranial tumours. Treatment pathways and outcomes related to delay were considered too disparate from other tumour types for combined analysis. Therefore, data for intracranial tumours was not included in further analyses in this paper, nor the summary flowchart in Figure 1.

Supplementary table 1b. Patients included by country and income group

High income			Upper middle income			Lower middle income		
Country	Patients	Centres	Country	Patients	Centres	Country	Patients	Centres
Australia	716 (4.5)	18	Argentina	71 (3.8)	2	Egypt	287 (12.8)	12
Austria	163 (1.0)	2	Azerbaijan	3 (0.2)	1	Ghana	14 (0.6)	1
Barbados	19 (0.1)	1	Botswana	9 (0.5)	1	India	1566 (69.6)	15
Belgium	25 (0.2)	3	Brazil	430 (22.7)	8	Indonesia	90 (4.0)	1
Canada	373 (2.4)	10	Colombia	138 (7.3)	5	Morocco	140 (6.2)	1
Chile	50 (0.3)	2	Guatemala	1 (0.1)	1	Nigeria	50 (2.2)	6
Croatia	19 (0.1)	1	Jordan	31 (1.6)	2	Pakistan	81 (3.6)	8
Czech Republic	3 (0.0)	1	Libya	66 (3.5)	3	Philippines	5 (0.2)	1
Denmark	174 (1.1)	2	Malaysia	194 (10.3)	7	Reunion	3 (0.1)	1
Finland	103 (0.6)	2	Mexico	128 (6.8)	1	Sudan	11 (0.5)	3
France	508 (3.2)	14	Peru	34 (1.8)	1	Syria	2 (0.1)	1
Germany	399 (2.5)	9	Romania	17 (0.9)	2	Uganda	1 (0.0)	1
Greece	266 (1.7)	11	Russia	4 (0.2)	1	Yemen	2 (0.1)	1
Hong Kong	62 (0.4)	3	Serbia	179 (9.5)	4			
Hungary	45 (0.3)	1	South Africa	92 (4.9)	1			
Ireland	177 (1.1)	8	Sri Lanka	19 (1.0)	1			
Italy	2291 (14.4)	47	Turkey	475 (25.1)	15			
Japan	19 (0.1)	1						
Kuwait	7 (0.0)	1						
Netherlands	234 (1.5)	7						
Oman	2 (0.0)	1						
Portugal	435 (2.7)	15						
Saudi Arabia	373 (2.4)	11						
Singapore	191 (1.2)	2						
Slovak Republic	3 (0.0)	1						
Slovenia	51 (0.3)	1						
Spain	1478 (9.3)	38						
Sweden	171 (1.1)	5						
Switzerland	127 (0.8)	5						
United Kingdom	6160 (38.8)	113						
United States	1219 (7.7)	21						

Percentages expressed of column total.

Supplementary table 2. Characteristics for patients awaiting surgery during light restrictions, moderate and full lockdowns

		COVID-19 Stringency Index group			
Factor	**Levels**	**Light restrictions**	**Moderate lockdown**	**Full lockdown**	**P-value**
Health system factors					
Weeks in full lockdown	Mean (SD)	2.4 (1.7)	5.5 (2.9)	12.7 (5.4)	<0.001
World Bank Income Classification	High income	4089 (90.4)	3130 (85.8)	8644 (73.1)	<0.001
	Upper middle income	228 (5.0)	325 (8.9)	1329 (11.2)	
	Lower middle income	204 (4.5)	191 (5.2)	1854 (15.7)	
Community SARS-CoV-2 case notification rate*	High income, low COVID	2952 (65.3)	1144 (31.4)	367 (3.1)	<0.001
	High income, high COVID	1137 (25.1)	1986 (54.5)	8277 (70.0)	
	Upper middle income, low COVID	228 (5.0)	248 (6.8)	262 (2.2)	
	Upper middle income, high COVID	0 (0.0)	77 (2.1)	1067 (9.0)	
	Lower middle income, low COVID	204 (4.5)	181 (5.0)	1205 (10.2)	
	Lower middle income, high COVID	0 (0.0)	10 (0.3)	649 (5.5)	
Patient factors					
Age	<50 years	775 (17.1)	562 (15.4)	2355 (19.9)	<0.001
	50-59 years	962 (21.3)	764 (21.0)	2409 (20.4)	
	60-69 years	1222 (27.0)	1048 (28.7)	3144 (26.6)	
	70-79 years	1176 (26.0)	927 (25.4)	2740 (23.2)	
	>80 years	386 (8.5)	345 (9.5)	1179 (10.0)	
Sex	Female	2711 (60.0)	2100 (57.6)	6666 (56.4)	<0.001
	Male	1810 (40.0)	1546 (42.4)	5161 (43.6)	
ASA grade	Grade 1-2	3274 (72.7)	2493 (68.6)	8381 (71.2)	<0.001
	Grade 3-5	1230 (27.3)	1143 (31.4)	3382 (28.8)	
	Missing	17	10	64	
ECOG performance score	0	2785 (63.0)	2157 (60.3)	6595 (56.7)	<0.001
	1	1186 (26.8)	1005 (28.1)	3645 (31.3)	
	≥2	448 (10.1)	417 (11.7)	1397 (12.0)	
	Missing	102	67	190	
Current smoker	No	4026 (89.1)	3202 (87.8)	10437 (88.2)	0.195
	Yes	495 (10.9)	444 (12.2)	1390 (11.8)	
Pre-existing respiratory condition	No	3950 (87.4)	3219 (88.3)	10571 (89.4)	0.001
	Yes	571 (12.6)	427 (11.7)	1256 (10.6)	
Revised Cardiac Risk Index	0	1355 (30.0)	1121 (30.7)	3603 (30.5)	0.032
	1	2331 (51.6)	1820 (49.9)	6092 (51.5)	
	2	691 (15.3)	541 (14.8)	1684 (14.2)	
	≥3	144 (3.2)	164 (4.5)	448 (3.8)	
Disease factors					
Disease stage	Early disease	2582 (57.4)	1960 (54.4)	6226 (54.2)	<0.001
	Advanced/nodal disease	1919 (42.6)	1641 (45.6)	5258 (45.8)	
	Missing	20	45	343	
Site specific cancer	Head and neck	672 (14.9)	649 (17.8)	2193 (18.5)	<0.001
	Colon	902 (20.0)	609 (16.7)	1913 (16.2)	
	Rectal	313 (6.9)	272 (7.5)	926 (7.8)	
	Gastric	83 (1.8)	148 (4.1)	492 (4.2)	
	Oesophageal	62 (1.4)	59 (1.6)	329 (2.8)	
	Thoracic	350 (7.7)	197 (5.4)	645 (5.5)	
	Liver	139 (3.1)	165 (4.5)	471 (4.0)	
	Pancreatic	138 (3.1)	145 (4.0)	493 (4.2)	
	Sarcoma	76 (1.7)	89 (2.4)	273 (2.3)	
	Prostate	123 (2.7)	61 (1.7)	353 (3.0)	
	Kidney or upper tract urothelial	119 (2.6)	66 (1.8)	257 (2.2)	
	Bladder	35 (0.8)	24 (0.7)	88 (0.7)	
	Gynaecological	547 (12.1)	439 (12.0)	1183 (10.0)	
	Breast	962 (21.3)	723 (19.8)	2211 (18.7)	
Treatment factors					
Neoadjuvant therapy	No neoadjuvant	4177 (92.4)	3187 (87.4)	9600 (81.2)	<0.001
	Neoadjuvant therapy, standard care	272 (6.0)	340 (9.3)	1287 (10.9)	
	Neoadjuvant therapy, COVID decision	72 (1.6)	119 (3.3)	940 (7.9)	

Percentages expressed of column total. SD=Standard deviation. ASA=American Society of Anaesthesiologists classification. ECOG=Eastern Cooperative Oncology Group. COVID=Coronavirus disease 2019. SARS-CoV-2=severe acute respiratory syndrome coronavirus 2. *Community SARS-CoV-2 rates were defined as the median 14-day cumulative

case notification rate per 100,000 population between the date of local emergence of the pandemic up to the date of surgery for operated patients or cessation of follow-up (31st August 2020) for non-operated patients, and were stratified by World Bank income group to account for differences in access to SARS-CoV-2 testing and reporting across settings.

Supplementary table 3. Characteristics of operated and non-operated patients during COVID-19

		Status at cessation of follow-up		
Factor	**Levels**	**Non-operated**	**Operated**	**P-value**
Health system factors				
COVID-19 Stringency Index group	Light restrictions	26 (1.3)	4495 (25.0)	<0.001
	Moderate lockdown	201 (10.0)	3445 (19.1)	
	Full lockdown	1775 (88.7)	10052 (55.9)	
Weeks in lockdown (COVID-19 stringency index)	Mean (SD)	20.3 (5.7)	7.8 (5.0)	<0.001
World Bank Income Classification	High income	1342 (67.0)	14521 (80.7)	<0.001
	Upper middle income	187 (9.3)	1704 (9.5)	
	Lower middle income	473 (23.6)	1776 (9.9)	
Community SARS-CoV-2 case notification rate*	High income, low COVID	1297 (64.8)	10103 (56.1)	<0.001
	High income, high COVID	58 (2.9)	680 (3.8)	
	Upper middle income, low COVID	129 (6.4)	1024 (5.7)	
	Upper middle income, high COVID	82 (4.1)	1508 (8.4)	
	Lower middle income, low COVID	391 (19.5)	268 (1.5)	
	Lower middle income, high COVID	45 (2.2)	4418 (24.5)	
Patient factors				
Age	<50 years	405 (20.2)	3287 (18.3)	0.001
	50-59 years	399 (19.9)	3739 (20.8)	
	60-69 years	555 (27.7)	4865 (27.0)	
	70-79 years	424 (21.2)	4422 (24.6)	
	>80 years	220 (11.0)	1690 (9.4)	
Sex	Female	1008 (50.3)	10472 (58.2)	<0.001
	Male	995 (49.7)	7531 (41.8)	
ASA Grade	Grade 1-2	1380 (70.8)	12777 (71.1)	0.822
	Grade 3-5	568 (29.2)	5190 (28.9)	
	Missing	55	36	
ECOG Performance Score	0	1004 (51.5)	10541 (59.6)	<0.001
	1	622 (31.9)	5217 (29.5)	
	≥2	325 (16.7)	1938 (11.0)	
	Missing	52	307	
Current smoker	No	1741 (86.9)	15933 (88.5)	0.04
	Yes	262 (13.1)	2070 (11.5)	
Pre-existing respiratory condition	No	1801 (89.9)	15948 (88.6)	0.081
	Yes	202 (10.1)	2055 (11.4)	
Revised Cardiac Risk Index	0	537 (26.8)	5544 (30.8)	<0.001
	1	1048 (52.3)	9202 (51.1)	
	2	336 (16.8)	2582 (14.3)	
	≥3	82 (4.1)	675 (3.7)	
Disease factors				
Disease stage	Early disease	889 (53.3)	9886 (55.1)	0.164
	Advanced/nodal disease	778 (46.7)	8045 (44.9)	
	Missing	336	72	
Site specific cancer	Head and neck	344 (17.2)	3173 (17.6)	<0.001
	Colon	170 (8.5)	3260 (18.1)	
	Rectal	188 (9.4)	1325 (7.4)	
	Gastric	75 (3.7)	648 (3.6)	
	Oesophageal	125 (6.2)	326 (1.8)	
	Thoracic	124 (6.2)	1068 (5.9)	
	Liver	77 (3.8)	698 (3.9)	
	Pancreatic	145 (7.2)	631 (3.5)	
	Sarcoma	49 (2.4)	389 (2.2)	
	Prostate	93 (4.6)	444 (2.5)	
	Kidney or upper tract urothelial	69 (3.4)	373 (2.1)	
	Bladder	40 (2.0)	107 (0.6)	
	Gynaecological	183 (9.1)	1986 (11.0)	
	Breast	321 (16.0)	3575 (19.9)	
Treatment factors				
Neoadjuvant therapy	No neoadjuvant	1353 (67.5)	15622 (86.8)	<0.001
	Neoadjuvant therapy, standard care	164 (8.2)	1736 (9.6)	
	Neoadjuvant therapy, COVID decision	486 (24.3)	645 (3.6)	

Percentages expressed of column total. SD=Standard deviation. ASA=American Society of Anaesthesiologists classification. ECOG=Eastern Cooperative Oncology Group. COVID=Coronavirus disease 2019. SARS-CoV-2=severe acute respiratory syndrome coronavirus 2. *Community SARS-CoV-2 rates were defined as the median 14-day cumulative case notification rate per 100,000 population between the date of local emergence of the pandemic up to the date of surgery for operated patients or cessation of follow-up (31st August 2020) for non-operated patients.

Supplementary table 4. Multivariable cox proportionate regression model of factors associated with surgical capacity during COVID-19 (presented in Figure 2)

Factor	Levels	N=	HR (univariable)	HR (multivariable)
COVID-19 Stringency Index group	Light restrictions	4520	-	-
	Moderate lockdown	3622	***0.78 (0.74-0.81, p<0.001)***	***0.81 (0.77-0.84, p<0.001)***
	Full lockdown	11678	***0.47 (0.46-0.49, p<0.001)***	***0.51 (0.50-0.53, p<0.001)***
World Bank Income Classification	High income	15733	-	-
	Upper middle income	1864	***0.93 (0.88-0.98, p=0.004)***	0.97 (0.92-1.02, p=0.220)
	Lower middle income	2232	***0.74 (0.70-0.78, p<0.001)***	***0.83 (0.78-0.87, p<0.001)***
Age	<50 years	3669	-	-
	50-59 years	4102	***1.07 (1.02-1.13, p=0.003)***	***1.10 (1.05-1.15, p<0.001)***
	60-69 years	5362	***1.05 (1.00-1.10, p=0.037)***	***1.09 (1.04-1.14, p=0.001)***
	70-79 years	4804	***1.12 (1.07-1.17, p<0.001)***	***1.17 (1.11-1.23, p<0.001)***
	>80 years	1895	1.06 (1.00-1.12, p=0.066)	1.06 (0.99-1.14, p=0.077)
Sex	Female	11398	-	-
	Male	8434	***0.89 (0.86-0.92, p<0.001)***	0.99 (0.95-1.02, p=0.457)
ASA Grade	Grade 1-2	14033	-	-
	Grade 3-5	5722	0.98 (0.95-1.02, p=0.307)	0.99 (0.95-1.03, p=0.533)
ECOG Performance Score	0	11445	-	-
	1	5789	***0.93 (0.90-0.96, p<0.001)***	***0.96 (0.92-0.99, p=0.020)***
	≥2	2247	***0.90 (0.86-0.95, p<0.001)***	***0.89 (0.84-0.94, p<0.001)***
Current smoker	No	17521	-	-
	Yes	2311	1.04 (0.99-1.09, p=0.108)	1.03 (0.99-1.08, p=0.171)
Pre-existing respiratory condition	No	17591	-	-
	Yes	2241	1.02 (0.97-1.07, p=0.391)	0.98 (0.94-1.03, p=0.472)
Revised Cardiac Risk Index	0	6059	-	-
	1	10137	***0.90 (0.87-0.93, p<0.001)***	1.01 (0.95-1.07, p=0.779)
	2	2882	***0.87 (0.83-0.91, p<0.001)***	0.96 (0.89-1.03, p=0.245)
	≥3	754	***0.85 (0.78-0.92, p<0.001)***	***0.90 (0.81-1.00, p=0.044)***
Disease stage	Early disease	10695	-	-
	Advanced/nodal disease	8748	***0.96 (0.93-0.99, p=0.008)***	***0.96 (0.93-0.99, p=0.018)***
Cancer location	Head and neck	3505	-	-
	Colon	3419	***1.21 (1.15-1.27, p<0.001)***	***1.16 (1.08-1.24, p<0.001)***
	Rectal	1491	***0.63 (0.59-0.67, p<0.001)***	***0.59 (0.54-0.64, p<0.001)***
	Gastric	717	***0.69 (0.63-0.75, p<0.001)***	***0.67 (0.61-0.74, p<0.001)***
	Oesophageal	444	***0.33 (0.30-0.37, p<0.001)***	***0.32 (0.28-0.36, p<0.001)***
	Thoracic	1184	***0.93 (0.87-1.00, p=0.036)***	***0.82 (0.76-0.90, p<0.001)***
	Liver	762	***0.69 (0.63-0.75, p<0.001)***	***0.63 (0.57-0.69, p<0.001)***
	Pancreatic	749	***0.75 (0.69-0.82, p<0.001)***	***0.73 (0.66-0.81, p<0.001)***
	Sarcoma	426	***0.71 (0.64-0.79, p<0.001)***	***0.67 (0.60-0.75, p<0.001)***
	Prostate	522	***0.51 (0.47-0.57, p<0.001)***	***0.44 (0.40-0.50, p<0.001)***
	Kidney or upper tract urothelial	433	***0.72 (0.65-0.80, p<0.001)***	***0.65 (0.57-0.73, p<0.001)***
	Bladder	142	***0.59 (0.49-0.72, p<0.001)***	***0.51 (0.42-0.62, p<0.001)***
	Gynaecological	2159	***0.95 (0.90-1.00, p=0.062)***	***0.86 (0.79-0.93, p<0.001)***
	Breast	3879	***0.88 (0.84-0.92, p<0.001)***	1.00 (0.94-1.05, p=0.884)

Surgical capacity defined as patients booked for surgery undergoing an operation during the follow-up window. Percentages expressed of row total. SD=Standard deviation. ASA=American Society of Anaesthesiologists classification. ECOG=Eastern Cooperative Oncology Group. COVID=Coronavirus disease 2019. SARS-CoV-2=severe acute respiratory syndrome coronavirus 2. *Community SARS-CoV-2 rates were defined as the median 14-day cumulative case notification rate per 100,000 population between the date of local emergence of the pandemic up to the date of surgery for operated patients or cessation of follow-up (31st August 2020) for non-operated patients, and were stratified by World Bank income group to account for differences in access to SARS-CoV-2 testing and reporting across settings. Number in dataframe = 19832, Number in model = 19066, Missing = 766, Number of events = 17597, Concordance = 0.627 (SE = 0.002), R-squared = 0.147 (Max possible = 1.000), Likelihood ratio test = 3027.320 (df = 31, p = 0.000)

Supplementary table 5. Sensitivity analysis of primary model for factors associated with surgical capacity during COVID-19 (outcome definition including elective surgery only)

Factor	Levels	N=	HR (univariable)	HR (multivariable)
COVID-19 Stringency Index group	Light restrictions	4520	-	-
	Moderate lockdown	3622	***0.78 (0.75-0.82, p<0.001)***	***0.82 (0.78-0.86, p<0.001)***
	Full lockdown	11678	***0.48 (0.46-0.49, p<0.001)***	***0.53 (0.51-0.55, p<0.001)***
World Bank Income Classification	High income	15733	-	-
	Upper middle income	1864	***0.84 (0.80-0.89, p<0.001)***	***0.87 (0.82-0.92, p<0.001)***
	Lower middle income	2232	***0.72 (0.69-0.76, p<0.001)***	***0.80 (0.75-0.84, p<0.001)***
Age	<50 years	3669	-	-
	50-59 years	4102	***1.09 (1.03-1.14, p=0.001)***	***1.11 (1.06-1.17, p<0.001)***
	60-69 years	5362	***1.05 (1.01-1.10, p=0.027)***	***1.10 (1.05-1.16, p<0.001)***
	70-79 years	4804	***1.13 (1.08-1.18, p<0.001)***	***1.19 (1.13-1.26, p<0.001)***
	>80 years	1895	1.05 (0.99-1.11, p=0.124)	***1.08 (1.01-1.15, p=0.033)***
Sex	Female	11398	-	-
	Male	8434	***0.87 (0.84-0.90, p<0.001)***	0.98 (0.95-1.02, p=0.388)
ASA Grade	Grade 1-2	14033	-	-
	Grade 3-5	5722	0.97 (0.94-1.00, p=0.059)	0.98 (0.94-1.02, p=0.281)
ECOG Performance Score	0	11445	-	-
	1	5789	***0.91 (0.88-0.94, p<0.001)***	***0.95 (0.92-0.99, p=0.006)***
	≥2	2247	***0.86 (0.82-0.91, p<0.001)***	***0.87 (0.82-0.92, p<0.001)***
Current smoker	No	17521	-	-
	Yes	2311	1.03 (0.98-1.08, p=0.273)	1.02 (0.98-1.08, p=0.331)
Pre-existing respiratory condition	No	17591	-	-
	Yes	2241	1.02 (0.98-1.07, p=0.323)	0.99 (0.94-1.04, p=0.607)
Revised Cardiac Risk Index	0	6059	-	-
	1	10137	***0.87 (0.84-0.90, p<0.001)***	1.00 (0.94-1.07, p=0.886)
	2	2882	***0.82 (0.78-0.86, p<0.001)***	0.94 (0.87-1.02, p=0.138)
	≥3	754	***0.80 (0.73-0.87, p<0.001)***	***0.89 (0.79-0.99, p=0.026)***
Disease stage	Early disease	10695	-	-
	Advanced/nodal disease	8748	***0.93 (0.90-0.96, p<0.001)***	***0.94 (0.91-0.97, p<0.001)***
Cancer location	Head and neck	3505	-	-
	Colon	3419	***1.14 (1.08-1.19, p<0.001)***	***1.08 (1.00-1.16, p=0.040)***
	Rectal	1491	***0.60 (0.57-0.65, p<0.001)***	***0.57 (0.52-0.62, p<0.001)***
	Gastric	717	***0.66 (0.61-0.73, p<0.001)***	***0.65 (0.59-0.72, p<0.001)***
	Oesophageal	444	***0.33 (0.30-0.37, p<0.001)***	***0.31 (0.28-0.36, p<0.001)***
	Thoracic	1184	0.95 (0.89-1.02, p=0.153)	***0.83 (0.76-0.90, p<0.001)***
	Liver	762	***0.68 (0.63-0.74, p<0.001)***	***0.62 (0.56-0.68, p<0.001)***
	Pancreatic	749	***0.74 (0.68-0.81, p<0.001)***	***0.71 (0.64-0.79, p<0.001)***
	Sarcoma	426	***0.72 (0.64-0.80, p<0.001)***	***0.67 (0.59-0.75, p<0.001)***
	Prostate	522	***0.53 (0.48-0.58, p<0.001)***	***0.44 (0.39-0.50, p<0.001)***
	Kidney or upper tract urothelial	433	***0.67 (0.59-0.74, p<0.001)***	***0.59 (0.52-0.67, p<0.001)***
	Bladder	142	***0.58 (0.48-0.71, p<0.001)***	***0.50 (0.41-0.62, p<0.001)***
	Gynaecological	2159	0.95 (0.90-1.01, p=0.083)	***0.85 (0.79-0.93, p<0.001)***
	Breast	3879	***0.90 (0.85-0.94, p<0.001)***	1.01 (0.96-1.07, p=0.729)

Surgical capacity defined as patients booked for surgery undergoing an operation during the follow-up window. Percentages expressed of row total. SD=Standard deviation. ASA=American Society of Anaesthesiologists classification. ECOG=Eastern Cooperative Oncology Group. COVID=Coronavirus disease 2019. SARS-CoV-2=severe acute respiratory syndrome coronavirus 2. *Community SARS-CoV-2 rates were defined as the median 14-day cumulative case notification rate per 100,000 population between the date of local emergence of the pandemic up to the date of surgery for operated patients or cessation of follow-up (31st August 2020) for non-operated patients, and were stratified by World Bank income group to account for differences in access to SARS-CoV-2 testing and reporting across settings. Number in dataframe = 19832, Number in model = 19066, Missing = 766, Number of events = 16754, Concordance = 0.627 (SE = 0.002), R-squared = 0.143(Max possible = 1.000), Likelihood ratio test = 2931.812 (df = 31, p = 0.000)

Supplementary table 6. Sensitivity analysis of primary model for factors associated with surgical capacity during COVID-19 (cancer location removed)

Factor	Levels	N=	HR (univariable)	HR (multivariable)
COVID-19 Stringency Index group	Light restrictions	4520	-	-
	Moderate lockdown	3622	***0.78 (0.74-0.81, p<0.001)***	***0.80 (0.76-0.83, p<0.001)***
	Full lockdown	11678	***0.47 (0.46-0.49, p<0.001)***	***0.51 (0.49-0.53, p<0.001)***
World Bank Income Classification	High income	15733	-	-
	Upper middle income	1864	***0.93 (0.88-0.98, p=0.004)***	1.01 (0.96-1.06, p=0.733)
	Lower middle income	2232	***0.74 (0.70-0.78, p<0.001)***	***0.86 (0.81-0.90, p<0.001)***
Age	<50 years	3669	-	-
	50-59 years	4102	***1.07 (1.02-1.13, p=0.003)***	***1.08 (1.03-1.14, p=0.001)***
	60-69 years	5362	***1.05 (1.00-1.10, p=0.037)***	***1.07 (1.02-1.12, p=0.005)***
	70-79 years	4804	***1.12 (1.07-1.17, p<0.001)***	***1.19 (1.13-1.25, p<0.001)***
	>80 years	1895	***1.06 (1.00-1.12, p=0.066)***	***1.17 (1.09-1.25, p<0.001)***
Sex	Female	11398	-	-
	Male	8434	***0.89 (0.86-0.92, p<0.001)***	***0.88 (0.85-0.90, p<0.001)***
ASA Grade	Grade 1-2	14033	-	-
	Grade 3-5	5722	0.98 (0.95-1.02, p=0.307)	1.01 (0.97-1.05, p=0.547)
ECOG Performance Score	0	11445	-	-
	1	5789	***0.93 (0.90-0.96, p<0.001)***	0.97 (0.93-1.00, p=0.088)
	≥2	2247	***0.90 (0.86-0.95, p<0.001)***	***0.95 (0.89-1.00, p=0.047)***
Current smoker	No	17521	-	-
	Yes	2311	1.04 (0.99-1.09, p=0.108)	***1.06 (1.01-1.11, p=0.023)***
Pre-existing respiratory condition	No	17591	-	-
	Yes	2241	1.02 (0.97-1.07, p=0.391)	1.00 (0.95-1.05, p=0.880)
Revised Cardiac Risk Index	0	6059	-	-
	1	10137	***0.90 (0.87-0.93, p<0.001)***	***0.80 (0.77-0.83, p<0.001)***
	2	2882	***0.87 (0.83-0.91, p<0.001)***	***0.76 (0.72-0.80, p<0.001)***
	≥3	754	***0.85 (0.78-0.92, p<0.001)***	***0.75 (0.69-0.82, p<0.001)***
Disease stage	Early disease	10695	-	-
	Advanced/nodal disease	8748	***0.96 (0.93-0.99, p=0.008)***	0.98 (0.95-1.01, p=0.190)

Surgical capacity defined as patients booked for surgery undergoing an operation during the follow-up window. Percentages expressed of row total. SD=Standard deviation. ASA=American Society of Anaesthesiologists classification. ECOG=Eastern Cooperative Oncology Group. COVID=Coronavirus disease 2019. SARS-CoV-2=severe acute respiratory syndrome coronavirus 2. *Community SARS-CoV-2 rates were defined as the median 14-day cumulative case notification rate per 100,000 population between the date of local emergence of the pandemic up to the date of surgery for operated patients or cessation of follow-up (31st August 2020) for non-operated patients, and were stratified by World Bank income group to account for differences in access to SARS-CoV-2 testing and reporting across settings. Number in dataframe = 19832, Number in model = 19066, Missing = 766, Number of events = 17597, Concordance = 0.596 (SE = 0.003), R-squared = 0.095(Max possible = 1.000), Likelihood ratio test = 1893.143 (df = 18, p = 0.000).

Supplementary table 7a. Sensitivity analysis of factors associated with surgical capacity during COVID-19 (World Bank Income groups, with interaction term by COVID-19 stringency index group)

Factor	Levels	N=	HR (univariable)	HR (multivariable)
Full lockdown * Upper middle income	Interaction	-	***0.85 (0.74-0.99, p=0.033)***	***0.85 (0.73-0.99, p=0.031)***
Full lockdown * Lower middle income	Interaction	-	0.88 (0.75-1.02, p=0.096)	***0.83 (0.71-0.97, p=0.019)***
Moderate lockdown * Upper middle income	Interaction	-	***0.57 (0.47-0.68, p<0.001)***	***0.64 (0.54-0.77, p<0.001)***
Moderate lockdown * Lower middle income	Interaction	-	1.09 (0.88-1.34, p=0.430)	***1.29 (1.04-1.59, p=0.019)***
COVID-19 Stringency Index group	Light restrictions	4520	-	-
	Moderate lockdown	3622	***0.81 (0.77-0.85, p<0.001)***	***0.82 (0.78-0.86, p<0.001)***
	Full lockdown	11678	***0.48 (0.47-0.50, p<0.001)***	***0.52 (0.50-0.55, p<0.001)***
World Bank Income Classification	High income	15733	-	-
	Upper middle income	1864	***1.27 (1.11-1.45, p=0.001)***	***1.17 (1.02-1.34, p=0.021)***
	Lower middle income	2232	0.95 (0.83-1.10, p=0.511)	0.94 (0.81-1.08, p=0.396)
Age	<50 years	3669	-	-
	50-59 years	4102	***1.07 (1.02-1.13, p=0.003)***	***1.10 (1.05-1.15, p<0.001)***
	60-69 years	5362	***1.05 (1.00-1.10, p=0.037)***	***1.09 (1.04-1.14, p<0.001)***
	70-79 years	4804	***1.12 (1.07-1.17, p<0.001)***	***1.17 (1.11-1.23, p<0.001)***
	>80 years	1895	1.06 (1.00-1.12, p=0.066)	1.07 (1.00-1.14, p=0.067)
Sex	Female	11398	-	-
	Male	8434	***0.89 (0.86-0.92, p<0.001)***	0.99 (0.95-1.03, p=0.562)
ASA Grade	Grade 1-2	14033	-	-
	Grade 3-5	5722	0.98 (0.95-1.02, p=0.307)	0.98 (0.95-1.02, p=0.419)
ECOG Performance Score	0	11445	-	-
	1	5789	***0.93 (0.90-0.96, p<0.001)***	***0.96 (0.92-0.99, p=0.017)***
	≥2	2247	***0.90 (0.86-0.95, p<0.001)***	***0.89 (0.84-0.94, p<0.001)***
Current smoker	No	17521	-	-
	Yes	2311	1.04 (0.99-1.09, p=0.108)	1.04 (0.99-1.09, p=0.144)
Pre-existing respiratory condition	No	17591	-	-
	Yes	2241	1.02 (0.97-1.07, p=0.391)	0.98 (0.94-1.03, p=0.478)
Revised Cardiac Risk Index	0	6059	-	-
	1	10137	***0.90 (0.87-0.93, p<0.001)***	1.00 (0.94-1.07, p=0.897)
	2	2882	***0.87 (0.83-0.91, p<0.001)***	0.95 (0.88-1.03, p=0.221)
	≥3	754	***0.85 (0.78-0.92, p<0.001)***	0.90 (0.81-0.99, p=0.038)
Disease stage	Early disease	10695	-	-
	Advanced/nodal disease	8748	***0.96 (0.93-0.99, p=0.008)***	***0.96 (0.93-1.00, p=0.025)***
Cancer location	Head and neck	3505	-	-
	Colon	3419	***1.21 (1.15-1.27, p<0.001)***	***1.15 (1.07-1.23, p<0.001)***
	Rectal	1491	***0.63 (0.59-0.67, p<0.001)***	***0.58 (0.54-0.63, p<0.001)***
	Gastric	717	***0.69 (0.63-0.75, p<0.001)***	***0.67 (0.61-0.74, p<0.001)***
	Oesophageal	444	***0.33 (0.30-0.37, p<0.001)***	***0.32 (0.28-0.36, p<0.001)***
	Thoracic	1184	***0.93 (0.87-1.00, p=0.036)***	***0.82 (0.75-0.90, p<0.001)***
	Liver	762	***0.69 (0.63-0.75, p<0.001)***	***0.62 (0.57-0.69, p<0.001)***
	Pancreatic	749	***0.75 (0.69-0.82, p<0.001)***	***0.73 (0.66-0.81, p<0.001)***
	Sarcoma	426	***0.71 (0.64-0.79, p<0.001)***	***0.67 (0.59-0.75, p<0.001)***
	Prostate	522	***0.51 (0.47-0.57, p<0.001)***	***0.44 (0.40-0.50, p<0.001)***
	Kidney or upper tract urothelial	433	***0.72 (0.65-0.80, p<0.001)***	***0.65 (0.57-0.73, p<0.001)***
	Bladder	142	***0.59 (0.49-0.72, p<0.001)***	***0.52 (0.43-0.64, p<0.001)***
	Gynaecological	2159	0.95 (0.90-1.00, p=0.062)	***0.85 (0.79-0.92, p<0.001)***
	Breast	3879	***0.88 (0.84-0.92, p<0.001)***	0.98 (0.93-1.04, p=0.501)

Surgical capacity defined as patients booked for surgery undergoing an operation during the follow-up window. Percentages expressed of row total. SD=Standard deviation. ASA=American Society of Anaesthesiologists classification. ECOG=Eastern Cooperative Oncology Group. COVID=Coronavirus disease 2019. SARS-CoV-2=severe acute respiratory syndrome coronavirus 2. *Community SARS-CoV-2 rates were defined as the median 14-day cumulative case notification rate per 100,000 population between the date of local emergence of the pandemic up to the date of surgery for operated patients or cessation of follow-up (31st August 2020) for non-operated patients, and were stratified by World Bank income group to account for differences in access to SARS-CoV-2 testing and reporting across settings. Number in dataframe = 19832, Number in model = 19066, Missing = 766, Number of events = 17597, Concordance = 0.629 (SE = 0.002), R-squared = 0.149(Max possible = 1.000), Likelihood ratio test = 3082.513 (df = 35, p = 0.000)

Supplementary table 7b. Sensitivity analysis of factors associated with surgical capacity during COVID-19 (World Bank Income groups, with stratified hazard ratios by stringency index group)

Factor	Levels	N=	HR (univariable)	HR (multivariable)
COVID-19 Stringency Index group by income group	Light restrictions * High income	4088	-	-
	Light restrictions * Upper middle income	228	***1.27 (1.11-1.45, p=0.001)***	***1.17 (1.02-1.34, p=0.021)***
	Light restrictions * Lower middle income	204	0.95 (0.83-1.10, p=0.511)	0.94 (0.81-1.08, p=0.396)
	Moderate lockdown * High income	3116	***0.81 (0.77-0.85, p<0.001)***	***0.82 (0.78-0.86, p<0.001)***
	Moderate lockdown * Upper middle income	316	***0.58 (0.51-0.66, p<0.001)***	***0.62 (0.55-0.70, p<0.001)***
	Moderate lockdown * Lower middle income	190	0.84 (0.72-0.98, p=0.024)	1.00 (0.85-1.16, p=0.960)
	Full lockdown * High income	8529	***0.48 (0.47-0.50, p<0.001)***	***0.52 (0.50-0.55, p<0.001)***
	Full lockdown * Upper middle income	1311	***0.52 (0.49-0.56, p<0.001)***	***0.52 (0.49-0.56, p<0.001)***
	Full lockdown * Lower middle income	1838	***0.41 (0.38-0.43, p<0.001)***	***0.41 (0.38-0.44, p<0.001)***
Age	<50 years	3669	-	-
	50-59 years	4102	***1.07 (1.02-1.13, p=0.003)***	***1.10 (1.05-1.15, p<0.001)***
	60-69 years	5362	***1.05 (1.00-1.10, p=0.037)***	***1.09 (1.04-1.14, p<0.001)***
	70-79 years	4804	***1.12 (1.07-1.17, p<0.001)***	***1.17 (1.11-1.23, p<0.001)***
	>80 years	1895	1.06 (1.00-1.12, p=0.066)	1.07 (1.00-1.14, p=0.067)
Sex	Female	11398	-	-
	Male	8434	***0.89 (0.86-0.92, p<0.001)***	0.99 (0.95-1.03, p=0.562)
ASA Grade	Grade 1-2	14033	-	-
	Grade 3-5	5722	0.98 (0.95-1.02, p=0.307)	0.98 (0.95-1.02, p=0.419)
ECOG Performance Score	0	11445	-	-
	1	5789	***0.93 (0.90-0.96, p<0.001)***	***0.96 (0.92-0.99, p=0.017)***
	≥2	2247	***0.90 (0.86-0.95, p<0.001)***	***0.89 (0.84-0.94, p<0.001)***
Current smoker	No	17521	-	-
	Yes	2311	1.04 (0.99-1.09, p=0.108)	1.04 (0.99-1.09, p=0.144)
Pre-existing respiratory condition	No	17591	-	-
	Yes	2241	1.02 (0.97-1.07, p=0.391)	0.98 (0.94-1.03, p=0.478)
Revised Cardiac Risk Index	0	6059	-	-
	1	10137	***0.90 (0.87-0.93, p<0.001)***	1.00 (0.94-1.07, p=0.897)
	2	2882	***0.87 (0.83-0.91, p<0.001)***	0.95 (0.88-1.03, p=0.221)
	≥3	754	***0.85 (0.78-0.92, p<0.001)***	***0.90 (0.81-0.99, p=0.038)***
Disease stage	Early disease	10695	-	-
	Advanced/nodal disease	8748	***0.96 (0.93-0.99, p=0.008)***	***0.96 (0.93-1.00, p=0.025)***
Cancer location	Head and neck	3505	-	-
	Colon	3419	***1.21 (1.15-1.27, p<0.001)***	***1.15 (1.07-1.23, p<0.001)***
	Rectal	1491	***0.63 (0.59-0.67, p<0.001)***	***0.58 (0.54-0.63, p<0.001)***
	Gastric	717	***0.69 (0.63-0.75, p<0.001)***	***0.67 (0.61-0.74, p<0.001)***
	Oesophageal	444	***0.33 (0.30-0.37, p<0.001)***	***0.32 (0.28-0.36, p<0.001)***
	Thoracic	1184	***0.93 (0.87-1.00, p=0.036)***	***0.82 (0.75-0.90, p<0.001)***
	Liver	762	***0.69 (0.63-0.75, p<0.001)***	***0.62 (0.57-0.69, p<0.001)***
	Pancreatic	749	***0.75 (0.69-0.82, p<0.001)***	***0.73 (0.66-0.81, p<0.001)***
	Sarcoma	426	***0.71 (0.64-0.79, p<0.001)***	***0.67 (0.59-0.75, p<0.001)***
	Prostate	522	***0.51 (0.47-0.57, p<0.001)***	***0.44 (0.40-0.50, p<0.001)***
	Kidney or upper tract urothelial	433	***0.72 (0.65-0.80, p<0.001)***	***0.65 (0.57-0.73, p<0.001)***
	Bladder	142	***0.59 (0.49-0.72, p<0.001)***	***0.52 (0.43-0.64, p<0.001)***
	Gynaecological	2159	0.95 (0.90-1.00, p=0.062)	***0.85 (0.79-0.92, p<0.001)***
	Breast	3879	***0.88 (0.84-0.92, p<0.001)***	0.98 (0.93-1.04, p=0.501)

Surgical capacity defined as patients booked for surgery undergoing an operation during the follow-up window. Percentages expressed of row total. SD=Standard deviation. ASA=American Society of Anaesthesiologists classification. ECOG=Eastern Cooperative Oncology Group. COVID=Coronavirus disease 2019. SARS-CoV-2=severe acute respiratory syndrome coronavirus 2. *Community SARS-CoV-2 rates were defined as the median 14-day cumulative case notification rate per 100,000 population between the date of local emergence of the pandemic up to the date of surgery for operated patients or cessation of follow-up (31st August 2020) for non-operated patients, and were stratified by World Bank income group to account for differences in access to SARS-CoV-2 testing and reporting across settings. Number in dataframe = 19832, Number in model = 19066, Missing = 766, Number of events = 17597, Concordance = 0.629 (SE = 0.002), R-squared = 0.149(Max possible = 1.000), Likelihood ratio test = 3082.513 (df = 35, p = 0.000)

Supplementary table 9. Differences in proportions of patients in each age group across settings

	Age group									
	<50 years*		50-59 years		60-69 years		70-79 years		>80 years	
Status at cessation of follow-up **SARS-CoV-2 case notification rate group**	**Not operated**	**Operated**	**Not operated**	**Operated**	**Not operated**	**Operated**	**Not operated**	**Operated**	**Not operated**	**Operated**
High income, low COVID	10 (2.5)	685 (20.8)	9 (2.3)	925 (24.7)	13 (2.3)	1228 (25.3)	6 (1.4)	1135 (25.7)	7 (3.2)	445 (26.3)
High income, high COVID	153 (37.8)	1296 (39.4)	203 (51.0)	1904 (50.9)	390 (70.3)	2832 (58.2)	358 (84.4)	2905 (65.7)	193 (87.7)	1166 (69.0)
Upper middle income, low COVID	9 (2.2)	208 (6.3)	12 (3.0)	160 (4.3)	20 (3.6)	186 (3.8)	13 (3.1)	97 (2.2)	4 (1.8)	29 (1.7)
Upper middle income, high COVID	33 (8.1)	287 (8.7)	35 (8.8)	241 (6.4)	35 (6.3)	293 (6.0)	18 (4.2)	167 (3.8)	8 (3.6)	36 (2.1)
Lower middle income, low COVID	24 (5.9)	679 (20.7)	29 (7.3)	441 (11.8)	19 (3.4)	276 (5.7)	8 (1.9)	100 (2.3)	2 (0.9)	12 (0.7)
Lower middle income, high COVID	***176 (43.5)***	132 (4.0)	***110 (27.6)***	68 (1.8)	78 (14.1)	48 (1.0)	21 (5.0)	18 (0.4)	6 (2.7)	2 (0.1)

COVID=Coronavirus disease 2019. SARS-CoV-2=severe acute respiratory syndrome coronavirus 2. *Included patients <50 years of age, and 50-59 years of age were more likely to be from lower middle income countries. This may explain the reduced odds of patients <50 years undergoing surgery during the follow-up window (residual confounding after multivariable adjustment).

Supplementary table 10. Reasons that patients remained non-operated <50 versus >50 years of age

Reasons	<50 years (N=405)		≥ 50 years (N=1598)		Total
	N=	Proportion (%)	N=	Proportion (%)	N=
COVID-19 related					
Multidisciplinary team decision to delay surgery due to patient risk during COVID-19	335	***82.7%***	1121	70.2%	1456
Change to alternative treatment modality because of COVID-19	48	11.9%	485	30.4%	533
Patient choice to avoid surgery during COVID-19 pandemic	72	17.8%	388	24.3%	460
Ongoing neoadjuvant therapy (COVID-decision)	94	***23.2%***	284	17.8%	378
No bed/critical care bed/operating room space available due to COVID-19	87	***21.5%***	212	13.3%	299
Change of recommendations in society guidelines related to COVID-19	42	10.4%	178	11.1%	220
Patient unable to travel to hospital related to COVID- 19	67	***16.5%***	73	4.6%	140
Collateral impact on supporting services causing delay	3	0.7%	21	1.3%	24
Patient delayed due to SARS-CoV-2 infection	2	0.5%	21	1.3%	23
Died of COVID-19 whilst waiting for surgery	0	0.0%	13	0.8%	13
Not COVID-19 related					
Disease progression leading to change in treatment plan	10	2.5%	154	9.6%	164
Delay due to other medical or surgical condition	3	0.7%	56	3.5%	59
Died unrelated to COVID-19 whilst waiting for surgery	6	1.5%	29	1.8%	35
Patient unable to afford surgery	5	1.2%	19	1.2%	24
Patient choice to avoid surgery unrelated to COVID-19	5	***1.2%***	14	0.9%	19
Disease regression leading to change in definitive treatment plan	1	0.2%	7	0.4%	8

COVID=Coronavirus disease 2019. SARS-CoV-2=severe acute respiratory syndrome coronavirus 2. Reasons which were more common in the <50 years age group are highlighted in bold. Two patients (0.1%) had no reasons given for non-operation during the follow-up window selected (missing data). Proportions are therefore expressed as a percentage of 2001 non-operated patients with that reason given and with data available. We anticipated that decisions to delay or cancel surgery during COVID-19 would be complex. Therefore, selecting more than one reason for non-operation during the follow-up window for each patient was permitted. One patient could have both one or more COVID-19 related and not COVID-related reason(s) selected.

Supplementary table 11. Sensitivity analysis of primary model for factors associated with surgical capacity during COVID-19 (patients >50 years old only, N=16163)

Factor	Levels	N=	HR (univariable)	HR (multivariable)
COVID-19 Stringency Index group	Light restrictions	3745	-	-
	Moderate lockdown	3061	***0.78 (0.75-0.82, p<0.001)***	***0.81 (0.77-0.85, p<0.001)***
	Full lockdown	9345	***0.48 (0.46-0.50, p<0.001)***	***0.52 (0.49-0.54, p<0.001)***
World Bank Income Classification	High income	13603	-	-
	Upper middle income	1331	***0.93 (0.88-0.99, p=0.017)***	0.95 (0.90-1.01, p=0.113)
	Lower middle income	1226	***0.78 (0.73-0.84, p<0.001)***	***0.87 (0.81-0.93, p<0.001)***
Age	50-59 years	4102	-	-
	60-69 years	5362	0.98 (0.94-1.02, p=0.272)	0.99 (0.95-1.04, p=0.795)
	70-79 years	4804	***1.04 (1.00-1.09, p=0.048)***	***1.07 (1.02-1.12, p=0.005)***
	>80 years	1895	0.98 (0.93-1.04, p=0.580)	0.97 (0.91-1.04, p=0.374)
Sex	Female	8828	-	-
	Male	7335	***0.88 (0.85-0.91, p<0.001)***	0.98 (0.94-1.02, p=0.404)
ASA Grade	Grade 1-2	10750	-	-
	Grade 3-5	5345	0.97 (0.93-1.00, p=0.056)	0.99 (0.95-1.03, p=0.529)
ECOG Performance Score	0	8578	-	-
	1	5160	***0.93 (0.89-0.96, p<0.001)***	***0.95 (0.92-0.99, p=0.014)***
	≥2	2122	***0.90 (0.86-0.95, p<0.001)***	***0.89 (0.84-0.94, p<0.001)***
Current smoker	No	14315	-	-
	Yes	1848	1.04 (0.99-1.10, p=0.114)	1.02 (0.97-1.08, p=0.385)
Pre-existing respiratory condition	No	14108	-	-
	Yes	2055	0.99 (0.94-1.04, p=0.686)	0.98 (0.93-1.03, p=0.393)
Revised Cardiac Risk Index	0	4079	-	-
	1	8581	***0.84 (0.81-0.87, p<0.001)***	1.01 (0.94-1.08, p=0.767)
	2	2756	***0.81 (0.77-0.85, p<0.001)***	0.96 (0.89-1.04, p=0.339)
	≥3	747	***0.79 (0.72-0.85, p<0.001)***	0.90 (0.81-1.01, p=0.069)
Disease stage	Early disease	8758	-	-
	Advanced/nodal disease	7109	***0.96 (0.93-1.00, p=0.030)***	***0.95 (0.92-0.99, p=0.007)***
Cancer location	Head and neck	2598	-	-
	Colon	3125	***1.10 (1.04-1.16, p=0.001)***	***1.10 (1.02-1.18, p=0.015)***
	Rectal	1307	***0.59 (0.55-0.63, p<0.001)***	***0.57 (0.53-0.63, p<0.001)***
	Gastric	610	***0.64 (0.58-0.70, p<0.001)***	***0.65 (0.58-0.72, p<0.001)***
	Oesophageal	408	***0.30 (0.26-0.34, p<0.001)***	***0.30 (0.26-0.34, p<0.001)***
	Thoracic	1099	***0.85 (0.79-0.92, p<0.001)***	***0.80 (0.73-0.87, p<0.001)***
	Liver	682	***0.64 (0.59-0.70, p<0.001)***	***0.61 (0.55-0.67, p<0.001)***
	Pancreatic	643	***0.70 (0.63-0.76, p<0.001)***	***0.70 (0.63-0.78, p<0.001)***
	Sarcoma	261	***0.64 (0.56-0.73, p<0.001)***	***0.60 (0.52-0.69, p<0.001)***
	Prostate	513	***0.47 (0.42-0.52, p<0.001)***	***0.43 (0.38-0.48, p<0.001)***
	Kidney or upper tract urothelial	370	***0.66 (0.58-0.74, p<0.001)***	***0.62 (0.54-0.70, p<0.001)***
	Bladder	127	***0.51 (0.42-0.63, p<0.001)***	***0.46 (0.37-0.57, p<0.001)***
	Gynaecological	1669	***0.87 (0.82-0.93, p<0.001)***	***0.81 (0.75-0.89, p<0.001)***
	Breast	2751	***0.83 (0.78-0.87, p<0.001)***	0.96 (0.90-1.02, p=0.164)

Surgical capacity defined as patients booked for surgery undergoing an operation during the follow-up window. Percentages expressed of row total. SD=Standard deviation. ASA=American Society of Anaesthesiologists classification. ECOG=Eastern Cooperative Oncology Group. COVID=Coronavirus disease 2019. SARS-CoV-2=severe acute respiratory syndrome coronavirus 2. *Community SARS-CoV-2 rates were defined as the median 14-day cumulative case notification rate per 100,000 population between the date of local emergence of the pandemic up to the date of surgery for operated patients or cessation of follow-up (31st August 2020) for non-operated patients, and were stratified by World Bank income group to account for differences in access to SARS-CoV-2 testing and reporting across settings. Number in dataframe = 16163, Number in model = 15539, Missing = 624, Number of events = 14369, Concordance = 0.629 (SE = 0.003), R-squared = 0.152(Max possible = 1.000), Likelihood ratio test = 2566.579 (df = 30, p = 0.000)

Supplementary table 12. Non-operation rate during lockdowns across SARS-CoV-2 rate groups

	Full lockdown		Moderate lockdown		Light restrictions	
SARS-CoV-2 case notification rate group	**Operated**	**Not operated**	**Operated**	**Not operated**	**Operated**	**Not operated**
High income, low COVID	345 (94.0)	22 (6.0)	1138 (99.5)	6 (0.5)	2935 (99.4)	17 (0.6)
High income, high COVID	7111 (85.9)	1166 (14.1)	1860 (93.7)	126 (6.3)	1132 (99.6)	5 (0.4)
Upper middle income, low COVID	245 (93.5)	17 (6.5)	208 (83.9)	40 (16.1)	227 (99.6)	1 (0.4)
Upper middle income, high COVID	945 (88.6)	122 (11.4)	70 (90.9)	7 (9.1)	0 (0.0)	0 (0.0)
Lower middle income, low COVID	1138 (94.4)	67 (5.6)	169 (93.4)	12 (6.6)	201 (98.5)	3 (1.5)
Lower middle income, high COVID	268 (41.3)	381 (58.7)	0 (0.0)	10 (100.0)	0 (0.0)	0 (0.0)

COVID=Coronavirus disease 2019.

Supplementary table 13. Secondary analysis of factors associated with surgical capacity during COVID-19 (SARS-CoV-2 case notification rate groups)

Factor	Levels	N=	HR (univariable)	HR (multivariable)
COVID-19 Stringency Index group	Light restrictions	4520	-	-
	Moderate lockdown	3622	***0.78 (0.74-0.81, p<0.001)***	***0.84 (0.80-0.88, p<0.001)***
	Full lockdown	11678	***0.47 (0.46-0.49, p<0.001)***	***0.57 (0.54-0.60, p<0.001)***
Community SARS-CoV-2 case notification rate*	High income, low COVID	4459	-	-
	High income, high COVID	11274	***0.60 (0.58-0.62, p<0.001)***	***0.89 (0.85-0.93, p<0.001)***
	Upper middle income, low COVID	727	***0.77 (0.71-0.83, p<0.001)***	***0.91 (0.84-0.99, p=0.030)***
	Upper middle income, high COVID	1137	***0.57 (0.53-0.61, p<0.001)***	***0.85 (0.78-0.92, p<0.001)***
	Lower middle income, low COVID	1587	***0.76 (0.72-0.80, p<0.001)***	1.06 (0.99-1.14, p=0.076)
	Lower middle income, high COVID	645	***0.17 (0.15-0.20, p<0.001)***	***0.27 (0.24-0.31, p<0.001)***
Age	<50 years	3669	-	-
	50-59 years	4102	***1.07 (1.02-1.13, p=0.003)***	***1.11 (1.05-1.16, p<0.001)***
	60-69 years	5362	***1.05 (1.00-1.10, p=0.037)***	***1.09 (1.04-1.15, p<0.001)***
	70-79 years	4804	***1.12 (1.07-1.17, p<0.001)***	***1.18 (1.12-1.24, p<0.001)***
	>80 years	1895	1.06 (1.00-1.12, p=0.066)	1.06 (1.00-1.14, p=0.067)
Sex	Female	11398	-	-
	Male	8434	***0.89 (0.86-0.92, p<0.001)***	1.00 (0.97-1.04, p=0.938)
ASA Grade	Grade 1-2	14033	-	-
	Grade 3-5	5722	0.98 (0.95-1.02, p=0.307)	0.98 (0.94-1.02, p=0.267)
ECOG Performance Score	0	11445	-	-
	1	5789	***0.93 (0.90-0.96, p<0.001)***	***0.94 (0.91-0.98, p=0.002)***
	≥2	2247	***0.90 (0.86-0.95, p<0.001)***	***0.90 (0.85-0.95, p<0.001)***
Current smoker	No	17521	-	-
	Yes	2311	1.04 (0.99-1.09, p=0.108)	***1.05 (1.00-1.10, p=0.039)***
Pre-existing respiratory condition	No	17591	-	-
	Yes	2241	1.02 (0.97-1.07, p=0.391)	0.98 (0.93-1.03, p=0.417)
Revised Cardiac Risk Index	0	6059	-	-
	1	10137	***0.90 (0.87-0.93, p<0.001)***	1.00 (0.94-1.06, p=0.938)
	2	2882	***0.87 (0.83-0.91, p<0.001)***	0.94 (0.87-1.02, p=0.120)
	≥3	754	***0.85 (0.78-0.92, p<0.001)***	***0.88 (0.80-0.98, p=0.021)***
Disease stage	Early disease	10695	-	-
	Advanced/nodal disease	8748	0.96 (0.93-0.99, p=0.008)	***0.96 (0.93-0.99, p=0.012)***
Cancer location	Head and neck	3505	-	-
	Colon	3419	***1.21 (1.15-1.27, p<0.001)***	***1.13 (1.05-1.21, p=0.001)***
	Rectal	1491	***0.63 (0.59-0.67, p<0.001)***	***0.57 (0.52-0.62, p<0.001)***
	Gastric	717	***0.69 (0.63-0.75, p<0.001)***	***0.65 (0.59-0.72, p<0.001)***
	Oesophageal	444	***0.33 (0.30-0.37, p<0.001)***	***0.30 (0.27-0.35, p<0.001)***
	Thoracic	1184	***0.93 (0.87-1.00, p=0.036)***	***0.80 (0.73-0.87, p<0.001)***
	Liver	762	***0.69 (0.63-0.75, p<0.001)***	***0.60 (0.55-0.66, p<0.001)***
	Pancreatic	749	***0.75 (0.69-0.82, p<0.001)***	***0.70 (0.64-0.78, p<0.001)***
	Sarcoma	426	***0.71 (0.64-0.79, p<0.001)***	***0.63 (0.56-0.71, p<0.001)***
	Prostate	522	***0.51 (0.47-0.57, p<0.001)***	***0.42 (0.37-0.47, p<0.001)***
	Kidney or upper tract urothelial	433	***0.72 (0.65-0.80, p<0.001)***	***0.61 (0.54-0.69, p<0.001)***
	Bladder	142	***0.59 (0.49-0.72, p<0.001)***	***0.50 (0.41-0.62, p<0.001)***
	Gynaecological	2159	0.95 (0.90-1.00, p=0.062)	***0.85 (0.78-0.91, p<0.001)***
	Breast	3879	***0.88 (0.84-0.92, p<0.001)***	***0.91 (0.86-0.96, p<0.001)***

Surgical capacity defined as patients booked for surgery undergoing an operation during the follow-up window. Percentages expressed of row total. SD=Standard deviation. ASA=American Society of Anaesthesiologists classification. ECOG=Eastern Cooperative Oncology Group. COVID=Coronavirus disease 2019. SARS-CoV-2=severe acute respiratory syndrome coronavirus 2. *Community SARS-CoV-2 rates were defined as the median 14-day cumulative case notification rate per 100,000 population between the date of local emergence of the pandemic up to the date of surgery for operated patients or cessation of follow-up (31st August 2020) for non-operated patients, and were stratified by World Bank income group to account for differences in access to SARS-CoV-2 testing and reporting across settings. Number in dataframe = 19832, Number in model = 19066, Missing = 766, Number of events = 17597, Concordance = 0.636 (SE = 0.002), R-squared = 0.171(Max possible = 1.000), Likelihood ratio test = 3574.260 (df = 34, p = 0.000)

Supplementary table 14. Treatment intervals across SARS-CoV-2 case notification rate groups

Interval diagnosis to surgery	High income, low COVID	High income, high COVID	Upper middle income, low COVID	Upper middle income, high COVID	Lower middle income, low COVID	Lower middle income, high COVID	P-value
Straight to surgery							
0-4 weeks	1263 (31.2)	2318 (26.6)	228 (37.9)	302 (32.5)	545 (49.5)	70 (33.0)	***<0.001***
5-8 weeks	1755 (43.4)	3111 (35.6)	175 (29.1)	207 (22.3)	295 (26.8)	53 (25.0)	
9-12 weeks	596 (14.7)	1632 (18.7)	99 (16.4)	131 (14.1)	121 (11.0)	22 (10.4)	
>12 weeks	432 (10.7)	1669 (19.1)	100 (16.6)	290 (31.2)	139 (12.6)	67 (31.6)	
Neoadjuvant therapy (standard care)							
0-4 weeks	29 (8.9)	64 (6.9)	7 (9.7)	1 (1.6)	7 (2.3)	2 (5.1)	***<0.001***
5-8 weeks	25 (7.7)	48 (5.1)	6 (8.3)	2 (3.2)	14 (4.6)	0 (0.0)	
9-12 weeks	37 (11.4)	73 (7.8)	11 (15.3)	4 (6.5)	15 (4.9)	1 (2.6)	
>12 weeks	234 (72.0)	749 (80.2)	48 (66.7)	55 (88.7)	268 (88.2)	36 (92.3)	
Neoadjuvant therapy (COVID decision)							
0-4 weeks	10 (21.3)	20 (4.6)	0 (0.0)	1 (3.1)	2 (1.9)	1 (5.9)	***<0.001***
5-8 weeks	10 (21.3)	78 (17.8)	0 (0.0)	2 (6.2)	6 (5.8)	3 (17.6)	
9-12 weeks	8 (17.0)	104 (23.7)	2 (33.3)	5 (15.6)	18 (17.3)	2 (11.8)	
>12 weeks	19 (40.4)	237 (54.0)	4 (66.7)	24 (75.0)	78 (75.0)	11 (64.7)	

Percentages presented by column total. COVID=Coronavirus disease 2019.

Supplementary table 15. System friction during lockdowns

Interval	Summary	Light restrictions	Moderate lockdown	Full lockdown	P-value
Straight to surgery					
Weeks diagnosis to operation	Mean (SD)	5.7 (4.4)	5.9 (4.6)	7.8 (5.9)	***<0.001***
Weeks diagnosis to decision	Mean (SD)	2.8 (3.5)	2.7 (3.5)	3.1 (3.9)	***<0.001***
Weeks decision to operation	Mean (SD)	2.9 (2.4)	3.2 (2.8)	4.7 (4.5)	***<0.001***
Neoadjuvant therapy (standard care)					
Weeks diagnosis to operation	Mean (SD)	15.3 (8.1)	15.8 (7.0)	17.4 (6.1)	***<0.001***
Weeks diagnosis to decision	Mean (SD)	11.6 (8.3)	9.7 (8.4)	9.7 (30.3)	0.488
Weeks decision to operation	Mean (SD)	3.7 (3.0)	6.1 (5.4)	9.4 (30.1)	***0.001***
Neoadjuvant therapy (COVID decision)					
Weeks diagnosis to operation	Mean (SD)	8.4 (6.5)	9.9 (6.2)	14.7 (6.1)	***<0.001***
Weeks diagnosis to decision	Mean (SD)	4.8 (6.9)	3.6 (5.8)	4.9 (5.8)	0.214
Weeks decision to operation	Mean (SD)	3.6 (3.3)	6.3 (4.6)	9.8 (5.9)	***<0.001***

Supplementary table 16. Characteristics of operated patients that went straight to surgery (no neoadjuvant therapy) grouped by time from diagnosis to operation (N=15622)

		Interval diagnosis to surgery				
Factor	**Levels**	**0-4 weeks**	**5-8 weeks**	**9-12 weeks**	**>12 weeks**	**P-value**
Health system factors						
COVID-19 Stringency Index group	Light restrictions	1372 (33.0)	1813 (43.7)	588 (14.2)	379 (9.1)	***<0.001***
	Moderate lockdown	1020 (33.4)	1244 (40.7)	476 (15.6)	317 (10.4)	
	Full lockdown	2333 (27.8)	2533 (30.1)	1535 (18.3)	2001 (23.8)	
Weeks in full lockdown	Mean (SD)	7.2 (4.9)	6.8 (4.8)	7.7 (4.5)	10.0 (5.0)	***<0.001***
World Bank Income Classification	High income	3581 (28.0)	4866 (38.1)	2228 (17.4)	2101 (16.4)	***<0.001***
	Upper middle income	530 (34.6)	382 (24.9)	230 (15.0)	390 (25.5)	
	Lower middle income	615 (46.9)	348 (26.5)	143 (10.9)	206 (15.7)	
SARS-CoV-2 case notification rate	High income, low COVID	1263 (31.2)	1755 (43.4)	596 (14.7)	432 (10.7)	***<0.001***
	High income, high COVID	2318 (26.6)	3111 (35.6)	1632 (18.7)	1669 (19.1)	
	Upper middle income, low COVID	228 (37.9)	175 (29.1)	99 (16.4)	100 (16.6)	
	Upper middle income, high COVID	302 (32.5)	207 (22.3)	131 (14.1)	290 (31.2)	
	Lower middle income, low COVID	545 (49.5)	295 (26.8)	121 (11.0)	139 (12.6)	
	Lower middle income, high COVID	70 (33.0)	53 (25.0)	22 (10.4)	67 (31.6)	
Patient factors						
Age	<50 years	940 (35.1)	852 (31.8)	409 (15.3)	480 (17.9)	***<0.001***
	50-59 years	1003 (31.5)	1174 (36.8)	493 (15.5)	519 (16.3)	
	60-69 years	1234 (29.2)	1525 (36.0)	723 (17.1)	749 (17.7)	
	70-79 years	1087 (27.7)	1501 (38.2)	698 (17.8)	644 (16.4)	
	>80 years	463 (29.1)	545 (34.3)	278 (17.5)	305 (19.2)	
Sex	Female	2726 (30.2)	3464 (38.4)	1441 (16.0)	1386 (15.4)	***<0.001***
	Male	2001 (30.3)	2133 (32.3)	1160 (17.6)	1311 (19.8)	
ASA Grade	ASA grade 1-2	3406 (30.9)	4005 (36.4)	1746 (15.9)	1853 (16.8)	***<0.001***
	ASA grade 3-5	1312 (28.6)	1576 (34.4)	851 (18.6)	841 (18.4)	
	Missing	9	19	5	3	
ECOG Performance Score	0	2778 (30.4)	3335 (36.5)	1439 (15.8)	1573 (17.2)	***0.002***
	1	1332 (29.6)	1590 (35.4)	810 (18.0)	764 (17.0)	
	≥2	560 (32.1)	567 (32.5)	297 (17.0)	321 (18.4)	
	Missing	60	110	68	69	
Current smoker	No	4153 (30.1)	4931 (35.7)	2294 (16.6)	2424 (17.6)	0.054
	Yes	574 (31.5)	666 (36.6)	307 (16.9)	273 (15.0)	
Pre-existing respiratory condition	No	4249 (30.8)	4920 (35.7)	2262 (16.4)	2355 (17.1)	***<0.001***
	Yes	478 (26.0)	677 (36.9)	339 (18.5)	342 (18.6)	
Revised Cardiac Risk Index	0	1534 (32.4)	1810 (38.3)	751 (15.9)	637 (13.5)	***<0.001***
	1	2372 (29.7)	2814 (35.3)	1310 (16.4)	1485 (18.6)	
	2	654 (28.6)	775 (33.9)	429 (18.8)	430 (18.8)	
	≥3	167 (26.9)	198 (31.9)	111 (17.9)	145 (23.3)	
Disease factors						
Disease stage	Early disease	2434 (27.0)	3271 (36.3)	1613 (17.9)	1685 (18.7)	***<0.001***
	Advanced/nodal disease	2271 (34.7)	2300 (35.1)	981 (15.0)	1002 (15.3)	
	Missing	22	29	9	12	
Cancer site	Head and neck	1011 (33.2)	1083 (35.6)	486 (16.0)	461 (15.2)	***<0.001***
	Colon	1221 (38.6)	1004 (31.7)	503 (15.9)	439 (13.9)	
	Rectal	232 (26.5)	306 (35.0)	130 (14.9)	206 (23.6)	
	Gastric	149 (32.7)	126 (27.6)	76 (16.7)	105 (23.0)	
	Oesophageal	26 (22.8)	32 (28.1)	13 (11.4)	43 (37.7)	
	Thoracic	242 (23.3)	427 (41.1)	187 (18.0)	184 (17.7)	
	Liver	98 (16.5)	182 (30.6)	153 (25.7)	162 (27.2)	
	Pancreatic	203 (35.4)	187 (32.6)	86 (15.0)	98 (17.1)	
	Sarcoma	78 (27.3)	79 (27.6)	57 (19.9)	72 (25.2)	
	Prostate	20 (5.0)	86 (21.4)	82 (20.4)	213 (53.1)	
	Kidney or upper tract urothelial	87 (23.4)	124 (33.3)	70 (18.8)	91 (24.5)	
	Bladder	14 (14.4)	39 (40.2)	27 (27.8)	17 (17.5)	
	Gynaecological	515 (28.4)	750 (41.4)	261 (14.4)	287 (15.8)	
	Breast	831 (29.8)	1172 (42.0)	470 (16.8)	319 (11.4)	
Treatment factors						
Operation grade	Major	3658 (29.7)	4303 (34.9)	2060 (16.7)	2297 (18.6)	***<0.001***
	Minor	1042 (32.4)	1268 (39.4)	530 (16.5)	381 (11.8)	
	Missing	21	22	10	18	

Percentages expressed of row total. SD=Standard deviation. ASA=American Society of Anaesthesiologists classification. ECOG=Eastern Cooperative Oncology Group. COVID=Coronavirus disease 2019. SARS-CoV-2=severe acute respiratory syndrome coronavirus 2.

Supplementary table 17. Outcomes by interval from diagnosis to operation for patients going straight to surgery (N=15622)

		Interval diagnosis to surgery					
Outcome	**Levels**	**0-4 weeks**	**5-8 weeks**	**9-12 weeks**	**>12 weeks**	**Total**	**P-value**
Margin status	R0	4043 (85.6)	4791 (85.8)	2222 (85.2)	2280 (84.7)	13336 (85.1)	***0.019***
	R1	328 (6.9)	441 (7.9)	202 (7.9)	217 (8.1)	1188 (7.7)	
	R2	100 (2.1)	107 (1.9)	53 (2.0)	37 (1.4)	297 (1.9)	
	Pathology unavailable	251 (5.3)	247 (4.4)	116 (4.5)	154 (5.7)	768 (4.9)	
	Missing	5	11	8	9	33	
Resectable disease at time of surgery	Resectable	4553 (96.3)	5508 (98.4)	2554 (98.2)	2645 (98.1)	15260 (97.7)	***<0.001***
	Unresectable	173 (3.7)	87 (1.6)	46 (1.8)	52 (1.9)	358 (2.3)	
	Unknown	1 (0.0)	2 (0.0)	1 (0.0)	0 (0.0)	4 (0.0)	
Pre-operative cancer-related complication requiring emergency surgery	Elective	4468 (94.7)	5547 (99.2)	2581 (99.4)	2674 (99.4)	15270 (97.9)	***<0.001***
	Emergency	252 (5.3)	43 (0.8)	16 (0.6)	15 (0.6)	326 (2.1)	
30-day SARS-CoV-2 infection rate	No	4685 (99.1)	5557 (99.3)	2577 (99.1)	2676 (99.2)	15495 (99.2)	0.698
	Yes	42 (0.9)	40 (0.7)	24 (0.9)	21 (0.8)	127 (0.8)	
30-day postoperative mortality rate	No	4652 (98.5)	5533 (98.9)	2570 (98.9)	2659 (98.9)	15414 (98.8)	***0.008***
	Yes	73 (1.5)	62 (1.1)	29 (1.1)	31 (1.1)	195 (1.2)	
	Missing	2	2	2	7	13	
New detection of metastatic disease*	No	2694 (98.1)	2967 (97.8)	1454 (98.7)	1656 (98.4)	8771 (98.1)	0.085
	Yes	51 (1.9)	66 (2.3)	18 (1.3)	24 (1.6)	159 (1.9)	
	Missing	4	5	4	14	27	

COVID=Coronavirus disease 2019. SARS-CoV-2=severe acute respiratory syndrome coronavirus 2. Resection margin status classified as R0=No microscopic or macroscopic disease, R1=Microscopic disease at the margin, R2=Macroscopic disease at the margin. *Detailed data on detection of new metastatic disease not collected for liver, pancreatic, breast and gynaecological cancers. Patients with metastatic disease at baseline removed from denominator (N=8957). Chi-squared tests do not include missing data. Percentages presented by column total.

Supplementary table 18. Outcomes across SARS-CoV-2 case notification rate groups for patients going straight to surgery (no neoadjuvant therapy) (N=15622)

		SARS-CoV-2 case notification rate group							
Outcome	**Levels**	**High income, low COVID**	**High income, high COVID**	**Upper middle income, low COVID**	**Upper middle income, high COVID**	**Lower middle income, low COVID**	**Lower middle income, high COVID**	**Total**	**P-value**
Margin status	R0	3397 (84.1)	7462 (85.7)	509 (84.8)	797 (85.9)	975 (88.8)	194 (91.5)	13334 (85.5)	***<0.001***
	R1	372 (9.2)	683 (7.8)	35 (5.8)	66 (7.1)	28 (2.6)	4 (1.9)	1188 (7.7)	
	R2	90 (2.2)	144 (1.6)	14 (2.3)	30 (3.2)	17 (1.5)	2 (0.9)	297 (1.9)	
	Pathology unavailable	182 (4.5)	420 (4.8)	43 (7.1)	35 (3.8)	76 (7.0)	12 (5.7)	768 (4.9)	
	Missing	5	21	1	2	4	0	33	
Resectable disease at time of surgery	Resectable	3970 (98.1)	8567 (98.1)	580 (96.3)	895 (96.2)	1040 (94.5)	206 (97.2)	15258 (97.7)	***<0.001***
	Unresectable	74 (1.8)	161 (1.8)	22 (3.7)	35 (3.8)	60 (5.5)	6 (2.8)	358 (2.3)	
	Unknown	2 (0.0)	2 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	4 (0.0)	
Pre-operative cancer-related complication requiring emergency surgery	Elective	3978 (98.4)	8562 (98.3)	581 (97.0)	893 (96.0)	1052 (95.7)	202 (95.3)	15268 (97.9)	***<0.001***
	Emergency	63 (1.6)	151 (1.7)	18 (3.0)	37 (4.0)	47 (4.3)	10 (4.7)	326 (2.1)	
30-day SARS-CoV-2 infection rate	No	3988 (98.6)	8697 (99.6)	601 (99.8)	916 (98.5)	1081 (98.3)	210 (99.1)	15493 (99.2)	***<0.001***
	Yes	58 (1.4)	33 (0.4)	1 (0.2)	14 (1.5)	19 (1.7)	2 (0.9)	127 (0.8)	
30-day postoperative mortality rate	No	3980 (98.4)	8641 (99.1)	594 (98.7)	917 (98.6)	1074 (97.6)	206 (97.2)	15412 (98.8)	***<0.001***
	Yes	65 (1.6)	77 (0.9)	8 (1.3)	13 (1.4)	26 (2.4)	6 (2.8)	195 (1.2)	
	Missing	1	12	0	0	0	0	13	
New detection of metastatic disease*	No	2223 (98.1)	5105 (98.2)	266 (97.4)	541 (97.7)	510 (97.9)	124 (98.4)	8769 (98.1)	0.741
	Yes	42 (1.9)	85 (1.8)	7 (2.6)	13 (2.3)	10 (2.1)	2 (1.6)	159 (1.9)	
	Missing	6	18	0	0	3	0	27	

COVID=Coronavirus disease 2019. SARS-CoV-2=severe acute respiratory syndrome coronavirus 2. Resection margin status classified as R0=No microscopic or macroscopic disease, R1=Microscopic disease at the margin, R2=Macroscopic disease at the margin. *Detailed data on detection of new metastatic disease not collected for liver, pancreatic, breast and gynaecological cancers. Patients with metastatic disease at baseline removed from denominator (N=8957). Percentages presented by column total.

Appendix A. Collaborating author list (PubMed citable). Full details of principal investigators and contact details available upon request.

Writing Group

James C Glasbey (UK), Adesoji Ademuyiwa (Nigeria), Adewale Adisa (Nigeria), Ehab AlAmeer (Saudi Arabia), Alexis P Arnaud (France), Faris Ayasra (Jordan), José Azevedo (Portugal), Ana Minaya Bravo (Spain), Ainhoa Costas-Chavarri (Rwanda), John Edwards (UK), Muhammed Elhadi (Libya), Marco Fiore (Italy), Christina Fotopoulou (UK), Gaetano Gallo (Italy), Dhruva Ghosh (India), Ewen A Griffiths (UK), Ewen Harrison (UK), Peter Hutchinson (UK), Ismail Lawani (Benin), Samuel Lawday (UK), Hans Lederhuber (Germany), Sezai Leventoglu (Turkey), Elizabeth Li (UK), Gustavo Mendonça Ataíde Gomes (Brazil), Harvinder Mann (UK), Ella J Marson (UK), Janet Martin (Canada), Dennis Mazingi (Zimbabwe), Kenneth McLean (UK), Maria Modolo (Argentina), Rachel Moore (South Africa), Dion Morton (UK), Faustin Ntirenganya (Rwanda), Francesco Pata (Italy), Maria Picciochi (Portugal), Peter Pockney (Australia), Antonio Ramos-De la Medina (Mexico), Keith Roberts (UK), April Camilla Roslani (Malaysia), Rajkumar Kottayasamy Seenivasagam (India), Richard Shaw (UK), Joana Filipa Ferreira Simões (UK), Neil Smart (UK), Grant D. Stewart (UK), Richard Sullivan (UK), Sudha Sundar (UK), Stephen Tabiri (Ghana), Elliott H Taylor (UK), Raghavan Vidya (UK), Dmitri Nepogodiev (UK), Aneel A Bhangu (UK, ***Overall Guarantor***).

Statistical analysis and data handling

James C Glasbey, Kenneth A McLean, Dmitri Nepogodiev, Ewen Harrison, Aneel A Bhangu

CovidSurg Operations Committee

Dmitri Nepogodiev (***Chair***), Kwabena Siaw-Acheampong, Ruth A Benson, Edward Bywater, Daoud Chaudhry, Brett E Dawson, Jonathan P Evans, James C Glasbey, Rohan R Gujjuri, Emily Heritage, Conor S Jones, Sivesh K Kamarajah, Chetan Khatri, Rachel A Khaw, James M Keatley, Andrew Knight, Samuel Lawday, Elizabeth Li, Harvinder S Mann, Ella J Marson, Kenneth A McLean, Siobhan C Mckay, Emily C Mills, Gianluca Pellino, Maria Picciochi, Elliott H Taylor, Abhinav Tiwari, Joana FF Simoes, Isobel M Trout, Mary L Venn, Richard JW Wilkin, Aneel Bhangu.

*International Cancer Leads (*denotes specialty Principal Investigators)*

James C Glasbey (***Chair***); **Colorectal:** Neil J Smart*, Ana Minaya-Bravo*, Jonathan P Evans, Gaetano Gallo, Susan Moug, Francesco Pata, Peter Pockney, Salomone Di Saverio, Abigail Vallance, Dale Vimalchandran; **Oesophagogastric**: Ewen A Griffiths*, Sivesh K Kamarajah, Richard PT Evans, Philip Townend; **Hepatopancreatobilary**: Keith Roberts*, Siobhan McKay*, John Isaac, Sohei Satoi; **Thoracic:** John Edwards*, Aman S Coonar, Adrian Marchbank, Edward J Caruana, Georgia R Layton, Akshay Patel, Alessandro Brunelli; **Sarcoma:** Samuel Ford*, Anant Desai*, Alessandro Gronchi*, Marco Fiore*, Max Almond, Fabio Tirotta, Sinziana Dumitra; **Neurosurgery:** Angelos Kolias*, Stephen J Price, Daniel M Fountain, Michael D Jenkinson, Peter Hutchinson, Hani J Marcus, Rory J Piper, Laura Lippa, Franco Servadei, Ignatius Esene, Christian Freyschlag, Iuri Neville, Gail Rosseau, Karl Schaller, Andreas K Demetriades, Faith Robertson, Alex Alamri; **Head and neck:** Richard Shaw*, Andrew G Schache, Stuart C

Winter, Michael Ho, Paul Nankivell, Juan Rey Biel, Martin Batstone, Ian Ganly; **Breast:** Raghavan Vidya*, Alex Wilkins, Jagdeep K Singh, Dinesh Thekinkattil; **Gynaecology:** Sudha Sundar*, Christina Fotopoulou*, Elaine YL Leung, Tabassum Khan, Luis Chiva, Jalid Sehouli, Anna Fagotti, Paul Cohen, Murat Gutelkin, Rahel Ghebre, Thomas Konney, Rene Pareja, Rob Bristow, Sean Dowdy, Shylasree TS, Rajkumar Kottayasamy Seenivasagam, Joe Ng, Keiichi Fujiwara; **Urology:** Grant D Stewart*, Benjamin Lamb, Krishna Narahari, Alan McNeill, Alexandra Colquhoun, John S McGrath, Steve Bromage, Ravi Barod, Veeru Kasivisvanathan*, Tobias Klatte.

Dissemination Committee

Joana FF Simoes (***Chair***); Tom EF Abbott, Sadi Abukhalaf, Michel Adamina, Adesoji O Ademuyiwa, Arnav Agarwal, Murat Akkulak, Ehab Alameer, Derek Alderson, Felix Alakaloko, Markus Albertsmeier, Osaid Alser, Muhammad Alshaar, Sattar Alshryda, Alexis P Arnaud, Knut Magne Augestad, Faris Ayasra, José Azevedo, Brittany K Bankhead-Kendall, Emma Barlow, David Beard, Ruth A Benson, Ruth Blanco-Colino, Amanpreet Brar, Ana Minaya-Bravo, Kerry A Breen, Chris Bretherton, Igor Lima Buarque, Joshua Burke, Edward J Caruana, Mohammad Chaar, Sohini Chakrabortee, Peter Christensen, Daniel Cox, Moises Cukier, Miguel F Cunha, Giana H Davidson, Anant Desai, Salomone Di Saverio, Thomas M Drake, John G Edwards, Muhammed Elhadi, Sameh Emile, Shebani Farik, Marco Fiore, J Edward Fitzgerald, Samuel Ford, Tatiana Garmanova, Gaetano Gallo, Dhruva Ghosh, Gustavo Mendonça Ataíde Gomes, Gustavo Grecinos, Ewen A Griffiths, Magdalena Gruendl, Constantine Halkias, Ewen M Harrison, Intisar Hisham, Peter J Hutchinson, Shelley Hwang, Arda Isik, Michael D Jenkinson, Pascal Jonker, Haytham MA Kaafarani, Debby Keller, Angelos Kolias, Schelto Kruijff, Ismail Lawani, Hans Lederhuber, Sezai Leventoglu, Andrey Litvin, Andrew Loehrer, Markus W Löffler, Maria Aguilera Lorena, Maria Marta Modolo, Piotr Major, Janet Martin, Hassan N Mashbari, Dennis Mazingi, Symeon Metallidis, Ana Minaya-Bravo, Helen M Mohan, Rachel Moore, David Moszkowicz, Susan Moug, Joshua S Ng-Kamstra, Mayaba Maimbo, Ionut Negoi, Milagros Niquen, Faustin Ntirenganya, Maricarmen Olivos, Kacimi Oussama, Oumaima Outani, Marie Dione Parreno-Sacdalanm, Francesco Pata, Carlos Jose Perez Rivera, Thomas D Pinkney, Willemijn van der Plas, Peter Pockney, Ahmad Qureshi, Dejan Radenkovic, Antonio Ramos-De la Medina, Toby Richards, Keith Roberts, April C Roslani, Martin Rutegård, Juan José Segura-Sampedro, Irène Santos, Sohei Satoi, Raza Sayyed, Andrew Schache, Andreas A Schnitzbauer, Justina O. Seyi-Olajide, Neil Sharma, Catherine A Shaw, Richard Shaw, Sebastian Shu, Kjetil Soreide, Antonino Spinelli, Grant D Stewart, Malin Sund, Sudha Sundar, Stephen Tabiri, Philip Townend, Georgios Tsoulfas, Gabrielle H van Ramshorst, Raghavan Vidya, Dale Vimalachandran, Oliver J Warren, Duane Wedderburn, Naomi Wright, EuroSurg, European Society of Coloproctology (ESCP), Global Initiative for Children's Surgery (GICS), GlobalSurg, GlobalPaedSurg, ItSURG, PTSurg, SpainSurg, Italian Society of Colorectal Surgery (SICCR), Association of Surgeons in Training (ASiT), Irish Surgical Research Collaborative (ISRC), Transatlantic Australasian Retroperitoneal Sarcoma Working Group (TARPSWG), Italian Society of Surgical Oncology (SICO).

Patient advisory group: Lesley Booth (UK, patient involvement lead), Margaret Barker (UK), Neil Barker, Shirley Cooke (UK), Suzanne Doré (UK), Nigel Horwood (UK), Emmy Runigamugabo (Rwanda), Carrie Tierney Weir (UK).

*Collaborators (*denotes hospital lead(s))*

Albania: Dajti I (University Hospital Center Nene Tereza, Tirana).

Argentina: Allemand C, Boccalatte LA*, Figari M, Lamm M, Larrañaga J, Marchitelli C, Noll F*, Odetto D, Perrotta M, Saadi J, Zamora L (Hospital Italiano De Buenos Aires, Buenos Aires); Ballester AM, Tapper KE, Zeff N* (Hospital Universitario Cemic, Buenos Aires); Valenzuela JI* (Hospital Velez Sarsfield, City Of Buenos Aires); Alurralde C, Anastasio J, Apas Perez de Nucci A, Caram EL, Eskinazi D*, Mendoza JP, Usandivaras M (Sanatorio 9 De Julio Sa, Tucuman); Badra R, Esteban A, García JS, García PM, Gerchunoff JI, Lucchini SM*, NIgra MA, Vargas L (Sanatorio Allende, Cordoba).

Armenia: Hovhannisyan T*, Stepanyan A* (Nairi Medical Center, Yerevan).

Australia: Vasey CE*, Watson EGR (Ballarat Base Hospital, Ballarat); Ip C*, Kealey J, Lim CSH, Sengupta S*, Ward S*, Wong E* (Box Hill Hospital, Melbourne); Gould T, Gourlay R*, Griffiths B (Calvary Mater Newcastle, Newcastle); Gananadha S*, McLaren M (Canberra Hospital, Canberra); Cecire J, Joshi N, Salindera S*, Sutherland A (Coffs Harbour Health Campus, Coffs Harbour Nsw); Ahn JH, Charlton G, Chen S, Gauri N, Hayhurst R, Jang S, Jia F, Mulligan C, Yang W, Ye G, Zhang H (Concord Repatriation General Hospital, Concord West, Sydney); Ballal M, Gibson D, Hayne D, McMillan H, Moss J*, Pugliese MJ, Richards T, Seow YTN, Thian A, Viswambaram P, Vo UG* (Fiona Stanley Hospital, Perth); Bennetts J*, Bright T*, Brooke-Smith M*, Fong R, Gricks B, Huang L, Lam YH, Nathan A, Ong BS, Ooi E, Szpytma M, Watson D (Flinders Medical Centre, Adelaide); Bagraith K, Caird S, Chan E, Dawson C, Ho D, Hui N, Izwan S, Jeyarajan E, Jordan S, Liang R, Lim A, Nolan GJ, Oar A, Parker D, Puhalla H, Quennell A, Rutherford L, Sommerville C, Townend P*, Von Papen M, Wullschleger M (Gold Coast University Hospital, Southport); Dawson AC*, Drane A (Gosford Hospital, Gosford); Blatt A*, Cope D, Egoroff N, Fenton M, Gani J, Lott N, Pockney P*, Shugg N (John Hunter Hospital, Newcastle); Elliott M, Phung D (Lifehouse, Sydney); Phan D, Townend D* (Lismore Base Hospital, Lismore); Bong C, Gundara J* (Logan Hospital, Brisbane); Frankel A* (Princess Alexandra Hospital, Brisbane); Bowman S*, Guerra GR (Queen Elizabeth II Jubilee Hospital, Brisbane); Gerns N, McGeorge S, Riddell A*, Roberts M*, Rukin N (Redcliffe Hospital, Redcliffe); Bolt J, Buddingh K, Dudi-Venkata NN, Jog S, Kroon HM*, Sammour T, Smith R, Stranz C (Royal Adelaide Hospital, Adelaide); Batstone M*, Lah K*, McGahan W*, Mitchell D*, Morton A, Pearce A, Roberts M*, Sheahan G*, Swinson B (Royal Brisbane And Women's Hospital, Brisbane); Waldron A, Walker P* (St John Of God Midland Public And Private Hospital, Perth); Alam N, Banting S, Chong L, Choong P*, Clatworthy S, Foley D, Fox A, Hii MW, Knowles B, Mack J, Read M, Rowcroft A, Ward S*, Wright G* (St Vincent's Hospital, Melbourne); Dawson AC*, Drane A*, Lun EWY* (Wyong Public Hospital, Wyong).

Austria: Lanner M* (Kardinal Schwarzenberg Klinikum, Schwarzach Im Pongau); Burtscher J, Trivik-Barrientos F* (Landesklinikum Wiener Neustadt, Wiener Neustadt); Königsrainer I* (Landeskrankenhaus Feldkirch, Feldkirch); Bauer M, Freyschlag C, Kafka M, Messner F, Öfner D*, Tsibulak I (Medical University Of Innsbruck, Innsbruck); Holawe S, Zimmermann M* (Medical University Of Vienna, Vienna); Emmanuel

K, Grechenig M, Gruber R, Harald M, Öhlberger L, Presl J*, Wimmer A (Paracelsus Medical University Salzburg, Salzburg).
Azerbaijan: Namazov İ, Samadov E (Leyla Medical Centerl, Baku).
Barbados: Barker D, Boyce R, Corbin S, Doyle A, Eastmond A, Gill R, Haynes A, Millar S, O'Shea M, Padmore G*, Paquette N, Phillips E, St. John S, Walkes K (Queen Elizabeth Hospital, Bridgetown).
Belgium: Abeloos J, De Backer T, De Ceulaer J*, Dick C*, Diez-Fraile A, Lamoral P, Spaas C (Az Sint-Jan Brugge-Oostende Av, Brugge); Ceelen W, Pattyn P, Van de putte D, Van Nieuwenhove Y, Van Ramshorst G*, Willaert W (Ghent University Hospital, Ghent);.
Botswana: Bazzett-Matabele L*, Chiyapo SP, Ramogola-Masire D*, Ramontshonyana G, Seiphetlheng A, Vuylsteke P (Princess Marina Hospital, Gaborone).
Brazil: Abdallah EA, Aguiar Júnior S*, Baiocchi G*, Carvalho GB, Coimbra FJF*, Kowalski LP*, Makdissi F, Marques N, Marques T, Soares Dos Santos S, Tirapelli Gonçalves B, Vartanian JG (A.C. Camargo Cancer Center, São Paulo); Dos Reis R* (Barretos Cancer Hospital, Barretos); Camara P*, De Lima RK, Della Giustina E, Hoffmann PV (Fundação Hospitalar De Blumenau, Blumenau); Gatti A*, Nardi C, Oliva R (Hospital Geral De Pirajussara, Taboão Da Serra); Nacif L* (Hospital Nove De Julho, Sao Paulo); Carvalho Ferro C, Gomes Mendonça Ataíde G, Lima Buarque I, Lira dos Santos Leite A, Pol-Fachin L, Santos Bezerra T, Maylson Ramos da Silva A, Windson de Araújo Silvestre D, Vieira Barros A* (Hospital Santa Casa De Misericordia De Maceio, Maceio); Campbell L* (Hospital Santa Helena, Brasília); De Cicco R* (Instituto De Câncer Dr Arnaldo Vieira De Carvalho, São Paulo); Cecconello I, Gregorio P, Pontual Lima L, Ribeiro Junior U, Takeda FR*, Terra RM* (Instituto Do Câncer De Estado De São Paulo, São Paulo); Faccini Teixeira M, Kowalski LP, Kulcsar MAV, Matos LL*, Nunes KS (Instituto Do Cancer Do Estado De São Paulo, Sao Paulo); Laporte G*, Salem M (Irmandade Da Santa Casa De Misericórdia De Porto Alegre, Porto Alegre); Barakat Awada J, Ijichi TR, Kim NJ, Marreiro A, Muller B, Nunes R* (Notre Dame Intermédica - Hospital Salvalus, São Paulo); Bodanese B, Eidt ER, Isoton JC, Lemos Vieira da Cunha M*, Regina de Sampaio L, Vendrame C*, Zeni M*, Zortéa JA, Zortéa MR* (Supera Oncologia - Hospital Regional Do Oeste, Chapeco).
Bulgaria: Sokolov M* (University Hospital Alexandrovska, Sofia).
Canada: Kidane B*, Srinathan S (Health Sciences Centre, Winnipeg); Munro A*, Helyer L, McKeen D (IWK Health Centre, Halifax); Boutros M*, Caminsky NG, Ghitulescu G, Jamjoum G, Moon J, Pelletier J, Vanounou T, Wong S (Jewish General Hospital, Montreal); Cheng D, MacNeil SD, Martin J* (London Health Sciences Centre And St Josephs Health Care London, London); Boutros M, Dumitra S*, Kouyoumdjian A, Schmid S, Spicer J (Mcgill University Health Center, Montreal); Agarwal A, Brar A, Dada J, Dare A, Hameed U*, Osman F (North York General Hospital, Toronto); Johnston B*, Russell C (Saint John Regional Hospital, Saint John); Groot G*, Persad A, Pham H, Wood M (Saskatoon City Hospital/Royal University Hospital/St. Paul's Hospital, Saskatoon Sk); Brar A, Ko M*, Rajendran L (St. Joseph's Health Centre, Toronto); Boutros M*, Demyttenaere S*, Garfinkle R (St. Mary's Hospital, Montreal); Brown C*, Karimuddin A, Lee N, Liu J, Madani Kia T, Phang PT, Raval M, Tom K (St. Paul's Hospital, Vancouver, Bc); Abou-Khalil J, Martel A, Nessim C*, Stevenson J (The Ottawa Hospital, Ottawa); Al Riyami S, Bali K, Bigam D*, Dajani K, Dell A (University Of Alberta Hospital, Edmonton).

Chile: Modolo MM*, Ramirez Nieto P, Sepulveda R, Molero A, Bolbaran A, Ruiz I (Barros Luco Trudeau, Santiago); Heredia F* (Clínica Universitaria De Concepción, Concepción); Bellolio F*, Besser N, Grasset E*, Guaman JO, Inzunza M, Irarrázaval MJ, Jarry C, Quintana Martinic M, Riquoir Altamirano C, Romero Manqui CA, Ruiz Esquide M, Vargas Añazco C (Hospital Clinico Universidad Católica, Santiago).
Colombia: Almeciga A*, Fletcher A*, Merchan A* (Centro De Investigaciones Oncológicas Clínica San Diego - Ciosad, Bogotá); Merchan A* (Clinaltec: Clinica Internacional De Alta Tecnologia En Cancer, Ibague); Quijano T, Sanabria D* (Clínica Los Nogales, Bogota); Arias-Amézquita F*, Cétares C, Cortes Murgueitio N, Gomez-Mayorga JL, Herrera-Almario G*, Rodriguez J*, Sanabria D (Fundacion Santa Fe De Bogota, Bogota); Iglesias P, Puentes LO* (Hospital San José, Bogotá); Calvache JA*, Orozco-Chamorro CM, Rojas DA, Sánchez-Gómez A (Hospital Universitario San José, Popayán); Abadia M, Acosta J, Almeciga A, Angel Aristizabal J, Bonilla A, Caicedo L, Calderon Quiroz PH, Cervera Bonilla S, Diaz S*, Facundo H, Garcia Mora M, Guevara O*, Guzman L, Herrera Mora DR, Jimenez Ramirez LJ, Lehmann C, Manrique E, Mariño I, Medina M, Pinilla Morales RE*, Puerto A, Puerto Horta J, Quintero M, Rey Ferro M, Rodriguez J, Saénz A, Santana D, Serrano W, Suescun O, Trujillo Sanchez LM*, Velasquez Cuasquen BG (Instituto Nacional De Cancerologia, Bogota); Mendoza Quevedo J* (Subred Sur Occidente De Kennedy (Hospital De Kennedy), Bogota).
Croatia: Bačić G, Karlović D, Kršul D, Zelić M* (University Hospital Center Rijeka, Rijeka); Luksic I*, Mamic M (University Hospital Dubrava, Zagreb); Bacic I, Bakmaz B, Ćoza I, Dijan E, Katusic Z, Mihanovic J*, Morović D, Rakvin I (Zadar General Hospital, Zadar).
Cyprus: Almezghwi H, Arslan K, Besim H, Özant A, Özçay N* (Near East University Hospital, Nicosia); Frantzeskou K, Gouvas N*, Kokkinos G, Papatheodorou P, Pozotou I, Stavrinidou O, Yiallourou A* (Nicosia General Hospital, Nicosia).
Czechia: Martinek L, Skrovina M*, Straka M, Szubota I (Hospital & Oncological Centre Novy Jicin, Novy Jicin); Peteja M, Žatecký J* (Slezská Nemocnice V Opavě, P.o., Opava); Javurkova V, Klat J* (University Hospital Ostrava, Ostrava).
Denmark: Antony S, Avlund T, Berg KD, Borre M, Christensen P*, Elkjær MC, Ernst A, Fensman SK, Haldrup M, Harbjerg JL, Iversen LH, Jensen PT*, Jeppesen TD, Kjaer DW, Kristensen HØ, Lund N, Maigaard Axelsen S, Mekhael M, Mikic N, Ostenfeld EB (Aarhus University Hospital, Aarhus); Ebbehøj AL, Krarup P, Schlesinger N, Smith H* (Bispebjerg Hospital, Copenhagen).
Dominican Republic: Batista S*, Crespo A, Díaz PJ, Rivas R, Rodriguez-Abreu J*, Tactuk N (Cedimat - Centro De Diagnóstico, Medicina Avanzada, Laboratorio Y Telemedicina, Santo Domingo).
Egypt: El Kassas M*, Omar W, Tawheed A (Helwan University, Cairo); Talaat M (Ain Shams University Specialized Hospital, Cairo); Abdelsamed A, Azzam AY*, Salem H*, Seleim A (Al Azhar University Hospitals, Cairo); Abdelmajeed A, Abdou M, Abosamak NE, AL Sayed M, Ashoush F*, Atta R, Elazzazy E, Elnemr M, Elsayed Hewalla ME, Elsherbini I, Essam E, Ewedah M, Ghallab I, Hassan E, Ibrahim M, Metwalli M, Mourad M, Qatora MS, Ragab M, Sabry A*, Saifeldin H, Samih A, Samir Abdelaal A, Shehata S*, Shenit K (Alexandria Main University Hospital, Alexandria); Attia D, Kamal N, Osman N* (Alexandria Medical Research Institute, Alexandria); Abbas AM*, Abd Elazeem HAS, Abd-Elkariem AY, Abdelkarem MM, Alaa S, Ashraf M, Ayman A, Azizeldine MG, Elkhayat H*, Emad Mashhour A, Gaber M, Hamza HM,

Hawal I*, Hetta HF, K. Ali A, M.elghazaly S, Mohammed MM*, Monib FA, Nageh MA, Saad A, Saad MM*, Shahine M*, Yousof EA, Youssef A (Assiut University Hospital, Assiut); El-Deeb M, Fawzy M, Ghaly G, Ibraheem M* (Baheya Foundation For Treatment Of Breast Cancer, Giza); Eldaly A* (El-Menshawy Hospital, Tanta); Esmail E (Kafr Elzyat Hospital, Tanta); ElFiky M*, Nabil A (Kasr Alainy Faculty Of Medicine, Cairo University, Cairo); Alrahawy M*, Sakr A*, Soliman H*, Soltan H* (Menofiya University Hospital, Menoufia); Amira G, Sallam I*, Sherief M, Sherif A (Misr Cancer Center, Al Jizah); Abdelrahman A, Aboulkassem H, Ghaly G*, Hamdy R, Morsi A, Salem H*, Sherif G (National Cancer Institute, Cairo); Abdeldayem H, Abdelkader Salama I*, Balabel M, Fayed Y, Sherif AE* (National Liver Institute, Menoufia University, Shibin Elkom); Elmorsi R*, Emile S, Refky B* (Oncology Center Mansoura University, Mansoura); Abd-elsalam S, Badr H, Elbahnasawy M*, Elzoghby M, Essa M, Gamal Badr S, Ghoneim A*, Hamad O, Hamada M, Hammad M, Hawila A, Morsy MS, Salman S, Sarsik S (Tanta University Hospital, Tanta).

Ethiopia: Bekele K* (Maddawalabu University Goba Referral Hospital, Goba).

Finland: Kauppila JH*, Sarjanoja E (Länsi-Pohja Central Hospital, Kemi); Helminen O, Huhta H, Kauppila JH* (Oulu University Hospital, Oulu).

France: Beyrne C, Jouffret L*, Lugans L, Marie-Macron L (Centre Hospitalier Avignon, Avignon); Chouillard E*, De Simone B* (Centre Hospitalier Intercommunal Poissy Saint Germain En Laye, Poissy); Fredon F*, Roux A (Centre Hospitalier Roland Mazoin, Saint-Junien); Bettoni J, Dakpé S, Devauchelle B, Lavagen N, Testelin S* (Chu Amiens, Amiens); Boucher S*, Breheret R, Gueutier A, Kahn A, Kün-Darbois J (Chu Angers, Angers); Barrabe A, Lakkis Z*, Louvrier A, Manfredelli S, Mathieu P (Chu Besançon, Besancon); Chebaro A*, Drubay V, El amrani M, Eveno C, Lecolle K, Legault G, Martin L, Piessen G*, Pruvot FR, Truant S, Zerbib P (Chu Lille, Lille); Ballouhey Q*, Barrat B, Fourcade L, Laloze J, Salle H, Taibi A, Tricard J, Usseglio J (Chu Limoges, Limoges); Bergeat D, Merdrignac A (Chu Rennes - General Surgery, Rennes); Le Roy B, Perotto LO, Scalabre A* (Chu Saint Etienne, Saint Etienne); Gornes H, Vaysse C*, Vergriete K (Chu Toulouse, Toulouse); Aimé A, Ezanno A*, Malgras B (Hia Begin, St Mande); Arnaud AP*, Fustec E, Lavoue V, Tesson C (Hopital Anne De Bretagne Chu Rennes - General Surgery, Rennes); Bouche P*, Tzedakis S* (Hôpital Cochin - Aphp, Paris); Cotte E, Glehen O, Lifante J (Hopital Lyon Sud, Pierre Bénite); Bendjemar L, Braham H, Charre L, El Arbi N, Morel-chevillet L, Police A*, Villefranque V, Volpin E (Hôpital Simone Veil, Eaubonne); D'Urso A, Felli E, Mutter D, Pessaux P, Seeliger B* (Strasbourg University Hospitals, IHU-Strasbourg, Strasbourg); Barbé Y, Bardet J, Barret E, Berry R, Boddaert G, Bonnet S, Brian E, Cathala N, Cathelineau X, Denet C, Fuks D, Gossot D, Grigoroiu M, Laforest A, Levy-Zauberman Y, Louis-Sylvestre C, Macek P, Mombet A, Moumen A, Pourcher G, Rozet F, Sanchez Salas R, Seguin-givelet A*, Tribillon E (Institut Mutualiste Montsouris, Paris); Crenn V, De Vergie S, Duchalais E*, Espitalier F, Ferron C, Fragnaud H, Malard O*, Regenet N*, Rigaud J*, Varenne Y, Waast D* (Nantes University Hospital, Nantes).

Germany: Bork U*, Distler M, Fritzmann J, Kirchberg J, Praetorius C, Riediger C, Weitz J, Welsch T, Wimberger P* (University Hospital Carl Gustav Carus, TU Dresden, Dresden); Beyer K, Kamphues C*, Lauscher J, Loch FN, Schineis C (Charité University Medicine, Campus Benjamin Franklin, Berlin); Albertsmeier M*, Angele M, Kappenberger A, Niess H, Schiergens T, Werner J (Department Of General,

Visceral And Transplantation Surgery, Ludwig-Maximilians-Universität Munich); Becker R*, Jonescheit J (Heilig-Geist Hospital Bensheim, Bensheim); Doerner J*, Seiberth R (Helios Universitätsklinikum Wuppertal – Universität Witten/Herdecke, Wuppertal); Pergolini I, Reim D* (Klinikum Rechts Der Isar TUM School Of Medicine, Munich); Herzberg J*, Honarpisheh H*, Strate T* (Krankenhaus Reinbek St. Adolf-Stift, Reinbek); Boeker C, Hakami I*, Mall J* (KRH Nordstadt-Siloah Hospitals, Hannover); Liokatis P*, Smolka W (LMU Klinikum Campus Innenstadt); Vassos N* (Mannheim University Medical Center (Universitätsmedizin Mannheim), Mannheim); Nowak K*, Reinhard T* (Romed Klinikum Rosenheim, Rosenheim); Hölzle F, Modabber A*, Winnand P (University Hospital Aachen, Aachen); Anthuber M, Shiban E, Sommer B, Sommer F, Wolf S* (University Hospital Augsburg, Augsburg); Howaldt H, Knitschke M* (University Hospital Giessen And Marburg, Giessen); Kauffmann P, Wolfer S* (University Hospital Goettingen / Universitätsmedizin Goettingen, Goettingen); Kleeff J, Lorenz K, Michalski C, Ronellenfitsch U*, Schneider R (University Hospital Halle (Saale), Saale); Bertolani E, Königsrainer A*, Löffler MW, Quante M*, Steidle C, Überrück L, Yurttas C (University Hospital Tübingen, Tübingen); Betz CS, Bewarder J, Böttcher A, Burg S, Busch C, Dreimann M, Frosch KH, Gosau M*, Heuer A, Izbicki J, Klatte TO, Koenig D, Moeckelmann N, Nitschke C, Perez D, Priemel M, Reiter A, Smeets R, Speth U, Stangenberg M, Thole S, Uzunoglu FG*, Viezens L, Vollkommer T, Zeller N (University Medical Center Hamburg-Eppendorf, Hamburg); Battista MJ*, Gillen K, Hasenburg A, Krajnak S, Linz VC, Schwab R (University Of Mainz, Department Of Gynaecology And Obstetrics, Mainz).

Ghana: Amo-Antwi K, Appiah-kubi A, Konney T*, Tawiah A (Komfo-Anokye Teaching Hospital, Kumasi); Boatey S, Issaka A, Korsah MA, Sheriff M* (Tamale Teaching Hospital, Tamale).

Greece: Angelou K, Haidopoulos D*, Rodolakis A (Alexandra General Hospital, Athens); Antonakis P, Bramis K, Chardalias L, Contis I, Dafnios N, Dellaportas D, Fragulidis G, Gklavas A, Konstadoulakis M, Memos N*, Papaconstantinou I*, Polydorou A, Theodosopoulos T, Vezakis A (Aretaieion Hospital, Athens); Antonopoulou MI, Manatakis DK*, Tasis N (Athens Naval And Veterans Hospital, Athens); Arkadopoulos N, Danias N, Economopoulou P, Frountzas M, Kokoropoulos P, Larentzakis A, Michalopoulos N*, Nastos C, Parasyris S, Pikoulis E, Selmani J, Sidiropoulos T, Vassiliu P (Attikon University General Hospital, Athens); Bouchagier K*, Klimopoulos S, Paspaliari D, Stylianidis G (Evaggelismos General Hospital, Athens); Akrivou D, Baxevanidou K, Bouliaris K, Chatzikomnitsa P, Delinasios G, Doudakmanis C, Efthimiou M, Giaglaras A, Kalfountzos C*, Kolla C, Koukoulis G, Zervas K, Zourntou S (General Hospital Of Larissa “Koutlimpaneio And Triantafylleio”, Larissa); Baloyiannis I, Diamantis A, Gkrinia E, Hajiioannou J*, Korais C, Koukoura O, Perivoliotis K, Saratziotis A, Skoulakis C, Symeonidis D, Tepetes K, Tzovaras G*, Zacharoulis D (General University Hospital Of Larissa, Larrisa); Alexoudi V, Antoniades K*, Astreidis I, Christidis P, Deligiannidis D, Grivas T, Ioannidis O*, Kalaitsidou I, Loutzidou L, Mantevas A, Michailidou D, Nikolaidou E, Papadopoulou S, Paraskevopoulos K, Politis S, Stavroglou A, Tatsis D, Tilaveridis I, Vahtsevanos K, Venetis G (George Papanikolaou General Hospital Of Thessaloniki, Thessaloniki); Karaitianos I*, Tsirlis T (Henry Dunant Hospital Center, Athens); Dinas K*, Margioula-Siarkou C, Petousis S (Hippocratio Hospital, Thessaloniki); Baili E, Charalabopoulos A, Liakakos T, Schizas D*, Spartalis E, Syllaios A, Zografos C (Laiko University Hospital, Athens); Anthoulakis C, Christou CD, Papadopoulos V, Tooulias A, Tsolakidis D*, Tsoulfas G*, Zouzoulas D (Papageorgiou General Hospital, Thessaloniki);

Athanasakis E, Chrysos E, Tsiaoussis I, Xenaki S*, Xynos E* (University Hospital Of Heraklion Crete And Interclinic Hospital Of Crete, Heraklion Crete).
Guatemala: Barrios Duarte A*, Lopez Muralles I, Lowey MJ, Portilla AL, Recinos G (Hospital General De Enfermedades, Guatemala City).
Hong Kong: Chan JYK, Chan SM, Chong CCN, Futaba K*, Ho MF, Hon SF, Lau RWH, Mak TWC, Ng CF, Ng CSH, Ng KKC, Ng SSM, Teoh AYB, Teoh JY (Prince Of Wales Hospital, Sha Tin); Foo CC* (Queen Mary Hospital, Pok Fu Lam).
Hungary: Banky B*, Suszták N (Szent Borbála Kórház, Tatabánya).
India: Misra S*, Pareek P, Vishnoi JR* (All India Institute of Medical Sciences Jodhpur); Ambre S, Balasubiramaniyan V, Chappity P, Chaudhary I, Colney L, Das MK*, Imaduddin M, Jain A, Jena SK, Kar M*, Mandal S, Mishra A, Mishra SS, Mishra TS, Mitra JK, Mittal Y, Muduly DK*, Nayak P, Parida PK, Pradhan P, Rajan DK, Rebba E, Samal DK, Singh A, Sultania M* (All India Institute Of Medical Sciences, Bhubaneswar); Agarwal SP, Agrawal A, Arora RK*, Chaturvedi J, Garg PK, Gaurav A, Gupta A, Kottayasamy Seenivasagam R*, Maharaj DD, Majumdar KS, Mishra N, Mittal A*, Narain TA, Nirjhar R, Poonia DR*, Sadhasivam S, Singh MP, Tiwari AR* (All India Institute Of Medical Sciences, Rishikesh); Akula AK, Bandegudda SK, Bindlish RP, Chaitanya A, Chandrasekhara Rao LM, Dalakoti P, Dasu S, Giridhar A, Gorijavolu NB, Iyer RR, Jayakarthik Y, Jonathan GT, Kalla MB, Kheni Y, Kumar CS, Murtuza SA, Naidu CCK, Nalukurthi RK, Nemade HO, Nusrath S, Patnaik SC, Raju KVVN, Ramalingam PR, Rao KV, Rayani BK, Reddy Kallam SM, Reddy SRR, Saksena AR, Sebastian JA, Sharma RM, Thammineedi SR* (Basavatarakam Indo American Cancer Hospital & Research Institute, Hyderabad); Krishnamurthy A, Madhupriya S, Raja A, Ramakrishnan AS* (Cancer Institute (WIA) Chennai); Dutt UK, Ghosh DN, Grewal S, Hans P, Haque PD*, Jain R, Kingsley PA, Mahajan A, Mandrelle K*, Michael V, Mukherjee P, Varghese A, Varghese SS, Veetil SK (Christian Medical College & Hospital, Ludhiana); Gaikwad P, George AJ, James SM, Jesudason MR, Mittal R*, Moorthy M, Riju J, Sebastian A, Sen S, Singh S, Sreekar D, Thomas V, Titus DK, Yezzaji HS (Christian Medical College & Hospital, Vellore); Aggarwal M, Dhamija P, Kumar A* (Government Medical College Patiala, Patiala); Chisthi MM, Gejoe G, Gopakumar D, Kollengode VV*, Kuttanchettiyar KG, Yadev I* (Government Medical College Thiruvananthapuram, Thiruvananthapuram); Balasubramanian A, Chaturvedula L, Dharanipragada K*, Kalayarasan R*, Manikandan R, Penumadu P* (Jawaharlal Institute Of Postgraduate Medical Education And Research, Pondicherry); Lakshminarayana B, Mathew S* (Kasturba Medical College Hospital, Manipal, Manipal); Reddihalli PV*, Shivdas S* (Kidwai Memorial Institute Of Oncology, Bengaluru); Akhtar N, Chaturvedi A, Gupta S, Kumar V, Rajan S* (King George's Medical University, Lucknow); Agrawal N, Ahluwalia P, Arora A, Batra-Modi K, Biswas M, Chaturvedi A, Chaturvedi H, Gautam G, Jain M, Jain S, Kumar S*, Nayyar R, Singh S, Tiwari A (Max Superspeciality Hospital, New Delhi); Bhushan Rangappa V, Kadapathri A, Kolur T, Pethkar R, Pillai V*, Popli G, Sharma J, Shetty V, Subramaniam N, Williams J (Mazumdar Shaw Cancer Centre, Narayana Health, Bengaluru); Agarwal P, Agarwal V, Baghel A, Sharma DB, Silodia A, Singh KN, Yadav SK* (Netaji Subhash Chandra Bose Medical College, Jabalpur); Aziz G, Chowdri N, Mehraj A*, Parray FQ, Shah ZA, Wani RA (Sher-I-Kashmir Institute Of Medical Sciences, Srinagar); Ahmed Z, Bali RS, Bhat MA, Laharwal AR, Mahmood M, Mir IS, Muzamil J, Najar FA, Rashid A*, Rather MH, Zaieem M (SMHS Hospital,

Government Medical College, Srinagar); Aggarwal G*, Agrawal V, Ahmed A, Ahmed R, Bhaumik J, Ghosh A, Gupta S, Jain D, Jain PV, Kewlani V, Pipara A, Shakya S, Sharma A*, Thambudorai R (Tata Medical Center, Kolkata); Badwe RA, Bakshi G, Chandankhede U, Chaudhari V, Chaukar D, Chitkara G, Dash B, Deshmukh A, deSoouza A, Gulia A, Maheshwari A, Moiyadi A, Nair D, Nair NS, Niyogi D, Pal M, Pandey D, Patkar S, Poddar P, Pramesh CS*, Puri A, Saklani A, Shetty P, Shrikhande SV, Shylasree TS, Singh V, Thiagarajan S (Tata Memorial Hospital, Mumbai).
Indonesia: Islam AA*, Kembuan G, Pajan H (Rsud Wahidin Sudirohusodo, Makassar).
Iran: Rahim F (Baghaei Hospital, Ahvaz); Brouki Milan P*, Mozafari M, Rezaei Tavirani M, Tizmaghz A (Firoozabadi Hospital, Tehran); Safari H (Golestan Hospital, Ahvaz).
Ireland: Aremu M*, Canas-Martinez A, Cullivan O, Murphy C, Owens P, Pickett L (Connolly Hospital Blanchardstown, Dublin); Akmenkalne L, Byrne J, Corrigan M*, Cullinane C, Daly A, Fleming C*, Jordan P, Kayyal MY, Killeen S, Lynch N, McCarthy A, Mustafa H, O'Brien S, O'Leary P, Syed WAS, Vernon L (Cork University Hospital, Cork); O'Duffy F, McHugh A*, Moran T (Mater Misericordiae University Hospital, Dublin); Callanan D, Dias A, Huang L, Ionescu A, Sheahan P* (South Infirmary Victoria University Hospital, Cork); Balasubramanian I, Boland M, Carrington E, Conlon K, Cullinane C, Evoy D, Fagan J, Fearon N, Gallagher T, Geary E, Geraghty J, Hanly A, Heneghan H*, Kennedy N, Kennelly R, Maguire D, Martin ST, McCartan D, McDermott EW, McPartland D, Ng KC, Prichard RS, Stafford T, Winter D* (St Vincent's University Hospital, Dublin); Alazawi D, Barry C*, Boyle T, Butt W, Connolly E, Donlon N, Donohue C, Fahey BA, Farrell R, Fitzgerald C, Kinsella J, Larkin J*, Lennon P, Maguire PJ*, Mccormick P, Mehigan BJ, Mohan H, Nugent TS, O'Sullivan H, Ravi N, Reynolds JV*, Rogers A, Shokuhi P, Smith J, Smith LA, Timon C (St. James's Hospital, Dublin); Bashir Y, Bass G, Conlon K, Connelly T, Creavin B, Earley H, Elliott JA*, Gillis A, Kavanagh D, Madden A, Manecksha RP, Neary P, O'Connell C, O'riordan J, Reynolds IS, Rice D, Ridgway P, Thomas A, Umair M, Whelan M (Tallaght Hospital, Dublin); Carroll P, Collins C, Corless K, Finnegan L, Fowler AL, Hogan A, Kerin M, Lowery A*, McAnena P, McKevitt K*, Nugent E, Ryan É (University Hospital Galway, Galway); Coffey JC, Cunningham RM, Devine M, Nally DM*, Peirce C, Tormey S (University Hospital Limerick, Limerick); Hardy N, Neary P, O'Malley S*, Ryan M (University Hospital Waterford/University College Cork, Waterford).
Israel: Gaziants V, Gold- Deutch R, Lavy R, Kalmovich-Muallem L, Zmora O* (Shamir Medical Center, Be'er Ya'akov).
Italy: Macina S* (Asst Mantua, Mantova); Mariani NM*, Opocher E, Pisani Ceretti A (Asst Santi Paolo E Carlo, Milan); Ferrari F*, Odicino F, Sartori E* (Asst Spedali Civili, Ospedale Di Brescia, Brescia); Cotsoglou C*, Granieri S (Asst Vimercate, Vimercate); Bianco F*, Camillo' A, Colledan M*, Tornese S, Zambelli MF (Asst-Papa Giovanni Xxiii- Bergamo, Bergamo); Bissolotti G, Fusetti S, Lemma F* (Azienda Ospedaliera Di Padova, Padova); Marino M*, Marino MV*, Mirabella A, Vaccarella G (Azienda Ospedaliera Ospedali Riuniti Villa Sofia-Cervello, Palermo, Palermo); Sena G* (Azienda Ospedaliera Pugliese-Ciaccio Di Catanzaro, Catanzaro); Agostini C, Alemanno G, Bartolini I, Bergamini C, Bruscino A, Checcucci C, De Vincenti R, Di Bella A, Fambrini M, Fortuna L, Maltinti G, Muiesan P*, Petraglia F, Prosperi P*, Ringressi MN, Risaliti M, Sorbi F*, Taddei A*, Tucci R (Azienda Ospedaliera Universitaria Careggi, Firenze); Bassi C, Bortolasi L*, Campagnaro T*, Casetti L, Conci S, De Pastena M, Esposito A, Fontana M, Guglielmi A,

Landoni L, Malleo G, Marchegiani G, Nobile S, Paiella S, Pedrazzani C, Rattizzato S, Ruzzenente A, Salvia R*, Turri G, Tuveri M (Azienda Ospedaliera Universitaria Integrata Di Verona, Verona); Altomare DF, Papagni V, Picciariello A* (Azienda Ospedaliero Universitaria Consorziale Policlinico Di Bari, Bari); Bellora P, D'Aloisio G, Ferrari M, Francone E, Gentilli S*, Nikaj H (Azienda Ospedaliero Universitaria Maggiore Della Carità, Novara); Andreani L, Bianchini M, Capanna R, Caretto M, Chiarugi M, Coccolini F, Cremonini C, Di Franco G, Domenici L*, Furbetta N, Gadducci A, Garibaldi S, Gianardi D, Giannini A, Guadagni S, Morelli L*, Musetti S, Palmeri M, Perutelli A, Simoncini T*, Tartaglia D* (Azienda Ospedaliero Universitaria Pisana, Pisa); Anania G*, Carcoforo P*, Chiozza M, De Troia A, Koleva Radica M, Portinari M, Sibilla MG, Urbani A (Azienda Ospedaliero Universitaria Sant'anna, Ferrara); Fabbri N, Feo CV*, Gennari S, Parini S, Righini E (Azienda Unità Sanitaria Locale di Ferrara - University of Ferrara); Ampollini L*, Arcuri MF, Bellanti L, Bergonzani M, Bertoli G, Bocchialini G, Cattelani L*, D'Angelo G*, Gussago F, Lanfranco D, Manigrasso E, Musini L, Poli T, Polotto S, Santoro GP, Varazzani A* (Azienda Ospedaliero-Universitaria Di Parma, Parma); Aguzzoli L, Annessi V, Borgonovo G, Castro Ruiz C, Coiro S, Falco G*, Mandato VD*, Mastrofilippo V, Montella MT, Zizzo M* (Azienda Unità Sanitaria Locale - IRCCS Di Reggio Emilia, Reggio Emilia); Grossi U, Novello S, Romano M, Rossi S, Zanus G* (Ca' Foncello Treviso, Università Di Padova); Esposito G, Frongia F, Pisanu A, Podda M* (Cagliari University Hospital, Cagliari); Belluco C, Lauretta A*, Montori G, Moras L, Olivieri M (Centro Di Riferimento Oncologico Di Aviano (Cro) Irccs, Aviano); Bussu F, Carta AG, Cossu ML, Cottu P, Fancellu A, Feo CF, Ginesu GC, Giuliani G, Madonia M, Perra T*, Piras A, Porcu A*, Rizzo D, Scanu AM, Tedde A, Tedde M (Cliniche San Pietro, A.o.u. Sassari, Sassari); Aversano A, Carbone F, Delrio P*, Di Lauro K, Fares Bucci A, Rega D*, Spiezio G (Colorectal Surgical Oncology Unit - Istituto Nazionale Tumori Fondazione, Pascale-I.r.c.c.s., Naples); Pirozzolo G*, Recordare A, Vignotto C (Dell'angelo Hospital, Venezia); Badalamenti G, Campisi G, Cordova A, Franza M, Maniaci G, Rinaldi G, Toia F* (Department Of Surgical, Oncological And Oral Sciences. University Of Palermo, Palermo); Calabrò M*, Farnesi F, Lunghi EG, Muratore A*, Pipitone Federico NS (Edoardo Agnelli, Pinerolo); D'Andrea G, Familiari P*, Picotti V (Fabrizio Spaziani, Frosinone 03100); De Palma G, Luglio G*, Pagano G, Tropeano FP (Federico II University Hospital, Naples); Antonelli B, Baldari L*, Beltramini GA, Boni L*, Cassinotti E*, Gianni' A*, Pignataro L*, Rossi G*, Torretta S (Fondazione IRCCS Ca' Granda - Ospedale Maggiore Policlinico, Milan); Abatini C, Baia M, Biasoni D, Bogani G, Cadenelli P, Capizzi V*, Cioffi SPB, Citterio D*, Comini LV, Cosimelli M, Fiore M*, Folli S, Gennaro M, Giannini L*, Gronchi A, Guaglio M*, Macchi A*, Martinelli F*, Mazzaferro V, Mosca A, Pasquali S, Piazza C, Raspagliesi F, Rolli L*, Salvioni R, Sarpietro G, Sarre C, Sorrentino L (Fondazione IRCCS Istituto Nazionale dei Tumori - Milan); Agnes A, Alfieri S, Belia F, Biondi A, Cauteruccio M, Cozza V, D'Ugo D, De Simone V, Fagotti A*, Gasparini G, Gordini L*, Litta F, Lombardi CP, Lorenzon L, Maccauro G, Marra AA, Marzi F, Moro A, Parello A, Perrone E, Persiani R, Ratto C, Rosa F, Saponaro G, Scambia G*, Scrima O, Sganga G, Tudisco R, Vitiello R, Ziranu A (Fondazione Policlinico Universitario Agostino Gemelli IRCCS, Rome); Belli A*, Granata V, Izzo F, Palaia R, Patrone R (Hpb Surgical Oncology Unit - Istituto Nazionale Tumori Fondazione, Pascale-I.r.c.c.s., Naples); Carrano FM, Carvello MM, De Virgilio A, Di Candido F, Ferreli F, Gaino F, Mercante G*, Rossi V, Spinelli A*, Spriano G (Humanitas Clinical And Research Center – Irccs, Rozzano (Mi) & Humanitas University, Department Of Biomedical Sciences, Pieve Emanuele, Milan); De Nardi C (Iov - Istituto

Oncologico Veneto, Padova); Donati DM*, Frisoni T, Palmerini E (Irccs Istituto Ortopedico Rizzoli, Bologna); Aprile A, Barra F*, Batistotti P, Ferrero S, Fregatti P*, Massobrio A, Pertile D, Scabini S*, Soriero D, Sparavigna M (Irccs Ospedale Policlinico San Martino, Genoa); Adamoli L, Ansarin M*, Cenciarelli S, Chu F, De Berardinis R, Fumagalli Romario U*, Mastrilli F, Pietrobon G, Tagliabue M (Istituto Europeo Di Oncologia - Irccs -Milano, Milan); Badellino E, Biglia N, Chiado' Piat F, Ferrero A*, Massobrio R (Mauriziano Hospital Torino, Italy); De Manzoni Garberini A* (Ospedale Civile Spirito Santo, Pescara); Mazzotti F*, Pasini F, Ugolini G (Ospedale Degli Infermi Di Faenza, Faenza); Barone R, Birolo SL*, Caccetta M, Deirino A, Garino M, Grasso M, Marafante C, Masciandaro A, Moggia E, Mungo S, Murgese A, Raggio E (Ospedale Degli Infermi Di Rivoli, Rivoli); Federico P, Maida P, Marra E, Marte G, Petrillo A, Tammaro T, Tufo A* (Ospedale Del Mare, Naples); Berselli M*, Borroni G*, Cocozza E, Conti L, Desio M, Livraghi L*, Marchionni V, Quintodei V, Rizzi A (Ospedale Di Circolo, University Of Insubria, University Hospital Of Varese, Asst Sette Laghi, Regione Lombardia, Varese Lombardy); Baldi C*, Corbellini C, Sampietro GM (Ospedale Di Rho - Asst Rhodense, Rho); Bordoni P, Clarizia G, Fleres F*, Franzini M, Grechi A, Longhini A, Spolini A (ASST Valtellina e Alto Lario, Sondrio Hospital, Chirurgia Generale - Sondrio); Cellerino P*, Galfrascoli E, Iacob G (Ospedale Fatebenefratelli E Oftalmico, Milan); Baldini E*, Capelli P, Conti L, Isolani SM, Ribolla M (Ospedale Guglielmo Da Saliceto – Piacenza, Piacenza); Bondurri A, Colombo F*, Ferrario L, Guerci C, Maffioli A (Ospedale Luigi Sacco Milano, Milan); Armao T, Ballabio M*, Bisagni P, Gagliano A, Longhi M, Madonini M, Pizzini P (Ospedale Maggiore Di Lodi, Lodi); Baietti AM, Biasini M, Maremonti P, Neri F, Prucher GM*, Ricci S, Ruggiero F, Zarabini AG (Ospedale Maggiore/Bellaria Carlo Alberto Pizzardi Ausl Bologna, Bologna); Impellizzeri H, Inama M*, Moretto G (Ospedale Pederzoli, Verona); Barmasse R, Mochet S*, Morelli L, Usai A (Ospedale Regionale Umberto Parini, Aosta); Bianco F*, Incollingo P (Ospedale S. Leonardo - Asl Napoli 3 Sud, Castellammare Di Stabia, Naples); Giacometti M*, Zonta S (Ospedale San Biagio, Asl Vco, Domodossola); Marino Cosentino L*, Sagnotta A* (Ospedale San Filippo Neri, Rome); Dell'Oro C, Fruscio R*, Grassi T, Negri S, Nespoli LC, Tamini N*, Zambetti B (Ospedale San Gerardo, Monza); Anastasi A, Bartalucci B, Bellacci A, Canonico G*, Capezzuoli L, Di Martino C, Ipponi P, Linari C, Montelatici M, Nelli T, Spagni G, Tirloni L, Vitali A (Ospedale San Giovanni Di Dio, Firenze); Abate E, Casati M*, Casiraghi T, Laface L, Schiavo M (Ospedale Vittorio Emanuele III - Carate Brianza, Carate Brianza (Mb)); Arminio A, Cotoia A, Lizzi V*, Vovola F (Ospedali Riuniti Azienda Ospedaliera Universitaria Foggia, Foggia); Vergari R* (Ospedali Riuniti Di Ancona, Ancona); D'Ugo S*, Depalma N, Spampinato MG (UOC Chirurgia Generale, Ospedale "Vito Fazzi", Lecce); Annicchiarico A, Catena F*, Giuffrida M, Perrone G (Parma University Hospital, Parma); Baronio G, Carissimi F, Montuori M, Pinotti E* (Policlinico San Pietro, Ponte San Pietro); Bartolucci P, Binda B, Brachini G, Bruzzaniti P, Chiappini A, Chiarella V, Ciccarone F, Cicerchia PM, Cirillo B, Crocetti D, De Toma G, Di bartolomeo A, Duranti G, Fiori E, Fonsi GB, Franco G, Frati A, Giugliano M, Iannone I, La Torre F, Lapolla P*, Leonardo C, Marruzzo G, Meneghini S, Mingoli A, Ribuffo D, Salvati M, Santoro A, Sapienza P, Scafa AK, Simonelli L, Zanacana G, Zambon M, Zuppi E (Policlinico Umberto I Sapienza University Of Rome, Rome); Capolupo GT*, Carannante F, Caricato M*, Mascianà G, Mazzotta E (Policlinico Universitario Campus Bio Medico Of Rome, Rome); Gattolin A, Migliore M, Rimonda R, Sasia D*, Travaglio E (Regina Montis Regalis Hospital, Mondovì); Chessa A*, Fiorini A, Norcini C (San Giovanni Di Dio,

Orbetello); Colletti G, Confalonieri M, Costanzi A*, Frattaruolo C, Mari G, Monteleone M (San Leopoldo Mandic, Merate (Lc)); Bandiera A, Bocciolone L, Bonavina G, Candiani M*, Candotti G, De Nardi P*, Gagliardi F, Medone M, Mortini P*, Negri G*, Parise P, Piloni M, Sileri P, Vignali A (San Raffaele Scientific Institute, Milan, Milan); Belvedere A, Bernante P, Bertoglio P, Boussedra S, Brunocilla E, Cervellera M, Cescon M, Cipriani R, Cisternino G, De Crescenzo E, De Iaco P*, Del Gaudio M, Dondi G, Droghetti M, Germinario G, Gori A, Frio F*, Jovine E, Mineo Bianchi F, Morezzi D, Neri J, Parlanti D, Perrone AM, Pezzuto AP, Pignatti M*, Pinto V, Poggioli G, Ravaioli M, Rottoli M*, Russo IS, Sartarelli L, Schiavina R, Serenari M*, Serra M, Solli P*, Tonini V, Taffurelli M*, Tanzanu M, Tesei M, Violante T, Zanotti S (IRCCS Azienda Ospedaliero - Universitaria di Bologna);
Borghi F, Cianflocca D, Di Maria Grimaldi S, Donati D, Gelarda E, Geretto P, Giraudo G, Giuffrida MC, Maione F, Marano A*, Palagi S, Pellegrino L, Peluso C, Giaccardi S, Testa V* (Santa Croce E Carle Hospital, Cuneo, Cuneo); Agresta F*, Prando D*, Zese M* (Santa Maria Degli Angeli Hospital Ulss5 - Adria, Adria); Aquila F, Gambacciani C, Lippa L, Pieri F, Santonocito OS* (Spedali Riuniti Di Livorno, Livorno); Armatura G*, Bertelli G, Frena A, Marinello P, Notte F, Patauner S, Scotton G* (St. Moritz Hospital, Bolzano); Fulginiti S, Gallo G*, Sammarco G, Vescio G (University ‘Magna Graecia’ Of Catanzaro, Catanzaro); Balercia P, Catarzi L, Consorti G* (University Hospital Umberto I Ancona, Ancona); Asti ELG, Bernardi D, Bonavina L*, Lovece A (University Of Milan, Irccs Policlinico San Donato, San Donato); Di Marzo F* (Valtiberina, Sansepolcro).
Japan: Fujiwara H* (Jichi Medical University Hospital, Shimotuske); Hashimoto D*, Yamaki S, Yamamoto T (Kansai Medical University, Hirakata); Daiko H*, Ishikawa M, Ishiyama K, Iwata S, Kanematsu K, Kanemitsu Y*, Kato T*, Kawai A*, Kobayashi E, Kobayashi Kato M, Moritani K, Nakagawa M, Nakatani F, Oguma J, Tanase Y, Uno M (National Cancer Center Hospital, Tokyo); Hada T, Iwahashi H, Miyamoto M, Suminokura J, Takano M* (National Defense Medical College, Tokorozawa); Fujiwara K*, Fujiwara N, Kurosaki A (Saitama Medical University International Medical Center, Hidaka-City).
Jordan: Ababneh H, Al Abdallah M*, Ayasra F, Ayasra Y, Hammad F, Qasem A (Al-Basheer Hospital, Amman); Abu Za’nouneh FJ, Al-Shraideh AA, Fahmawee T, Hmedat A, Ibrahim A, Obeidat K* (King Abdullah University Hospital, Ar Ramtha); Abdel Al S, Abdel Jalil R, Abou Chaar MK, Al-Masri M*, Al-Najjar H, Alawneh F, Alsaraireh O, Elayyan M, Ghanem R, Lataifeh I (King Hussein Cancer Center, Amman).
Kazakhstan: Fakhradiyev I*, Saliev T, Tanabayeva S (City Clinical Hospital No. 4, Almaty).
Kuwait: Almahmeed H*, Almazeedi S*, Alsabah S*, Jamal M* (Jaber Al Ahmad Al Sabah Hospital, Kuwait).
Libya: Aldokali N, Senossi O, Subhi MT (Alkhadra Hospital, Tripoli); Algallai M, Alwarfly S, AlZAEDE S, Gahwagi M*, Moftah M (Benghazi Medical Center, Benghazi); Abusannoga M, Alawami A, Alawami M*, Albashri M, Malek A (Medical Care Clinic, Tripoli); Burgan D*, Kamoka E, Kilani AI, Salamah A, Salem M, Shuwayyah A (National Cancer Institute, Sabratha - Libya, Sabratha); Abdelkabir M*, Altomi I, Altoumi M (Sabha Medical Center, Tripoli); Bouhuwaish A*, Elmabri A, Omar M, Taher AS (Tobruk Medical Center, Tobruk); Abdulwahed E*, Alshareea E, Aribi N, Aribi S, Biala M, Ghamgh R, Morgom M (Tripoli Central Hospital, Tripoli); Alansari SAA, Aldayri Z, Alsoufi A, Elhadi A, Elhajdawe F, Ellojli I*, ERgebi AAD, Kredan A, Msherghi A*, Nagib T (Tripoli University Hospital, Tripoli); Abudher A*, Alshareef K*, Elamin F (Yashfeen Clinic, Tajora-Tripoli).

Lithuania: Bradulskis S, Dainius E, Kubiliute E, Kutkevičius J, Parseliunas A, Subocius A, Venskutonis D* (Lithuanian University Of Health Sciences Kaunas Clinical Hospital, Kaunas).
Madagascar: Rasoaherinomenjanahary F*, Razafindrahita JB, Samison LH (Joseph Ravoahangy Andrianavalona Hospital, Antananarivo).
Malaysia: Ong EC (Bintulu, Bintulu); Abdul Maei N, Ngo CW*, Ramasamy S (Hospital Enche' Besar Hajjah Khalsom, Kluang, Johor); Hamdan KH, Ibrahim MR, Tan JA, Thanapal MR* (Hospital Kuala Lumpur, Kuala Lumpur); Choong E, Lim RZM* (Hospital Sultanah Aminah, Johor); Amin Sahid N, Hayati F*, Jayasilan J, Sriram RK*, Subramaniam S (Queen Elizabeth Hospital & Universiti Malaysia Sabah, Kota Kinabalu, Sabah, Malaysia, Kota Kinabalu); Ibrahim AF* (Sarawak General Hospital, Kuching, Sarawak); Che jusoh A, Hussain AH, Mohamed Sidek AS, Mohd Yunus MF, Soh JY, Wong MP, Zakaria AD*, Zakaria Z (School Of Medical Sciences & Hospital, Universiti Sains Malaysia, Kelantan); Kampan N, Mohd Azman ZA, Nur Azurah AG, Zainuddin AA (Universiti Kebangsaan Malaysia Medical Centre, Malaysia); Fadzli AN*, Fathi NQ, Koh PS*, Liew YT*, Roslani AC*, Tang CY, Teoh LY*, Wong WJ*, Xavier R, Yahaya AS (University Malaya Medical Centre, Kuala Lumpur).
Mexico: Alvarez MR, Arrangoiz R, Cordera F*, De la Rosa Abaroa MA, Gómez-Pedraza A, Hernandez R, Maffuz-Aziz A, Posada JA (Abc Medical Center, Mexico City); Lupián-Angulo AI, Soulé Martínez CE* (Hospital Central Norte Pemex, Mexico City); Aboharp Hasan Z, ALvarado Silva C, Bazan Soto A, Hernández Rubio A, Jiménez Villanueva X, Otoniel LR, Sosa Duran EE* (Hospital Juárez De México, Ciudad De México); Becerra García FC* (Hospital San Angel Inn Patriotismo, Mexico City); Melchor-Ruan J*, Romero Bañuelos E, Vilar-Compte D (Instituto Nacional De Cancerologia, Mexico City); Alfaro-Goldaracena A, Buerba GA, Castillejos-Molina RA, Chan C, Dominguez-Rosado I, Medina-Franco H, Mercado MÁ*, Oropeza-Aguilar M, Peña Gómez Portugal E, Posadas-Trujillo OE, Rodriguez-Covarrubias F, Salgado-Nesme N, Sarre C, Vilatoba M (Instituto Nacional De Ciencias Médicas Y Nutrición "Salvador Zubirán", Mexico City).
Morocco: Arkha Y, Bechri H, El Ouahabi A, Oudrhiri MY* (Centre Hospitalier Universitaire Ibn Sina Rabat, Rabat); El Azhari A, Louraoui SM*, Rghioui M (Cheikh Khalifa International University Hospital, Casablanca City); Bougrine M, Derkaoui hassani F*, El abbadi N (Cheikh Zaid International University Hospital, Rabat); Amrani L, Belkhadir ZH, Benkabbou A, Chakib O, El Ahmadi B, El Bouazizi Y, Essangri H, Ghannam A*, Majbar AM, Mohsine R, Souadka A* (Institut National D'oncologie, Rabat).
Netherlands: Borgstein ABJ, Gisbertz SS*, Van Berge Henegouwen MI* (Amsterdam UMC, Cancer Center Amsterdam, University of Amsterdam); Hompes R*, Meima-van Praag EM, Pronk A, Sharabiany S (Amsterdam Umc, University Of Amsterdam, Amsterdam); Grotenhuis B*, Hartveld L, Reijers S, Van Houdt W* (Antoni Van Leeuwenhoek Ziekenhuis, Amsterdam); Baaij J, Bolster-van Eenennaam M*, De Graaff M, Sloothaak D, Van Duijvendijk P* (Gelre Ziekenhuis, Apeldoorn); Ebben LDA, Kuiper SZ*, Melenhorst J, Poeze M, Sluijpers NRF, Vaassen LAA (Maastricht University Medical Centre +, Maastricht); Posma-Bouman L* (Slingeland Ziekenhuis, Doetinchem); Derksen T, Franken J, Oosterling S* (Spaarne Gasthuis, Haarlem); De Bree R* (University Medical Center Utrecht, Utrecht); Konsten J*, Van Heinsbergen M (Viecuri Medisch Centrum, Venlo).

Nigeria: Adeyeye A, Akinmade A*, Enoch E, Fayose S (Afe Babalola University Multi-System Hospital, Ido Ekiti); Abur P, Fidelis L, Nwabuoku SE, Oyelowo N, Sholadoye TT*, Tolani MA* (Ahmadu Bello University Teaching Hospital, Zaria); Olaogun J* (Ekiti State University Teaching Hospital, Ado-Ekiti); Abiyere H, Adebara I, Adeniyi A, Adeyemo O, Babalola O, Bakare A, Banjo O, Okunlola A* (Federal Teaching Hospital, Ado Ekiti, Ado Ekiti); Adeniran A, Atobatele K, Eke G, Faboya O, Ogunyemi A, Omisanjo O, Oshodi O, Oshodi Y, Williams O* (Lagos State University Teaching Hospital, Ikeja); Ademuyiwa A, Afolabi B, Akinajo O, Alakaloko F, Atoyebi O, Balogun O, Belie O, Bode C, Chibuike George I, Elebute O, Ladipo-Ajayi O, Ohazurike E, Okunowo A, Olajide TO, Seyi-Olajide J* (Lagos University Teaching Hospital, Idi Araba); Daniel A, Egbuchulem IK*, Lawal TA*, Nwaorgu O*, Ogundoyin O*, Olulana D, Onakoya P, Oyelakin O (University College Hospital, Ibadan); Abdullahi H, Agida E, Aisuodionoe-Shadrach O, Ajibola H, Akaba G, Sani AS, Chinda J, Dawang Y, Garba S, Mshelbwala P, Obande J, Olori S*, Olute A, Osagie O, Pius Ogolekwu I, Umar A (University Of Abuja Teaching Hospital, Gwagwalada); Abdur-Rahman L*, Adeleke N, Adeyeye A*, Aremu I, Bello J, Olasehinde O, Popoola A, Raji HO (University Of Ilorin Teaching Hospital, Ilorin).

Oman: Massoud JG*, Massoud R, Sorour TM (Khoula Hospital, Muscat).

Pakistan: Abassy J*, Ahmed K, Alvi A, Arshad M, Khan S*, Pirzada A, Saleem A, Siddiqui T, Turk K (Aga Khan University, Karachi); Hanif F*, Haroon M, Khan MI (Bahria International Hospital, Bahria Orchard, Lahore); Jamal A, Kerawala AA* (Cancer Foundation Hospital, Karachi); Memon AS*, Nafees Ahmed R, Rai L* (Dr Ruth K.m. Pfau Civil Hospital, Karachi); Javed S*, Mahmood U, Shabbir RK, Yaqoob E* (Holy Family Hospital, Rawalpindi); Afzal A*, Ahmed Riaz S, Akbar A, Ali AA*, Ali G, Janjua A*, Mohsin M*, Naqi SA*, Saleem I*, Shaukat A*, Sohail M (King Edward Medical University, Mayo Hospital, Lahore, Lahore); Afzal MF, Khokhar MI*, Latif F (Lahore General Hospital, Pgmi, Amc, Lahore); Ayub B, Hassan N*, Martins RS, Ramesh P, Sayyed R* (Patel Hospital, Karachi); Ayyaz M*, Butt U*, Kashif M, Khan WH*, Qureshi AU*, Umar M, Waris Farooka M*, Wasim T* (Services Hospital Lahore, Lahore); Bhatti ABH* (Shifa International Hospital, Islamabad); Ayubi A, Rashid I, Waqar SH* (The Pakistan Institute Of Medical Sciences, Islamabad).

Palestine: Al-Slaibi I, I. A. Alzeerelhouseini H, Jobran F* (Al-Ahli Hospital, Hebron, West Bank); Abukhalaf SA (Palestine Medical Complex, Ramallah, West Bank).

Panama: Arrue E, Cukier M*, Rodriguez-Zentner H (Pacifica Salud Hospital, Panama).

Peru: Borda-Luque G*, León Palacios JL, Lizzetti G, Vasquez Ojeda XP (Cayetano Heredia National Hospital, Lima); Falcon Pacheco GM*, Robles R (Instituto Regional De Enfermedades Neoplásicas Del Sur, Arequipa).

Philippines: Jocson R, Teh C*, Uy Magadia E (National Kidney & Transplant Institute, Quezon City).

Poland: Major P (Jagiellonian University Medical College, Krakow); Bąk M, Dubieńska K, Ławnicka A, Murawa D* (Karol Marcinkowski University Hospital, Zielona Gora); Bobiński M*, Kotarski J*, Rasoul-Pelińska K* (Medical University Of Lublin, Ist Chair And Department Of Gynaecological Oncology And Gynaecology, Lublin); Brociek A, Chloupek A, Janik M, Kowalewski P, Kwiatkowski A, Panasiewicz P, Roszkowski R, Rot P, Sroczyński P, Walędziak M* (Military Institute Of Medicine, Warsaw).

Portugal: Azevedo C, Machado D, Mendes F* (Centro Hospitalar Cova Da Beira, Covilha); De Sousa X* (Centro Hospitalar De Setúbal, Setúbal); Fernandes U, Ferreira C*, Guidi G, Leal C, Marçal A, Marques R, Martins D, Melo A, Tenreiro N, Vaz Pereira R, Vieira B (Centro Hospitalar De Trás-Os-Montes E Alto Douro, E.p.e., Vila Real); Almeida JI, Almeida-Reis R*, Correia de Sá T, Costa MJMA, Fernandes V, Ferraz I, Lima da Cruz L, Lima da Silva C, Lopes L, Machado N, Marialva J, Nunes Coelho M, Pedro J, Pereira C, Ribeiro A, Ribeiro CG, Santos R, Saraiva P, Silva RL, Tavares F, Teixeira M, Valente P (Centro Hospitalar Do Tamega E Sousa, Penafiel); Almeida AC, Amaral MJ, Andrade R, Athayde Nemésio R, Breda D, Camacho C, Canhoto C, Colino M, Correia S, Costa M, De Barros J, De Oliveira López AL, Duque M, Garrido S, Guerreiro P, Guimarães A, Lázaro A*, Lopes C, Martins R, Nogueira O, Oliveira A, Oliveira JM, Rodrigues M, Ruivo A, Santos E, Silva M, Simões J, Valente da Costa A (Centro Hospitalar E Universitário De Coimbra, Coimbra); Almeida A, Castanheira Rodrigues S, Cavaleiro Leitão de Carvalho AS, Devezas V, Faria CS, Jácome F, Magalhães Maia M, Nogueiro J, Pereira A, Pereira-Neves A, Pina-Vaz T, Santos-Sousa H*, Silveira H, Vaz S, Vieira P (Centro Hospitalar E Universitário De São João, Porto); Gomes da Costa A, Lobo Antunes I* (Centro Hospitalar Lisboa Norte, Lisbon); Pinto J, Tojal A* (Centro Hospitalar Tondela-Viseu, Viseu); Cardoso N, Cardoso P*, Domingues JC, Henriques P, Manso MI, Martins dos Santos G, Martins R, Morais H*, Pereira R, Revez T, Ribeiro R, Ribeiro VI, Soares A, Sousa S, Teixeira J (Centro Hospitalar Universitário Do Algarve - Unidade De Faro, Faro); Amorim E, Baptista VH, Cunha MF*, Dias B, Fazenda A, Melo Neves JP, Policarpo F, Sampaio da Nóvoa Gomes Miguel II, Veiga D (Centro Hospitalar Universitario Do Algarve - Unidade De Portimão, Portimao); Bandovas JP, Borges N*, Branquinho A, Chumbinho B, Correia J, Fidalgo H, Figueiredo de Barros I, Frade S, Gomes J, Kam da Silva Andrade A, Maciel J, Pereira Rodrigues A, Pina S, Silva N*, Silveira Nunes I, Sousa R (Centro Hospitalar Universitário Lisboa Central, Lisbon); Ascensão J, Azevedo P, Costeira B, Cunha C, Garrido R*, Gomes H, Lourenço I, Mendinhos G*, Miranda P, Nobre Pinto A, Peralta Ferreira M, Ribeiro J, Rio Rodrigues L, Sousa Fernandes M (Hospital Beatriz Angelo, Loures); Azevedo J* (Hospital Da Horta, E.p.e., Horta); Galvão D, Soares AC, Vieira A*, Vieira B (Hospital De Santo Espirito Da Ilha Terceira, Angra Do Heroismo); Patrício B, Santos PMDD*, Vieira Paiva Lopes AC (Hospital De Torres Vedras - Centro Hospitalar Do Oeste, Torres Vedras); Cunha R, Faustino A, Freitas A, Jacob Oliveira B, Martins AB, Mendes JR*, Parreira R, Rosa J, Teves M (Hospital Do Divino Espírito Santo, Ponta Delgada); Abreu da Silva A*, Claro M, Costa Santos D, Deus AC, Grilo JV (Hospital Do Litoral Alentejano, Santiago Do Cacém); Castro Borges F*, Corte Real J, Henriques S, Lima MJ, Matos Costa P (Hospital Garcia De Orta, Almada); Alagoa Joao A, Azevedo P, Camarneiro R, Capunge I, Fragoso M, Frazão J, Martins A, Pedro V, Pera R, Ramalho de Almeida F, Sampaio Soares A*, Vale R, Vasconcelos M (Hospital Prof. Doutor Fernando Fonseca, E.p.e., Amadora); Brito da Silva F, Caiado A*, Fonseca F (Instituto Português De Oncologia De Lisboa Francisco Gentil, Lisboa); Ângelo M, Baiao JM, Martins Jordão D*, Vieira Caroço T (Ipo Coimbra, Coimbra); Messias J, Millan A, Salgado I, Santos P* (Ipo Lisboa, Lisboa); Baía C, Canotilho R, Correia AM, Ferreira Pinto AP, Peyroteo M, Videira JF* (IPO Porto, Porto).
Puerto Rico: Escobar P*, Maldonado Santiago M (Instituto Gineco Oncologico, San Juan).
Réunion: Kassir R*, Sauvat F (Chu Reunion, Saint Denis).

Romania: Bonci E*, Gata V*, Titu S* (“Prof. Dr. Ion Chiricuta” Institute Of Oncology, Cluj-Napoca); Bezede C, Chitul A, Ciofic E, Cristian D, Grama F* (Coltea Clinical Hospital, Bucharest); Pirtea L*, Secosan C (Emergency Clinical City Hospital, Timisoara); Ciubotaru C, Negoi I*, Negoita VM, Stoica B (Emergency Clinical Hospital Bucharest, Bucharest); Ginghina O*, Iordache N, Iosifescu RV, Mardare M, Mirica RM, Spanu A, Văcărașu AB, Zamfir-Chiru-Anton M (Saint John Emergency Hospital, Bucharest).
Russia: Garmanova T, Kazachenko E, Markaryan D, Rodimov S, Tsarkov P*, Tulina I (Clinic Of Coloproctology And Minimally Invasive Surgery, Sechenov Medical State University, Moscow); Abelevich A, Bazaev A, Kokobelyan AK, Yanishev A* (Privolzhsky Research Medical University, Nizhny Novgorod Regional Clinical Hospital, Sechenov Medical State University, Nizhny Novgorod); Litvin A*, Litvina Y, Provozina A (Immanuel Kant Baltic Federal University, Regional Clinical Hospital, Kaliningrad); Agapov M*, Galliamov E, Kakotkin V, Kubyshkin V, Semina E, Камалов А (Moscow Research And Educational Center, Lomonosov Moscow State University, Moscow); Novikova A, Zakharenko A* (Pavlov First State Medical University Of St. Petersburg, Saint Petersburg).
Saudi Arabia: Alshahrani M*, Alsharif F, Eskander M (Aseer Central Hospital, Abha); Al Raddadi R, Majrashi S*, Mashat A (East Jeddah General Hospital, Jeddah); Akeel N, Alharthi M, Aljiffry M, Basendowah M, Farsi A, Ghunaim M, Khoja A, Maghrabi A, Malibary N*, Nassif M, Nawawi A, Saleem A, Samkari A, Trabulsi N* (King Abdulaziz University Hospital, Jeddah); A Azab M* (King Abdullah Medical City Makkah, Makkah); Aldosri M, Alghanem A, Alguraigari A, ALjohani K, Alqahtani D, Alzaidi TM, Basyouni A, Elhussain E, Jaloun H*, Mudawi I, Shafei M (King Fahad Armed Forces Hospital, Jeddah); Al Awwad S*, Alghamdi M*, Alnumani T*, Nasser M*, Said bayazeed A* (King Fahad General Hospital, Jeddah); Abdelrhman S, Awad S*, Ghedan S, I Sharara M, Mashaly A (King Faisal Medical Complex, Taif City); Aburahmah M, Al Otaibi F, Al-alem I, Al-Badawi IA, AlDahash H, Alhazzaa N, Alhefdhi A*, Alhelal B, AlKattan K, Almalik O, Alomair A, Alomar O, Alotaibi NH, Alresaini F, Alrifai O, Alsakka M, Alsalamah R, Alsemari M, Alsobhi S, AlSumai T, Farrash F, Khan P, Mahasin Z, Othman E, Pant R, Robaidi H, Saleh W, Salem H, Shaheen M, Spangenberg P, Velagapudi S (King Faisal Specialist Hospital, Riyadh); Al Habes H, Alamri A, Alkarak S, Alqannas M*, Alyami M*, Alzamanan M, Cortés-Guiral D*, Elawad A (King Khalid Hospital, Najran); Adi H, Al ahmad F, Al Ayed A, Al zahrani A, Alalawi Y*, Alishi Y, Alqahtani B (King Salman Armed Forces Hospital, Tabouk); AlAamer O, Alriyees L, Alselaim N* (King Saud Bin Abdulaziz University For Health Sciences, King Abdullah International Medical Research Center, Ministry Of National Guard, Health Affairs, General Surgery Department., Riyadh); Alfaifi J, Alkreedees N, Almutrafi SN*, Alramadhan M, Alshitwi A, D’Souza J (King Saud Medical City, Riyadh); Abdulkareem A, Ajlan A, Akkour K, Al-Habib A, Al-Khayal K, Alatar A, Alburakan A, Alhalal H, Alhassan B, Alhassan N, Aljassir F, Alobeed O, Alsaif A, Alsaif F, Alshammari S, Alshaygy I, Barry M, Bin Nasser A*, Bin Traiki T, Bokhari A, Elwatidy S, Helmi H, Madkhali A, Nouh T*, Rabah PD, Zubaidi A (King Saud University, Riyadh); Al Amri A* (Najran University Hospital, Najran); Abdulfattah F, Al Hasan I*, Al-Kharashi E*, Alanazi F, Albaqami F, Alghamdi A, Alghuliga A, Aljaber F, Alsowaina K, Alsuhaibani A, Arab N*, Badahdah F (Prince Sultan Military Medical City, Riyadh); Alobaysi S, Alshahrani A, Alzahrani A* (Security Forces Hospital, Riyadh).
Serbia: Paunovic I*, Slijepcevic N (Centre For Endocrine Surgery, Clinical Centre Of Serbia, Belgrade); Aleksić L, Antic A, Barisic G*, Ceranic M, Ebrahimi K, Galun D*, Grubač Ž, Ivanović N, Jelenkovic J,

Kecmanović D, Kmezić S, Knezevic D*, Krivokapic Z*, Latinčić S, Markovic V*, Matić S*, Miladinov M, Pavlov M*, Pejovic I, Radenkovic D*, Sabljak P*, Skrobić O*, Šljukić V, Tadic B, Vasljević J, Velickovic D, Zivanovic M (Clinic For Digestive Surgery, Clinical Centre Of Serbia, Belgrade); Doklestic K, Gregoric P*, Ivancevic N, Loncar Z, Micic D (Clinic For Emergency Surgery, Emergency Centre, Clinical Centre Of Serbia, Belgrade); Perovic M, Srbinovic L (Clinic For Gynecology And Obstetrics Narodni Front, Belgrade); Andrijasevic S, Bozanovic T, Cerovic Popovic R, Dokic M, Janjic T, Jeremic K, Kadija S, Ladjevic Likic I, Mirkovic L, Pantovic S, Pilic I, Radojevic M, Stefanovic A*, Vidakovic S, Vilendecic Z (Clinic For Gynecology And Obstetrics, Clinical Center Of Serbia, Belgrade); Antic S, Dunđerović D, Jelovac D*, Jezdic Z, Konstantinovic V, Kotlar B, Kuzmanovic C, Lazić M, Pajić S, Petrovic M, Popovic F, Pucar A, Romic M, Sumrak S, Vujanac V (Clinic For Maxillofacial Surgery, School Of Dental Medicine, University Of Belgrade, Belgrade); Bascarevic V, Bogdanovic I, Grujičić D*, Ilic R*, Jokovic M, Milićević M, Milisavljević F, Miljković A, Paunovic A, Šćepanović V, Stanimirovic A, Todorovic M (Clinic For Neurosurgery, Clinical Center Of Serbia, Belgrade); Folic M, Jotic A, Krejovic Trivic S, Milovanovic J*, Trivic A (Clinic For Otorhinolaryngology And Maxillofacial Surgery, Clinical Center Of Serbia, Belgrade); Bumbasirevic U*, Dzamic Z, Kajmaković B, Prijović N, Zivkovic M (Clinic Of Urology, Clinical Center Of Serbia, Belgrade); Buta M, Cvetkovic A, Djurisic I, Gacic S, Goran M, Inic Z, Jeftic N, Jevric M, Jokic V, Markovic I*, Milanović M, Nikolic S, Pejnovic L, Savković N, Spurnic I, Stevic D, Stojiljkovic D, Vucic N, Zegarac M (Institute For Oncology And Radiology Of Serbia, Belgrade); Karamarkovic A, Kenic M, Kovacevic B, Krdzic I*, Milutinović V, Savic G (Zvezdara University Medical Center, Belgrade).

Singapore: Chan CW, Lieske B* (National University Hospital, Singapore).

Slovakia: Gális B, Šimko K (University Hospital Bratislava, Bratislava).

Slovenia: Cokan A*, Crnobrnja B, Dovnik A, Knez J, Pakiž M (University Medical Centre, Maribor).

South Africa: Almgla N*, Bernon M, Boutall A, Cairncross L*, Chinnery G, Herman A, Hilton T, Jonas E, Kloppers C*, Malherbe F, Mugla W*, Nel D, Rayamajhi S, Scriba M, Van Wyngaard T, Vogel J (Groote Schuur Hospital, Cape Town).

Spain: Castaño-Leon AM*, Delgado Fernandez J, Eiriz Fernandez C, Espino Segura-Illa M, Esteban Sinovas O, Garcia Perez D, Gomez P, Jimenez-Roldan L, Lagares A, Moreno-Gomez L, Paredes I, Pérez Núñez A, Sánchez Aniceto G*, Santas Alegret M (12 De Octubre University Hospital, Madrid); Fernández Rodríguez P, Paniagua García Señorans M*, Sanchez-Santos R, Vigorita V (Álvaro Cunqueiro Hospital, Vigo); Acrich E, Baena Sanfeliu E, Barrios O, Golda T*, Santanach C, Serrano-Navidad M, Sorribas Grifell M, Vives RV (Bellvitge University Hospital, Hospitalet De Llobregat); Arce Gil J*, Escolà D, Jiménez A* (Comarcal Alt Penedés, Barcelona); Alcázar JA, Angoso-Clavijo M, Blanco-Antona F, Carabias-Orgaz A, Díaz Maag R, Eguía Larrea M, Esteban Velasco C, Garcia J, García-Plaza AGP, Gonzalez-Muñoz JI, Muñoz-Bellvis L, Parreño-Manchado FC, Sánchez Tocino JM, Sanchez-Casado AB, Trebol J* (Complejo Asistencial Universitario De Salamanca, Salamanca); Hernandez Gutierrez J, Tébar Zamora A* (Complejo Hospitalario De Toledo, Toledo); Sánchez Mozo A* (Complejo Hospitalario Universitario De Albacete, Albacete); Cayetano Paniagua L, Gomez Fernandez L* (Consorci Sanitari De Terrassa, Barcelona); Artigues E, Bernal-Sprekelsen JC*, Catalá Bauset JC, Gilabert-Estellés J (Consorcio Hospital General Universitario, Valencia); Collera P, Diaz Del Gobbo R, Farre Font R, Flores Clotet R, Gómez Díaz CJ*,

Guàrdia N, Guariglia CA, Osorio A, Sanchez Jimenez R, Sanchon L, Soto Montesinos C (Fundació Althaia - Xarxa Assistencial Universitària De Manresa, Manresa); Albi Martin B, García Villayzán JE* (Fundación Jimenez Diaz University Hospital, Madrid); Alonso-Lamberti L, Assaf M, Baeza Pintado N, Carabias A, García-Quijada J, Huertas Fernandez MA, Jimenez Miramón J, Jimenez V*, Jover JM, Landeo Agüero SA, Leon R, Martín Salamanca MB*, Pérez Simón V, Ponce S, Rodriguez JL, Salazar A, Valle Rubio A (Getafe University Hospital, Getafe); Aguado H* (Hellín Hospital, Albacete); Aldecoa Ansorregui I, Bravo Infante R, De Lacy FB, Di Somma A*, Díaz-Feijoo B*, Enseñat Nora J*, Fabregas N, Ferrés A, Gil Ibañez B, Gonzalez Sanchez JJ*, Gracia I, Hoyos Castro JA, Lacy AM*, Langdon C, Momblán D, Morales X, Oleaga L, Otero A, Pedrosa L, Poblete Carrizo J, Reyes Figueroa LA, Roldan Ramos P, Rumia-Arboix J, Tercero-Uribe AI, Topczewski TE, Torales J, Torne A, Torné R, Turrado-Rodriguez V*, Valero R, Valverde S (Hospital Clinic Barcelona, Barcelona); Anula R, Avellana R, Camarero Rodríguez E, Catalán Garza V, Dziakova J, García Alonso M, Lasses Martínez B, López Antoñanzas L, Muguerza JM*, Ochagavía S, Peña Soria MJ, Rivera-Alonso D, Saez Carlin P, Sánchez del Pueblo C, Sanz Ortega G, Sanz-Lopez R, Torres A (Hospital Clínico San Carlos , Madrid); Garcés-Albir M*, Lopez F*, Martín-Arévalo J, Moro-Valdezate D*, Pla-Marti V (Hospital Clínico Universitario De Valencia, Valencia); Beltrán de Heredia J, De Andrés-Asenjo B*, Gómez Sanz T, Jezieniecki C, Nuñez Del Barrio H, Ortiz de Solórzano Aurusa FJ, Romero de Diego A, Ruiz Soriano M, Trujillo Díaz J, Vazquez Fernandez A (Hospital Clínico Universitario De Valladolid, Valladolid); Lora-Cumplido P, Sosa MV* (Hospital De Cabueñes, Gijón); Balague C, Ballester E, Moral A, Sánchez López A*, Targarona EM (Hospital De La Santa Creu I Sant Pau, Barcelona); Galvan-Perez A, Gonzalez-Gonzalez E, Minaya Bravo AM*, San Miguel-Mendez C (Hospital Del Henares, Madrid); Alonso de la Fuente N, Cazador Labat M, Cecchini L, Espinosa CA*, Jimenez Toscano M*, López Campillo A, Mancebo G, Martorell P, Munarriz M (Hospital Del Mar, Barcelona); Grau-Talens EJ, Martin-Perez B* (Hospital Don Benito-Villanueva, Don Benito (Badajoz)); Benavides Buleje JA, Carrasco Prats M*, Fernández PV, Fernández-López A*, García Escudero D*, García Porcel VJ, Garcia Soria V*, Giménez Francés C*, González Valverde FM, Gurrea-Almela E, López-Morales P, Marco Garrido A, Martínez Alonso JA, Medina E, Muñoz Camarena JM, Parra Baños PA, Peña Ros E, Ramirez Faraco M, Ruiz-Marín M*, Sanchez Rodriguez C, Valero Soriano M (Hospital General Reina Sofía, Murcia); Allué Cabañuz M, Colsa Gutiérrez P, García Domínguez M, Gimenez Maurel T, Martín Anoro LF, Ponchietti L, Rodriguez Artigas JM, Roldón Golet M*, Utrilla Fornals A (Hospital General San Jorge, Huesca); Estaire Gómez M*, Fernández Camuñas Á, Garcia Santos EP, Jimenez Higuera E, López de la Manzanara Cano CA, Martínez-Pinedo C, Moreno Pérez A, Muñoz-Atienza V, Padilla-Valverde D*, Picón Rodríguez R, Redondo Calvo FJ, Sánchez-García S, Sanchez-Pelaez D (Hospital General Universitario De Ciudad Real, Ciudad Real); Curtis Martínez C, Fernández-Candela A, Sánchez-Guillén L* (Hospital General Universitario De Elche, Elche); Colombari RC, Del valle E, Fernández M, Lozano Lominchar P*, Martín L, Rey Valcarcel C, Steiner MA, Tudela M, Zorrilla Ortúzar J (Hospital General Universitario Gregorio Marañón, Madrid); Alcaide Matas F, García Pérez JM, Troncoso Pereira P* (Hospital Mateu Orfila, Mahon); Blas Laina JL, Cros B, Escartin J*, Garcia Egea J, Nogués A, Talal El-Abur I, Yánez C (Hospital Royo Villanova, Zaragoza); Mora-Guzmán I* (Hospital Santa Bárbara, Puertollano); Cárdenas Puiggrós L* (Hospital Universitari De Girona Dr. Josep Trueta, Girona); Abellán M, Achalandabaso Boira M*, Jorba R, Memba

Ikuga R, Olona C, Sales Mallafré R (Hospital Universitari De Tarragona Joan Xxiii, Tarragona); Aguilo O, Cavallé Busquets P, Gavalda Pellice MGP*, Jorda Sole M*, Mateu I, Miralles Curto M, Salinas Peña J (Hospital Universitari Sant Joan, Reus); Fernández Martínez D, García Flórez LJ*, Solar-Garcia L (Hospital Universitario Central De Asturias (Huca), Oviedo); Aragon Achig EJ*, Barbier L, Caja Vivancos P*, Gainza A, García Gutierrez JJ, García-Operé G, Gómez-Suárez J, Jiménez-Jiménez M, Mallabiabarrena Ormaechea G*, Marín H, Martin Playa P*, Melchor Corcóstegui I, Municio-Martín JA, Oñate M, Pascua-Gómez LA, Pesántez Peralta MA*, Prieto Calvo M, Rodriguez Fraga A, Villalabeitia Ateca I* (Hospital Universitario Cruces, Barakaldo); De Andres Olabarria U, Durán Ballesteros M, Fernández Pablos FJ, Ibáñez-Aguirre FJ, Sanz Larrainzar A, Ugarte-Sierra B* (Hospital Universitario De Galdakao, Galdakao-Usansolo); Acosta Mérida MA*, Ortiz López D, Yepes Cano AF (Hospital Universitario De Gran Canaria Doctor Negrín, Las Palmas De Gran Canaria); Correa Bonito A, De la Hoz Rodríguez Á, Delgado Búrdalo L, Di Martino M*, García Sánz I, García Septiem J*, Maqueda González R, Martin-Perez E, Muñoz de Nova JL (Hospital Universitario De La Princesa, Madrid); Calvo Espino P*, Guillamot Ruano P (Hospital Universitario De Móstoles, Móstoles); Colao García L, Díaz Pérez D*, Esteban Agustí E, Galindo Jara P, Gutierrez Samaniego M*, Hernandez Bartolome MA*, Serrano González J (Hospital Universitario De Torrejón De Ardoz, Madrid); Alonso Poza A, Diéguez B, García-Conde M, Hernández-García M, Losada M* (Hospital Universitario Del Sureste, Madrid); Chiesa-Estomba CM, González García JÁ, Larruscain E, Sistiaga-Suárez JA* (Hospital Universitario Donostia, San Sebastian); Alvarez E, Chavarrias N, Frías L, García Pineda V, Gegúndez Simón A, Gómez Rivas J, Gortázar de las Casas S, Gracia M, Guevara J, Hernández Gutierrez A, Loayza A, María Dolores DT, Martí C, Melendez M, Moreno-Palacios E, Perez Y, Prieto Nieto MI, Ramos-Martín P, Rubio-Perez I*, Saavedra J, Sánchez Méndez JI, Siegrist Ridruejo J, Toribio Vazquez C, Urbieta A, Yebes A, Zapardiel I* (Hospital Universitario La Paz, Madrid); Aparicio-López D, Cantalejo diaz M, De Miguel Ardevines MDC, Dobón Rascón MÁ, Duque-Mallén V*, Gascon Ferrer I, González-Nicolás Trébol MT, Gracia-Roche C, Herrero Lopez M, Jariod Ferrer UM*, Kälviäinen H, Lanzon A, Martinez German A, Matute M, Redondo C, Sánchez Fuentes N, Santero-Ramirez MS, Saudí S, Simón Sanz MV, Uson T (Hospital Universitario Miguel Servet, Zaragoza); Blazquez Martin A, Diez Alonso M*, García Rico E, Garcia-Loarte Gomez E, Garcia-Moreno Nisa F, Gutierrez Calvo A, Hernandez P, Lasa I, Mendoza-Moreno F, Morales Palacios N*, Ovejero Merino E, Vera Mansilla C (Hospital Universitario Principe De Asturias, Madrid); Acero J*, Haddad A (Hospital Universitario Ramon Y Cajal, Madrid); Barranquero AG, Caballero Silva U, Cabañero Sánchez A*, Cavestany Garcia-Matres C, Cerro Zaballos C, Fra Fernández S, Moreno Mata N, Muñoz Molina GM, Núñez J, Ocaña J, Ramos D* (Hospital Universitario Ramón y Cajal, Madrid); Acebes García F, Bailón M, Bueno Cañones AD, Choolani Bhojwani E, Marcos-Santos P, Miguel T, Pacheco Sánchez D, Pérez-Saborido B, Sanchez Gonzalez J, Tejero-Pintor FJ* (Hospital Universitario Río Hortega, Valladolid); Alconchel F*, Conesa A, Gil Martínez J*, Gutiérrez Fernández AI, Lopez Abad A, Nicolás-López T*, Ramirez Romero P, Roca Calvo MJ, Rodrigues K*, Ruiz Manzanera JJ, Soriano AI (Hospital Universitario Virgen De La Arrixaca, Murcia); Cano A, Capitan-Morales L, Cintas Catena J, Gomez-Rosado J*, Oliva Mompean F, Pérez Sánchez MA, Río Lafuente FD, Torres Arcos C, Valdes-Hernandez J (Hospital Universitario Virgen Macarena, Seville); Bruna Esteban M, Cholewa H, Domingo S*, Frasson M, Lago V*, Marina Martin T*, Martínez Chicote C, Sancho-Muriel J*

(Hospital Universitario Y Politécnico La Fe, Valencia); Estraviz-Mateos B, Fernández Gómez Cruzado L, González de Miguel M, Landaluce-olavarria A*, Lecumberri D (Hospital Urduliz, Bizkaia); Abad Gurumeta A, Abad-Motos A, Martínez-Hurtado E, Ripollés-Melchor J*, Ruiz Escobar A (Infanta Leonor University Hospital, Madrid); Cuadrado-García A*, Garcia-Sancho Tellez L*, Heras Aznar J*, Maté Mate P, Ortega Vázquez I*, Picardo AL, Rojo López JA, Sanchez Cabezudo Noguera F*, Serralta de Colsa D* (Infanta Sofía University Hospital, San Sebastian De Los Reyes); Anchuelo Latorre J, Cagigas Fernandez C, Caiña Ruiz R, Fernandez Diaz MJ, Gomez Ruiz M, Hernanz F, Jimeno Fraile J*, Martínez-Pérez P, Poch C, Santarrufina Martinez S*, Valbuena Jabares V (Marqués De Valdecilla University Hospital, Santander); Moliner-Sachez C, Pingarron-Martin L, Rey-Biel J*, Ruiz Martin I (Rey Juan Carlos University Hospital, Móstoles); Cagigal Ortega EP, Cervera I, Díaz Peña P, Garcia de Castro Rubio E , Enjuto D*, Fernández Bernabé P, Garcés García R, Gonzalez J, Hernández I, Herrera-Merino N, Marqueta De Salas M, Martinez Pascual P, Perez Gonzalez M*, Ramos Bonilla A, Rodríguez Gómez L (Severo Ochoa University Hospital, Leganés); Alfonso Garcia M, Craus-Miguel A, Fernández Vega L, Ferrer-Inaebnit E, Gil Catalán A, González Argente FX, Jeri S, Oseira A, Pujol Cano N, Segura-Sampedro JJ*, Soldevila Verdeguer C, Villalonga B (Son Espases University Hospital, Palma De Mallorca); Bescós C*, Blanco-Colino R, Brana I, Caimari B, De Pablo García-Cuenca A, Duran-Valles F, Espin-Basany E*, Giralt López de Sagredo J, Pamias J, Pellino G, Prat N, Pujol Pina R, Saez barba M (Vall D'hebron University Hospital, Barcelona).
Sri Lanka: Arulanantham A, Bandara GBKD, Jayarajah U*, Ravindrakumar S, Rodrigo VSD (District General Hospital Chilaw, Chilaw).
Sudan: Ali Adil AA (Al-Rajhi, Omdurman); Elhafiz MHY* (Best Care Hospital, Khartoum); Ali EE, Awadelkarim M, Bakheit I*, Elbahri H, Hamid HKS (Ibrahim Malik Teaching Hospital, Khartoum); Essa MEA*, Ahmed AA, Abubakr Hassan, Momin Majed Yousuf Hilles (Medical and Cancer Research Institute at Nyala); Saleh M (University Of Gezira Hospital, Wad Madani).
Sweden: Arkani S*, Freedman J* (Danderyds Hospital, Stockholm); Elbe P*, Lindqvist EK* (Karolinska University Hospital, Stockholm); Angenete E*, Park J, Taflin H* (Sahlgrenska University Hospital, Gothenburg); Greiff L*, Hagander L* (Skane University Hospital, Lund); Älgå A*, Heinius G, Nordberg M, Pieniowski E (South General Hospital, Stockholm); Gkekas I, Löfgren N, Rutegård M*, Sund M* (Umea University Hospital, Umea).
Switzerland: Arigoni M, Bernasconi M, Christoforidis D*, Di Giuseppe M, La Regina D, Mongelli F (Ente Ospedaliero Cantonale, Ticino (Lugano, Bellinzona, Locarno, Mendrisio)); Chevallay M, Dwidar O, Gialamas E, Sauvain M* (Hopital De Pourtales, Neuchatel); Giger R*, Hool S, Klenke F, Kollàr A*, Kurze C, Mueller SA (Inselspital, Bern University Hospital, University Of Bern, Bern); Kiessling S, Stoeckli S* (Kantonsspital St. Gallen, St. Gallen); Adamina M*, Bächler T, Crugnale AS, Giardini M, Guglielmetti L, Peros G, Solimene F (Kantonsspital Winterthur, Winterthur); Gass M*, Metzger J, Scheiwiller A (Luzerner Kantonsspital, Luzern); Gutschow C*, Turina M* (Universitätsspital, Zürich).
Syrian Arab Republic: Al Asadi T, Alkhateb S, Altom R, Bakkar B, Maa Albared S*, Melhem S (Damascus Hospital, Damascus); Hamdan A, Hammed A*, Hammed S, Hossain M, Mahfoud M, Moussa A (Tishreen University Hospital, Latakia); Alsayyad R, Alsrouji S, Ashour G, Hareth Al-Nahr M, Slitin A, Tanos C (Al-Hilal Hospital).

Tunisia: Kacem MJ, Maghrebi H, Sebai A* (La Rabta Hospital, Tunis).
Turkey: Aghayeva A*, Hamzaoglu I, Sahin I (Acibadem Altunizade Hospital, Istanbul); Akaydin E, Aliyeva Z, Aytac E, Baca B, Dülgeroğlu O, Ozben V*, Ozmen BB, Uras C (Acibadem Atakent Hospital, Istanbul); Arikan AE*, Bilgin IA*, Bozkırlı B*, Ceyhan GO, Kara H, Karahasanoğlu T, Uras C (Acibadem Maslak Hospital, Istanbul); Celik H* (Adana Baskent University, Adana); Meydanli MM* (Ankara City Hospital, Ankara); Akbas A, Altinel Y*, Calikoglu F, Ercan G, Ercetin C, Hacım NA, Meriç S, Tokocin M, Vartanoglu T, Yigitbas H (Bagcilar Research And Training Hospital, Istanbul); Akilli H*, Ayhan A*, Kuscu E* (Baskent University, Ankara); Doğangün M, Iflazoğlu N, Yalkın Ö* (Bursa City Hospital, Bursa); Turna A* (Cerrahpasa Medical Faculty Istanbul University, Istanbul); Onan MA* (Gazi University Medical Faculty Hospital, Ankara); Akgor U*, Cennet O, Dincer HA, Erol T, Gultekin M*, Orhan N, Ozgul N*, Salman MC*, Soyak B* (Hacettepe University Hospital, Ankara); Aydemir L, Başaran B, Kara H, Sen C*, Ulusan M (Istanbul University Faculty Of Medicine, Istanbul); Açıkgöz AS, Alhamed A, Aykanat Y, Bese T, Cebi S, Demirkıran F, Ergün S*, Kayan B, OZcelık MF, Sanli AN, Uludağ SS*, Velidedeoglu M*, Zengin AK (Istanbul Universty - Cerrahpaşa Medical Faculty, Istanbul); Bozkurt MA, Kara Y*, Kocatas A (Kanuni Sultan Suleyman Training And Research Hospital, Istanbul); Candas Altinbas B, Çekiç AB, Eyuboglu K, Guner A*, Türkyılmaz S, Usta MA (Karadeniz Technical University, Farabi Hospital, Trabzon); Cimenoglu B, Demirhan R, Saracoglu K* (Kartal Dr. Lutfi Kirdar Training And Research Hospital, Istanbul); Azamat İF, Balik E*, Buğra D, Giray B, Kulle CB, Taskiran C*, Vatansever D (Koç University Medical School, Istanbul); Güler SA, Güreşin A, Tatar OC*, Utkan NZ, Yildirim A, Yüksel E (Kocaeli University Teaching Hospital, Kocaeli); Abbasov A*, Yanar H (Liv Hospital Ulus, Istanbul); Ugurlu MU* (Marmara University, School Of Medicine, Istanbul); Akin E, Altintoprak F*, Bayhan Z, Cakmak G, Çapoğlu R, Çelebi F, Demir H, Dikicier E, Firat N, Gönüllü E, Kamburoğlu MB, Kocer B, Küçük IF, Mantoglu B (Sakarya University Faculty Of Medicine, Sakarya); Çolak E*, Kucuk GO, Uyanik MS (Samsun Training And Research Hospital, Samsun); Goksoy B* (Sehit Prof.dr. İlhan Varank Training And Research Hospital, Istanbul); Bozkurt E, Citgez B, Mihmanli M, Tanal M*, Yetkin G (Sisli Hamidiye Etfal Training And Research Hospital, Istanbul); Akalin M, Arican C, Avci EK, Aydin C, Demirli Atıcı S*, Emiroglu M, Kaya T*, Kebabçı E, Kilinc G, Kirmizi Y, Öğücü H, Salimoğlu S, Sert İ, Tugmen C, Tuncer K, Uslu G, Yeşilyurt D (University Of Health Sciences Tepecik Training And Research Hospital, İzmir); Karaman E*, Kolusarı A (Van Yuzuncu Yil University, Medical Faculty, Van); Yildiz A* (Yildirim Beyazit University Yenimahalle Training And Research Hospital, Ankara); Gultekin FA* (Zonguldak Bulent Ecevit University School Of Medicine Research And Training Hospital, Zonguldak).
Uganda: Lule H*, Oguttu B* (Kampala International University Teaching Hospital, Ishaka).
United Arab Emirates: Abdelgalil K* (Tawam Johns Hopkins Hospital, Al-Ain, Abu Dhabi).
United Kingdom: Agilinko J, Ahmeidat A, Barabasz M, Bekheit M*, Cheung LK, Colloc T, Cymes W, Elhusseini M, Gradinariu G, Hannah A, Kamera BS, Mignot G, Shaikh S*, Sharma P (Aberdeen Royal Infirmary, Aberdeen); Abu-Nayla I, Agrawal A*, Al-Mohammad A, Ali S, Ashcroft J, Azizi A, Baker O, Balakrishnan A*, Byrne M, Colquhoun A, Cotter A, Coughlin P, Davies RJ*, Durrani A, Elshaer M, Fordington S, Forouhi P*, Georgiades F, Grimes H, Habeeb A, Hudson V, Hutchinson P*, Irune E, Jah A*, Khan DZ, Kolias A, Kyriacou H, Lamb B, Liau S*, Luke L, Mahmoud R, Mannion R, Masterson L*, Mitrofan

C, Mohan M, Morris A, Murphy S, O'Neill JR*, Price S, Pushpa-rajah J, Raby-Smith W, Ramzi J, Rooney SM, Santarius T, Singh AA, Stewart GD*, Tan XS, Townson A, Tweedle E, Walker C, Waseem S, Yordanov S (Addenbrooke's Hospital, Cambridge); Jones T, Kattakayam A, Loh C, Lunevicius R, Nunes Q, Pringle S, Schache A, Shaw R*, Sheel A, Sud A, Sundhu M (Aintree University Hospital, Liverpool); Rossborough C (Altnagelvin Area Hospital, London); Angelou D, Choynowski M, McAree B*, McCanny A, Neely D (Antrim Area Hospital- Northern Health And Social Care Trust, Antrim); Kamel F, Kumar L, Madani R*, Nisar P (Ashford And St Peter's Hospital, Chertsey); Tutoveanu G* (Barnsley Hospital Nhs Foundation Trust, Barnsley); Ali S, Bittar MN*, Creanga M*, Elniel M, Law J, Youssef M* (Blackpool Victoria Hospital, Blackpool); Ahad S, De La Cruz Monroy MFI, Hashem M, Langlands F, Mosley F*, Oktseloglou V*, Omar I, Patel F* (Bradford Royal Infirmary, Bradford); Alanbuki A*, Patel M, Shabana A (Brighton And Sussex Nhs Trust, Princess Royal Hospital, Hayward's Heath); Rathinaezhil R* (Brighton And Sussex University Hospitals Nhs Trust, Brighton); Perera E, Raveendran D, Ravi-Shankar K, Thiruchelvam J* (Broomfield Hospital, Chelmsford); Che Bakri NA, Jawad Z, Jiao L, Nazarian S, Vashisht R* (Bupa Cromwell Hospital, London); Arrowsmith L*, Campbell W* (Causeway Hospital, Coleraine); Grove T, Kontovounisios C, Warren O* (Chelsea And Westminster Hospital, London); Rolland P* (Cheltenham General Hospital, Cheltenham); Aggarwal A, Brown S, Jelley C, Neal N* (Churchill Hospital)
Kaur R, Leung E*, Sundar S* (City Hospital, Dudley Road, Birmingham); Doulias T*, Li M, Martin E, Rodwell H (Colchester Hospital University, Colchester); Clifford R, Eardley N, Krishnan E, Manu N, Martin E, Roy Mahapatra S, Serevina OL, Smith C, Vimalachandran D* (Countess Of Chester Hospital, Chester); Bordenave M*, Houston R, Putnam G, Robson A*, Tustin H (Cumberland Infirmary, Carlisle); Emslie K*, Labib PL*, Marchbank A, Miller D, Minto G, Natale J, Nwinee H, Panahi P, Rogers L* (Derriford Hospital, Plymouth); Abubakar A*, Akhter Rahman MM, Chan E, O'Brien H, Sasapu K* (Diana Princess Of Wales Hospital Grimsby, Grimsby); Inglis R, Ng HJ* (Dumfries And Galloway Royal Infirmary, Dumfries); De Gea Rico A, Ghazali N*, Lambert J, Markose G, Math S, Sarantitis I, Shreshtha D, Simpson R*, Sonanis S, Sultana A*, Taggarsi M, Timbrell S, Vaz OP, Vitone L* (East Lancashire Hospitals Nhs Trust, Blackburn); Day A*, Dent H, Fahim M, Waheed S* (East Surrey Hospital, Redhill); Hunt A, Laskar N* (East Sussex Healthcare (Conquest Hospital And Eastbourne District General Hospital), Hastings); Gupta A*, Steinke J, Thrumurthy S (Epsom & St Helier University Hospitals Nhs Trust, Epsom); Massie E, McGivern K, Rutherford D, Wilson M* (Forth Valley Royal Hospital, Larbert); Hardie J, Kazzaz S* (Frimley Health Nhs Ft - Frimley Park, Camberley); Bacarese-Hamilton T, Ip M*, James A, Salerno G*, Stockdale T (Frimley Health Nhs Ft - Wexham Park, Slough); Handa S, Kaushal M, Kler A, Patel P*, Redfern J, Tezas S (Furness General Hospital, Barrow In Furness); Aawsaj Y, Amonkar S, Barry C, Blackwell L, Blake D, Carter J, Emerson H, Fisher A*, Katory M, Korompelis P, McCormick W, Mustafa A, Pearce L, Ratnavelu N*, Reehal R (Gateshead Health Nhs Foundation Trust, Gateshead); Damola A*, Kretzmer L*, Lalou L, Lim P, Manku B, Parwaiz I, Sandher M, Stafford J (George Eliot Hospital, Nuneaton); Abdelkarim M, Asqalan A, Gala T, Ibrahim S, Maw A*, Mithany R, Morgan R*, Sundaram Venkatesan G (Glan Clwyd Hospital, Rhyl); Holroyd D, Jamieson N*, Jones C, Shin JS (Glasgow Royal Infirmary, Glasgow); Ang K, Caruana EJ*, Chandarana K, Chowdhry MF, Mohammad A, Nakas A, Rathinam S (Glenfield Hospital, Leicester); Banfield D, Boal M*, Brown O, Dean H, Dwerryhouse S*, Higgs S, Vallance A (Gloucestershire Royal

Hospital, Gloucester); Boyd E, Irvine V, Kirk A* (Golden Jubilee National Hospital, Glasgow); Bakolas G, Boulton A, Chandock A*, Khan T, Kumar M* (Good Hope Hospital, Sutton Coldfield); Agoston P, Billè A, Challacombe B*, Fraser S, Harrison-Phipps K, King J, McCrindle S, Mehra G, Mills L, Najdy M, Nath R, Okiror L, Pilling J, Rizzo V, Routledge T, Sayasneh A*, Stroman L*, Wali A (Guy's Hospital, London); Fehervari M*, Fotopoulou C*, Habib N, Hamrang-Yousefi S, Jawad Z, Jiao L, Pai M, Ploski J, Rajagopal P, Saso S, Sodergren M, Spalding D (Hammersmith Hospital, London); Laws S* (Hampshire Hospitals Nhs Trust, Wincheter & Basingstoke); Hardie C, McNaught C* (Harrogate District Hospital, Harrogate); Alam R, Budacan A, Cahill J, Kalkat M*, Karandikar S*, Kenyon L, Naumann D, Patel A (Heartlands Hospital, Birmingham); Chen F, Cheung J* (Hinchingbrooke Hospital, Huntingdon); Ayorinde J, Chase T, Cuming T, Ghanbari A, Humphreys L, Tayeh S* (Homerton University Hospital, London); Aboelkassem Ibrahim A, Bichoo R, Cao H, Chai AKW, Choudhury J, Evans C, Fitzjohn H, Ikram H, Khalifa E, Langstroth M, Loubani M*, McMillan A, Nazir S, Qadri SSA, Robinson A, Ross E, Sehgal T, Wilkins A (Hull University Teaching Hospitals Nhs Trust, Hull); Dixon J*, Dunning J, Freystaetter K, Jha M, Kusuma VRM, Lester S*, Madhavan A, Thulasiraman SV, Viswanath Y* (James Cook University Hospital, Middlesbrough); Curl-Roper T, Delimpalta C, Liao CCL*, Velchuru V, Westwood E (James Paget Univeristy Nhs Foundation Trust Hospital, Great Yarmouth); Belcher E*, Bond-Smith G*, Chidambaram S, Di Chiara F, Fasanmade K, Fraser L, Fu H, Ganau M*, Gore S, Goricar M, Graystone J, Jeyaretna D, Khatkar H, Lami M, Maher M, Mastoridis S, McVeigh J, Mihai R, Myatt R, Piper R*, Prabhu S, Risk OBF, Selbong U, Shah K, Silva P, Smillie R, Soleymani majd H, Sravanam S, Stavroulias D, Tebala GD, Vatish M*, Verberne C, Wallwork K, Williams MA, Winter SC* (John Radcliffe Hospital, Oxford); Ahmed I, Djouani A, Eddy B, Folkard S, Hassan F, Kommu S, Papadopoulos G, Simoes A, Streeter E, Tait-Bailey J, Thomas M, Wang W, Yao M* (Kent And Canterbury Hospital, Canterbury); Anscomb N*, Baldwin-Smith R, Davies M, Grainger C, Haji A, Haq A, Nunoo-Mensah JW, Rizk M (King's College Hospital, London); Bhatti MI, Boyd-Carson H, Elsey E, Gemmill E, Herrod P*, Jibreel M, Lenzi E, Saafan T, Sapre D, Sian T, Watson N (King's Mill Hospital, Sutton-In-Ashfield); Athanasiou A*, Borg E, Bourke G, Bradshaw L, Brunelli A*, Burke J, Coe P*, Costigan F, Elkadi H, Ho M*, Johnstone J, Kanatas A, Kantola V, Kaufmann A, Laios A, Lam S, MacInnes E*, Munot S, Nahm C, Otify M, Pompili C, Raslan M, Salminen H, Smith I, Theophilou G*, Toogood G, Wade R*, Ward D, West C (Leeds Teaching Hospitals Trust, Leeds); Al-Harbawee A, Alharawee A, Annamalai S, Ashmore C, Boddy A, Hossain T*, Irvine E, Kassam K*, Kourdouli A (Leicester Royal Infirmary, Leicester); Chean CS, Dharamavaram S, Gvaramadze A, Jibril A, Kulkarni N, Pereira I, Prusty L, Shanthakunalan K, Srikumar B, Thekkinkattil D* (Lincoln County Hospital, Lincoln); Adegbola S, Menakaya C, Noel J (Lister Hospital, Stevenage); Harky A, Shackcloth M* (Liverpool Heart And Chest Hospital, Liverpool); Askari A, Chan C*, Cirocchi N, Kudchadkar S, Patel K, Sagar J*, Shaw S, Talwar R* (Luton And Dunstable University Hospital, Luton); Abdalla M, Edmondson R, Ismail O, Jones D, Newton K, Stylianides N* (Manchester Royal Infirmary, Manchester); Aderombi A, Andaleeb U, Bajomo O, Beatson K, Garrett W*, Mehmood M, Ng V (Medway Hospital, Gillingham); Al-Habsi R, Brimioulle M*, Divya GS, Keeler B*, Soulsby RE*, Taylor A (Milton Keynes University Hospital, Milton Keynes); Al-Sarireh B*, Clancy R, Cripps P, Dobbs T*, Egan R*, Fabre I, Harries R*, Henry A, Kittur M*, Li Z, Parkins K, Soliman F, Spencer N, Thompson D (Morriston Hospital Swansea, Swansea); Burgess C*, Gemmell C, Grieco C, Hollyman M*, Hunt L*, Morrison J*, Ojha

S, (Musgrove Park Hospital, Taunton); Abbadessa F, Barnard S, Chan C, Dawe N, Hammond J, Koshy RM, Mahmoud Ali F, McPherson I, Mellor C, Moir J, Pandanaboyana S*, Powell J, Rai B*, Rogers A*, Roy C, Sachdeva A, Saleh C, Tingle S, Williams T (Newcastle Upon Tyne Hospitals Nhs Foundation Trust, Newcastle Upon Tyne); Manickavasagam J*, McDonald C*, McGrath N, McSorley N, Ragupathy K*, Ramsay L, Solth A (Ninewells Hospital, Dundee); Aristotelous C*, Kakisi O, Seebah K, Shaikh I*, Sreedharan L, Touil L, Youssef M* (Norfolk And Norwich University Hospital, Norwich); Shah J* (North Manchester General Hospital, Manchester); Ameerally P, Baguley M, Gnanachandran C*, Heer B, Rogers M, Woods R* (Northampton General Hospital, Northampton); Aujayeb A, Mills S* (Northumbria Nhs Hospital Trust, North Shields); Abu J, Addae-Boateng E, Bratt D, Brock L, Burnside N*, Cadwell-Sneath S, Gajjar K*, Gan C, Grundy C, Hallam K, Hassell K, Hawari M, Joshi A, Khout H, Konstantinidi K, Lee RXN, Nunns D, Schiemer R, Walton T*, Weaver H, Whisker L*, Williamson K (Nottingham City Hospital, Nottingham); McVeigh J, Myatt R*, Williams MA (Nuffield Orthopaedic Centre, Oxford); Ahmed ME, Bukhari SI, Illingworth B, Kanthasamy S, Knights E, Ong SL, Pujari R, Tan KHM, Vanker R* (Peterborough City Hospital, Peterborough); Michel M, Patil S, Ravindran S, Sarveswaran J*, Scott L (Pinderfields Hospital, Wakefield); Biliatis I*, Edmond M, King E* (Poole Hospital, Poole); Babawale O, Hodgson D, Ismail M, Khan J*, Lokman U, Phan YC* (Queen Alexandra Hospital, Portsmouth); Almond M*, Bhangu A*, Breik O, Cato LD, Chowdhury YA*, Desai A*, Ford S*, Griffiths E*, Idle M, Kamal M, Karia K, Kisiel A, Kulkarni R, Mak JKC, Martin T, Nankivell P*, Parente A, Parmar S, Pathanki AM, Phelan L, Praveen P, Saeed S, Sharma N, Singh J*, Solomou G, Soon WC, Stevens A, Tirotta F, Topham C, Ughratdar I, Vijayan D (Queen Elizabeth Hospital Birmingham, Birmingham); Ballantyne K*, Barker L, Chapman K, Charalambous M*, Chianakwalam C, English C, Evans J*, Fell A*, Frimpong D, Halkias C, Iyer R, Merh R, Neagu G, Nikolaou S, Poddar A, Pronisceva V, Reddy V, Williams N (Queen Elizabeth The Queen Mother Hospital Margate, Margate); Alakandy L, Bhattathiri P, Brown J, Canty M, Day E*, Geddes A, Grivas A, Hassan S, Lammy S*, Littlechild P, Maseland C, Mathieson C, McCaul J*, McMahon J, O'Kane R, St. George E, Suttner N, Taylor W, Tilling E (Queen Elizabeth University Hospital, Glasgow); English W, Kaul S, Khan AH, Khan F, Mansuri A, Mukherjee S*, Patel M, Sarigul M, Singh S, Smith C, Tan KL, Vulliamy P, Woodham A, Yang YH (Queen's Hospital Romford, Romford); Adiamah A, Brewer H, Chowdhury A*, Evans J, Humes D*, Jackman J, Koh A, Lewis-Lloyd C, Navarro A*, Oyende O, Reilly J, Vohra R*, Worku D (Queens Medical Centre, Nottingham); Cool P, Cribb G, Shepherd K* (Robert Jones And Agnes Hunt Orthopaedic Hospital, Oswestry); Bisset C, Moug S* (Royal Alexandra Hospital, Paisley); Chadha R* (Royal Berkshire Hospital, Reading); Elson N, Galleano R, Faulkner G*, Langone A, Panayi Z, Saleh P, Tuminello F, Underwood C (Royal Bolton Hospital, Farnworth); Brixton G, Findlay L, Klatte T*, Majkowska A, Manson J*, Potter R (Royal Bournemouth Hospital, Bournemouth); Al-Khyatt W, Awad S*, Bhalla A*, Chia Z, Daliya P, Goyal A*, Grimley E, Hamad A, Kumar A*, Malcolm FL, Ng JCK, Phillips A, Theophilidou E, Williams S (Royal Derby Hospital, Derby); Bowden J, Campain N, Daniels I, Evans C, Fowler G, John J, Massey L, McDermott F*, McGrath J*, McLennan A, Ng M, Pascoe J, Rajaretnam N (Royal Devon And Exeter Hospital, Exeter); Angamuthu N, Bulathsinhala S, Chowdhury S, Davidson B, Fusai G, Gilliland J, Hart C, Hidalgo Salinas C, Knowles J, Machairas N, Mirnezami R, Pissanou T, Pollok JM*, Raptis DA, Soggiu F, Tzerbinis H, Varcada M*, Xyda S (Royal Free Hospital, Hampstead); Beamish A, Davies E,

Foulkes R*, Magowan D, Nassa H, Ooi R, Price C, Smith L, Solari F, Tang A, Williams G* (Royal Gwent Hospital, Newport); Abd Kahar NN, Al-Tamimi Y, Bacon A, Beasley N, Catto J, Chan LH, Chew D, Crank M, Ilenkovan N, Macdonald M, Narice B, Rominiyi O*, Saad S, Sinha S, Thompson A, Varley I* (Royal Hallamshire Hospital, Sheffield); Brennan P, Drake T*, Harrison EM*, Linder G, Mayes J, McGregor R, Pasricha R, Skipworth RJE*, Zamvar V* (Royal Infirmary Of Edinburgh, Edinburgh); Davies E*, Hawkin P, Raymond T, Ryska O (Royal Lancaster Infirmary, Morecambe); Baron R*, Dunne D, Gahunia S, Halloran C, Howes N*, McKinney R, McNicol F*, Rajput K, Russ J, Sutton R, Szatmary P, Tan JR, Thomas A, Whelan P (Royal Liverpool University Hospital, Liverpool); Anzak A, Banerjee A, Fuwa O, Hughes F*, Jayasinghe JD, Knowles C, Kocher HM*, Leal Silva I, Ledesma FS, Minicozzi A*, Navaratne L, Patki P*, Rahman R, Ramamoorthy R, Sohrabi C, Tanabalan C, Thaha M*, Thakur B*, Venn M, Yip V* (Royal London Hospital, London); Baumber R, Parry J* (Royal National Orthopaedic Hospital, Stanmore); Evans S, Jeys L, Morris G, Parry M*, Stevenson J (Royal Orthopaedic Hospital, Birmingham); Ahmadi N, Aresu G, Barrett-Brown ZM, Coonar A*, Durio Yates H, Gearon D, Hogan J, King M, Peryt A, Pradeep IS, Smith C (Royal Papworth Hospital, Cambridge); Adishesh M*, Atherton R*, Baxter K, Brocklehurst M, Chaudhury M, Krishnamohan N*, McAleer J, Owens G, Parkin E*, Patkar P, Phang I* (Royal Preston Hospital, Preston); Aladeojebi A, Ali M, Ali S, Barmayehvar B, Gaunt A*, Gowda M, Halliday E, Kitchen M*, Mansour F, Nanjaiah P*, Thomas M*, Zakai D* (Royal Stoke University Hospital, Stoke-On-Trent); Abbassi-Ghadi N, Assalaarachchi H, Currie A, Flavin M, Frampton A*, Hague M, Hammer C, Hopper J, Horsnell J*, Humphries S, Kamocka A, Madhuri TK*, Preston S, Singh P*, Stebbing J, Tailor A, Walker D* (Royal Surrey County Hospital, Guildford); Coomber E, Jaunoo S, Kennedy L*, Williams O (Royal Sussex County Hospital, Brighton); Airey A, Bunni J, Crowley R, Fairhurst K*, Frost J*, George R, Lee S, Mitchell S, Phull J, Richards S (Royal United Hospital Bath, Bath); Aljanadi F, Campbell A, Glass A, Hraishawi I, Jones M*, McIlmunn C, McIntosh S*, Mhandu P, O'Donnell C, Turkington R* (Royal Victoria Hospital, Belfast); Al-Ishaq Z, Bhasin S, Bodla AS, Burahee A, Crichton A, El-Ghobashy A*, Fossett R, Pigadas N*, Rahman E, Snee D, Vidya R, Yassin N* (Royal Wolverhampton Nhs Trust, Wolverhampton); Colombo F, Fountain D, Hasan MT, Karabatsou K*, Laurente R, Pathmanaban O* (Salford Royal Hospital, Salford); Barlow C, Ding D, Foster J, Longstaff L (Salisbury Nhs Foundation Trust, Salisbury); Brett-Miller C, Buruiana FE, Kaur R, Leung E*, Sundar S* (Sandwell General Hospital, Birmingham); Al-mukhtar A, Brown S*, Edwards J*, Giblin A, Kelty C, Lee M, Lye G, Newman T, Sharkey A, Steele C, Sureshkumar Shah N, Whitehall E (Sheffield Teaching Hospital Nhs Foundation Trust, Sheffield); Blair J, Lakhiani A, Parry-Smith W, Sahu B* (Shrewsbury And Telford Hospitals, Shrewsbury); Athwal R*, Baker A, Jones L, Konstantinou C, Ramcharan S*, Singh S, Vatish J, Wilkin R (South Warwickshire Nhs Foundation Trust, Warwick); Alzetani A*, Amer K, Badran A*, Colvin HV, Ethunandan M, Sekhon GK, Shakoor Z, Shields H, Singh R*, Talbot T, Wensley F (Southampton General Hospital, Southampton); Lawday S, Lyons A* (Southmead Hospital, Bristol); Newman S (Southport And Formby District General Hospital, Southport); Chung E, Hagger R, Hainsworth A, Hunt I, Karim A, Owen H, Ramwell A, Santhirakumaran G, Smelt J, Tan C, Vaughan P, Williams K* (St George's Hospital, London); Baker C, Davies A, Gossage J, Kelly M*, Knight W (St Thomas' Hospital, London); Bromage S, Hall J, Kaushik V, Rudic M*, Vallabh N, Zhang Y (Stepping Hill Hospital, Stockport); Harris G, James G, Kang C, Lin DJ, Rajgor AD, Royle T*, Scurrah R, Steel B, Watson

LJ (Sunderland Royal Hospital, Sunderland); Kocher HM* (The London Clinic, London); Choi D, Hutchison R, Jain A, Luoma V, Marcus HJ*, May R, Menon A, Pramodana B, Webber L (The National Hospital For Neurology And Neurosurgery, London); Hayes A, Jones R, Sivarajah G, Smith M, Smrke A, Strauss D* (The Royal Marsden Nhs Foundation Trust, London); Abouelela FAM, Aneke IA, Asaad P, Brown B, Collis J, Duff S*, Khan A, Moura F, Taylor M, Wadham B, Warburton H (The University Hospital Of South Manchester, Manchester); Elmoslemany T, Jenkinson MD*, Millward CP, Zakaria R (The Walton Centre Nhs Foundation Trust, Liverpool); Mccluney S, Parmar C*, Shah S (The Whittington Hospital, London); Allison J, Babar MS*, Bowen J, Collard B, Goodrum S, Lau K, Patel A, Sargent M, Scott R*, Thomas E, Whitmore H (Torbay And South Devon Nhs Trust, Torquay); Balasubramaniam D*, Jayasankar B*, Kapoor S, Ramachandran A (Tunbridge Wells Hospital, Maidstone); Semple C* (Ulster Hospital Dundonald, Dundonald); Elhamshary A, Imam SMB, Kapriniotis K, Kasivisvanathan V*, Lindsay J, Rakhshani-Moghadam S (University College London Hospital At Westmoreland Street, London); Beech N, Chand M*, Green L, Kalavrezos N*, Kiconco H, McEwen R, Schilling C, Sinha D (University College London Hospital, London); Pereca J*, Singh J (University Hospital Ayr, Ayr); Chopra S, Egbeare D*, Thomas R (University Hospital Llandough, Cardiff); Arumugam S, Ibrahim B*, Khan K* (University Hospital North Durham, Durham); Combellack T*, Hill G*, Jones S*, Kornaszewska M, Mohammed M, Tahhan G, Valtzoglou V, Williams J (University Hospital Of Wales, Cardiff); Blencowe N, Eskander P, Gash K, Gourbault L, Hanna M, Maccabe TA, Main B, Olivier J*, Newton C*, Roswadowski S, Ryan N, Teh E, West D*(University Hospitals Bristol Nhs Foundation Trust, Bristol and Weston NHS Foundation Trust); Al-omishy H, Baig M, Bates H, Di Taranto G, Dickson K, Dunne N, Gill C, Howe D*, Jeevan D, Khajuria A, Martin-Ucar A*, McEvoy K, Naredla P, Ng V, Robertson S*, Sait M, Sarma DR, Shanbhag S*, Shortland T, Simmonds S, Skillman J, Tewari N*, Walton G (University Hospitals Coventry And Warwickshire Nhs Trusts, Coventry); Akhtar MA*, Brunt A, McIntyre J, Milne K, Rashid MM, Sgrò A, Stewart KE, Turnbull A (Victoria Hospital Kirkcaldy, Kirkcaldy); Abou-Foul AK* (Walsall Manor Hospital, Walsall); Gossedge G*, O'Donnell S, Oldfield F (Warrington & Halton Teaching Hospitals Nhs Trust, Warrington); Thomson S* (West Hertfordshire Hospitals Nhs Trust, Hertfordshire); Aguilar Gonzalez M*, Talukder S* (West Suffolk Hospital, Bury St Edmunds); Boyle C, Fernando D, Gallagher K, Laird A*, Tham D (Western General Hospital, Edinburgh); Bath M, Patki P*, Sohrabi C, Tanabalan C (Whipps Cross University Hospital, London); Basnyat P*, Davis H, Montauban P, Shrestha A (William Harvey Hospital, Ashford); Agarwal K*, Arif T, Magee C*, Nambirajan T*, Powell S*, Vinayagam R* (Wirral University Teaching Hospital, Wirral); Flindall I, Hanson A, Mahendran V (Worcestershire Royal Hospital, Worcester); Green S, Lim M, MacDonald L, Miu V, Onos L, Sheridan K, Young R* (York Teaching Hospitals Nhs Trust, York); Alam F, Griffiths O, Houlden C, Jones R*, Kolli VS, Lala AK, Leeson S, Peevor R, Seymour Z* (Ysbyty Gwynedd, Bangor, North Wales).

United States of America: Consorti E, Gonzalez R, Grolman R, Kwan-Feinberg R*, Liu T, Merzlikin O (Alta Bates Summit Medical Center (Sutter Health), San Francisco); Brown A, Cooper Z*, Hirji S, Jolissaint J, Mahvi D, Okafor B, Raut CP*, Roxo V, Salim A (Brigham And Women's Hospital, Boston); Bessen S, Chen L, Dagrosa L, Fay K, Fleischer C, Hasson R, Henderson E, Leech M, Loehrer A*, Markey C, Paydarfar J, Rosenkranz K, Telma K, Tocci N, Wilkinson-Ryan I, Wilson M (Dartmouth-Hitchcock Medical Center, Lebanon, Nh); Bokenkamp M, Brown K*, Fleming D*, Haynes A*, Heron C, Hill C, Kay H, Leede E,

McElhinney K, Olson KA, Osterberg EC*, Riley C, Srikanth P (Dell Seton Medical Center At The University Of Texas, Austin); Barbour J, Blazer D*, DiLalla GA*, Fayanju O, Hwang ES*, Kahmke R, Kazaure H, Lazarides A, Lee W*, Lidsky M*, Menendez C, Moris D, Plichta J, Pradhan MC, Puscas L, Rice HE, Rocke D, Rosenberger L*, Scheri R, Smith BD, Stang MT, Tolnitch L, Turnage K, Visgauss J, Walton FS, Watts T, Zani S (Duke University Medical Center, Durham, Ma); Farma J* (Fox Chase Cancer Center, Philadelphia); Cardona K, Russell MC (Emory University, Atlanta, GA); Clark J, Kwon D* (Henry Ford Hospital, Detroit, Michigan); Goel N*, Kronenfeld J (Jackson Memorial Hospital, Miami); Bigelow B, Etchill E*, Gabre-Kidan A*, Jenny H, Kent A, Ladd MR, Long C, Malapati H, Margalit A, Rapaport S, Rose J, Stevens K, Tsai L, Vervoort D, Yesantharao P (Johns Hopkins Hospital, Baltimore, Md); Dehal A* (Kaiser Permanente Panorama City Medical Center, Panorama City); Klaristenfeld D* (Kaiser Permanente San Diego Medical Center, San Diego); Huynh K (Kaiser Permanente West Los Angeles, Los Angeles); Kaafarani H*, Naar L, Qadan M (Massachusetts General Hospital, Boston, Ma); Brown L, Ganly I* (Memorial Sloan Kettering Cancer Center, New York); Mullinax JE* (Moffitt Cancer Center, Tampa); Alpert N, Gillezeau C, Miles DDS MD FACS BA*, Taioli E (Mount Sinai Hospital, New York); Cha DE, Gleeson E, Horn C, Sarpel U* (Mount Sinai, New York); Gusani N, Hazelton J*, Maines J, Oh JS, Ssentongo A, Ssentongo P (Pennsylvania State University, Hershey); Bhama A (Rush University Medical Centre, Chicago, Il); Colling K*, Najarian M (Saint Mary's Medical Center-Essentia Health, Duluth); Azam M, Choudhry A*, Marx W (Suny Upstate University Hospital, Syracuse); Abedin Y, Arzumanov G, Chokshi R, Gabrilovich S, Glass N*, Kalyoussef E, Parvin-Nejad FP, Roden D, Stein J, Suarez-Ligon A, Tsui G, Zhao K (The University Hospital, Newark, Nj); Fleming J, Fuson A, Gigliotti J, Ovaitt A, Ying Y* (University Of Alabama Birmingham, Birmingham); Abel MK, Andaya V, Bigay K, Boeck MA, Chen L, Chern H, Corvera C, El-Sayed I, Glencer A, Ha P, Hamilton BCS, Heaton C, Hirose K, Jablons DM, Kirkwood KS, Kornblith LZ*, Kratz JR, Lee RH, Miller PN, Nakakura EK, Nunez-Garcia B, O'Donnell RJ, Ozgediz D, Park P, Robinson B, Sarin A, Sheu B, Varma MG, Wai KC, Wustrack R, Xu MJ, Zimel M (University of California San Francisco (UCSF), San Francisco, CA) Beswick D*, Goddard J, Manor J, Song J (University Of Colorado Hospital/Memorial Hospital/Medical Center Of The Rockies (All Within Uchealth System), Denver/Colorado Springs/Loveland); Cioci A, Pavlis W, Rakoczy K, Ruiz G, Saberi R (University Of Miami Hospital, Miami, Fl); Fullmer T, Gaskill C, Gross N*, Kiong K, Roland CL*, Zafar SN (University Of Texas Md Anderson Cancer Center, Houston); Abdallah M, Abouassi A, Aigbivbalu E, Almasri M, Eid J, George B, Kulkarni G, Marwan H*, Mehdi M, San Andrés M, Sundaresan J (University Of Texas Medical Branch, Galveston); Aoun SG, Ban VS*, Batjer HH, Bosler K, Caruso J, Sumer B* (University Of Texas Southwestern, Dallas); Abbott D, Acher A, Aiken T, Barrett J, Foley E, Schwartz PB, Zafar SN* (University Of Wisconsin, Madison); Hawkins AT*, Maiga A (Vanderbilt University Medical Center, Nashville, TN); Ruzgar NM, Sion M, Ullrich S (Yale New Haven Hospital, New Haven, Ct).
Uruguay: Laufer J*, Scasso S* (Hospital Pereira Rossell, Montevideo, Montevideo).
Yemen: Al-Naggar H*, Al-Shehari M*, Almassaudi A, Alsayadi M, Alsayadi R, Nahshal M, Shream S (Al-Thawra Modern General Hospital, Sana'a); AL-Ameri S, Aldawbali M (Royal Hospital, Sana'a).

Appendix B. Definition of "lockdowns" in sample of participating countries

ISO3 code	Country	World Bank income group	Date of first lockdown (full or moderate)	COVID-19 stringency index score
ARE	United Arab Emirates	High income	Full, 26th March 2020	73.2
AUT	Austria	High income	Full, 16th March 2020	81.5
BEL	Belgium	High income	Full, 18th March 2020	73.2
BRB	Barbados	High income	Full, 28th March 2020	73.2
CAN	Canada	High income	Moderate (regional), 17th March 2020	43.5
CHE	Switzerland	High income	Full, 17th March 2020	73.2
CYP	Cyprus	High income	Full, 24th March 2020	92.6
CZE	Czech Republic	High income	Full, 16th March 2020	79.6
DEU	Germany	High income	Full, 22nd March 2020	76.9
DNK	Denmark	High income	Moderate (national), 12th March 2020	38.0
ESP	Spain	High income	Full, 14th March 2020	67.1
FRA	France	High income	Full, 17th March 2020	88.0
GBR	United Kingdom	High income	Full, 23rd March 2020	78.2
GRC	Greece	High income	Full, 23rd March 2020	84.3
HRV	Croatia	High income	Moderate (national), 19th March 2020	50.0
HUN	Hungary	High income	Full, 28th March 2020	76.9
IRL	Ireland	High income	Full, 28th March 2020	85.2
ITA	Italy	High income	Full, 9th March 2020	74.5
JPN	Japan	High income	Moderate (national) only, 7th April 2020	43.5
KWT	Kuwait	High income	Full, 10th May 2020	100.0
LTU	Lithuania	High income	Full, 16th March 2020	81.5
NLD	Netherlands	High income	Moderate (national), 15th March 2020	53.7
OMN	Oman	High income	Full, 10th April 2020	92.6
PAN	Panama	High income	Full, 25th March 2020	75.9
POL	Poland	High income	Moderate (national), 13th March 2020	41.7
PRT	Portugal	High income	Full, 19th March 2020	82.4
SAU	Saudi Arabia	High income	Moderate (regional), 9th March 2020	30.6
SGP	Singapore	High income	Full, 8th April 2020	76.9
USA	United States	High income	Moderate (regional) only 17 March 2020	55.1
ALB	Albania	Upper middle income	Full, 13th March 2020	78.7
ARG	Argentina	Upper middle income	Full, 19th March 2020	100.0
AZE	Azerbaijan	Upper middle income	Full, 31st March 2020	88.89
BGR	Bulgaria	Upper middle income	Moderate (national), 13th March 2020	50.93
BRA	Brazil	Upper middle income	Moderate (regional) only, 17th March 2020	57.9
BWA	Botswana	Upper middle income	Full, 2nd April 2020	86.11
COL	Colombia	Upper middle income	Full, 25th March 2020	87.96
JOR	Jordan	Upper middle income	Full, 18th March 2020	100
LBY	Libya	Upper middle income	Full, 22nd March 2020	77.78
LKA	Sri Lanka	Upper middle income	Full, 18th March 2020	81.48
MEX	Mexico	Upper middle income	Moderate (national), 24th March 2020	52.78
MYS	Malaysia	Upper middle income	Full, 18th March 2020	73.15
PER	Peru	Upper middle income	Full, 16th March 2020	90.74
ROU	Romania	Upper middle income	Full, 25th March 2020	78.7
RUS	Russian Federation	Upper middle income	Full, 28th March 2020	71.7
SRB	Serbia	Upper middle income	Moderate (national), 15th March 2020	49.07
TUR	Turkey	Upper middle income	Full, 28th March 2020	75.9
ZAF	South Africa	Upper middle income	Full, 26th March 2020	88
EGY	Egypt	Lower middle income	Full, 25th March 2020	84.3
ETH	Ethiopia	Lower middle income	Full, 8th April 2020	80.6
GHA	Ghana	Lower middle income	Moderate (regional) only, 26th March 2020	52.8
IND	India	Lower middle income	Full, 25th March 2020	100.0
MAR	Morocco	Lower middle income	Moderate (national), 19th March 2020	55.56
MDG	Madagascar	Lower middle income	Full, 23rd March 2020	91.67
NGA	Nigeria	Lower middle income	Moderate (regional) only, 23rd March 2020	48.6
PAK	Pakistan	Lower middle income	Full, 24th March 2020	93.5
PHL	Philippines	Lower middle income	Full, 15th March 2020	75.0
PSE	Palestine	Lower middle income	Full, 7th March 2020	74.07
TUN	Tunisia	Lower middle income	Full, 22nd March 2020	90.74

Appendix C. Indicators in the Oxford COVID-19 government response index

Indicator	Name	Type	Targeted/general?	Maximum value (levels)
Containment and closure				
C1	School closing	Ordinal	Geographic	3 (0, 1, 2, 3)
C2	Workplace closing	Ordinal	Geographic	3 (0, 1, 2, 3)
C3	Cancel public events	Ordinal	Geographic	2 (0, 1, 2)
C4	Restrictions on gathering size	Ordinal	Geographic	4 (0, 1, 2, 3, 4)
C5	Close public transport	Ordinal	Geographic	2 (0, 1, 2)
C6	Stay-at-home requirements	Ordinal	Geographic	3 (0, 1, 2, 3)
C7	Restrictions on internal movement	Ordinal	Geographic	2 (0, 1, 2)
C8	Restrictions on international travel	Ordinal	No	4 (0, 1, 2, 3, 4)
Economic response				
E1	Income support	Ordinal	Sectoral	2 (0, 1, 2)
E2	Debt/contract relief for households	Ordinal	No	2 (0, 1, 2)
Health systems				
H1	Public information campaign	Ordinal	Geographic	2 (0, 1, 2)
H2	Testing policy	Ordinal	No	3 (0, 1, 2, 3)
H3	Contact tracing	Ordinal	No	2 (0, 1, 2)
H6	Facial coverings	Ordinal	Geographic	4 (0, 1, 2, 3, 4)
H7	Vaccination policy	Ordinal	Funding	5 (0, 1, 2, 3, 4, 5)

13 indicators are included in the Oxford COVID-19 government response index (overall) which are used for this analysis. Published in Hale, T., Angrist, N., Goldszmidt, R. et al. A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker). Nat Hum Behav 5, 529–538 (2021). https://doi.org/10.1038/s41562-021-01079-8

Appendix D. Use of the Oxford COVID-19 Government Stringency index

In order to define the national government response to COVID-19 for each patient in each included country, we used the stringency index from the Oxford COVID-19 government response tracker. The COVID-19 stringency index is a data-driven tool for policy and research that measures how the response of governments has varied in response to COVID-19 at a national level with across 19 indicators including 'lockdown' measures and behavioural interventions aimed at reducing population mobility (1). The index has been validated by demonstrating associations with population SARS-CoV-2 infection rates and Google mobile phone mobility data. The stringency index was highly associated with population mobility in validation data and was best targeted towards the impact of restrictive governmental interventions on surgical capacity, so was chosen for use in this study.

In this study, three groupings of the level of 'lockdown' based on COVID-19 stringency index scores were adopted: (1) Light restrictions (index score <20); (2) Moderate lockdown (index score $20 \leq x \leq 60$); (3) Full lockdown (index score >60). Recognising variability in definitions of lockdown across included countries, the selection of a cut-point for a 'full lockdown' was validated by using national policy, media and press sources to identify the date of first national 'lockdown' for a sample of participating high-income, upper middle-income and lower middle-income countries, and extracting the point estimate for the COVID-19 stringency index score on the date of lockdown (***Appendix C***). If no 'full lockdown' was reported to have occurred, a representative date where some restrictive measures were imposed at either a national or regional level (i.e., a 'moderate lockdown') was selected. Whilst all participating hospitals were in areas affected by COVID-19, the definition of 'light restrictions' aimed to emulate 'normal circumstances' as closely as possible to allow internal comparison within the dataset between periods of 'full lockdown' and essentially normal care.

For each patient, a median average score whilst waiting for surgery and the number of weeks in full lockdown were calculated and used in analyses. We considered several methods of measuring the overall exposure of each included patient including median average from diagnosis to surgery or censorship, point estimates at the time of diagnosis or decision for surgery (study entry) and 'area under the stringency curve' (sum of stringency scores multiplied by duration of exposure). Whilst the point estimate at the time of

study entry (date of decision for surgery) would minimise any impact of future information bias, whereby patients may be more likely to be exposed to several lockdown states therefore demonstrate a central tendency (i.e., classified as moderate lockdown overall) we felt that this would misrepresent the complex and dynamic nature of lockdowns, and risk underestimating or overestimating patients' overall exposure. Supporting this decision, we did not see a central tendency in the distribution of calculated median. Balancing the risks and benefits of each method of processing the Oxford COVID-19 government response index we took a pragmatic decision to adopt the median average score for all included analyses.

Appendix E. Challenges with use of SARS-CoV-2 case notification rates

Accurate estimation of a country's SARS-CoV-2 burden is challenging. For example, studies from Zambia and India using post-mortem records and population level sampling have demonstrated a significant underestimation (100-times and higher) of SARS-CoV-2 infection rates and subsequent COVID-related deaths (2, 3). Cross-reactivity with other pathogens endemic in Sub-Saharan Africa has also been reported. Therefore, case rates were used for exploratory analyses only, and stratified by World Bank income tertile. Data on SARS-CoV-2 rates were extracted from the World Health Organisation, European Centre for Disease Control, US Centre for Disease Control and specific national registries via the Our World in Data portal (4). Case notification rates for SARS-CoV-2 reflect the ability of health systems to identify exposed patients, perform accurate tests, and report these to international registries.

Appendix F. Patient level variable descriptions and definitions

Patient level variables included age, sex, American Society of Anaesthesiologists grade, Eastern Cooperative Oncology Group (ECOG) performance status, smoking status, pre-existing respiratory condition, and Revised Cardiac Risk Index (RCRI). To account for different tumour grading and staging systems across the included cancer types, disease status was classified at the time of decision for surgery as early stage (organ confined, non-nodal, non-metastatic, fully resectable) or advanced stage (growth beyond organ, nodal, metastatic operated with curative intent). For analyses of surgical outcomes, grade of surgery was categorised based on the Clinical Coding & Schedule Development Group as either Minor (minor/intermediate) or Major (major/complex major) (5)

Appendix G. Estimation of treatment intervals

In order to estimate the impact of lockdown of treatment delays, the relationship between lockdowns and the interval from diagnosis to surgery was explored. The date of diagnosis was defined pragmatically as the date when diagnostic imaging, laboratory samples, multidisciplinary team discussion, or an outpatient clinic diagnosis was made (whichever was earliest). The interval from date of diagnosis to the date of surgery was calculated in whole weeks. Accepting that there are likely to be significant differences in the 'normal' interval from diagnosis to surgery across different health systems, a 'delay' from diagnosis to surgery was not specifically defined. Several different interval groups were defined pragmatically in 4-week epochs according to describe differences between intervals from diagnosis to surgery and surgical quality. The association between lockdowns and interval from diagnosis to surgery was primarily explored in patients with neoadjuvant therapy (i.e. that went 'straight to surgery').

In secondary exploration, the point of 'system friction' was also reported to compare differences in intervals from diagnosis to decision for surgery, and from decision to operation. Date of decision for surgery was again defined pragmatically as the date of multidisciplinary team discussion, or surgeon's decision to book the patient for an operation.

Appendix H. Classification of reasons for non-operation

Reflecting the complexity of surgical decision making during the pandemic, more than one reason could be selected for non-operation for any single patient. One patient therefore could have both COVID-19 related and not COVID-related reason(s) selected. Where it was unclear whether a reason was directly or indirectly COVID-related (for example, disease progression leading to change in treatment plan) this was attributed as a non-COVID-19 related reason. In practice, it is complex to summarise the exact processes underpinning reasons for treatment delay in this complex multi-specialty and multi-country dataset. These reasons are provided to illustrate the common themes in the data and explore: (1) to what extent cancellation and delay could have been expected as part of ‘normal’ (pre-pandemic) practice; (2) estimate harms incurred to patients as a result of delay or cancellation of surgery due to COVID-related and unrelated causes.

Appendix I. Definitions of secondary outcomes for operated patients

The full protocol definitions of each included secondary outcome were:

- Resection margin status: R0: No microscopic or macroscopic disease, R1: Microscopic disease at the margin, R2: Macroscopic disease at the margin, Pathology unavailable: No histopathological analysis performed or reported, Missing: Missing data).
- Resectable disease at the time of surgery (resectable/unresectable). Unresectable disease was defined by the operating surgeon as surgery performed with a palliative intent (i.e., for symptomatic management, non-curative only) or an abandoned procedure due to concerns around resectability.
- Pre-operative cancer-related complication requiring emergency surgery e.g., obstructed bowel, bleeding at the tumour site. Emergency surgery was defined as an unplanned admission requiring surgery within hours of decision to operate.
- 30-day postoperative SARS-CoV-2 infection rate, confirmed by RT-qPCR testing of a nasopharyngeal swab, or an indicative CT thorax or clinical diagnosis of symptomatic COVID-19 in patients for whom swab testing was unavailable (6, 7).
- 30-day postoperative mortality rate (8-10).
- New detection of metastatic disease up to a maximum of 30-days after surgery. Metastatic disease was defined upon postoperative histological staging, or upon restaging radiological examination where this was performed. Data on detection of new metastatic disease was not collected for liver, pancreatic, breast and gynaecological cancers, therefore rates of detection of new metastatic disease removed these patients from the denominator of estimates of proportions.

Appendix J. Full statistical methodology

No pre-specified sample size calculation was performed. Missing data were included in flowcharts and summary tables, but excluded from the models. We pre-planned to conduct multiple imputation by chained equations if the level of missingness for variables included in the model was greater than 5%. Non-parametric data were summarised with medians and interquartile ranges and differences between groups were tested using the Mann-Whitney U test. Parametric data were summarised with mean average and standard deviation. Differences between groups were explored using two-tailed Student's t-test (two comparator groups) or one-way Analysis of Variance (ANOVA, three or more comparator groups) The $\chi 2$ test was used for categorical data. Cox proportional hazards regression modelling was used to explore association between lockdowns and the primary outcome, presented as adjusted hazard ratios (HR) and 95% confidence intervals. Operation was included as the outcome event, and no censoring was performed for death or progression to unresectable disease to deal with competing risks, given individuals had the same follow-up time (i.e., describing sub-distribution rather than cause-specific hazards). The proportional hazards (PH) assumption was checked using the Schoenfeld individual test and graphical diagnostics based on the scaled Schoenfeld residuals. The proportional hazard assumption was accepted if a non-significant relationship was detected between residuals and time. Clinically plausible health-system, patient, and disease-related factors were selected *a priori* for inclusion in adjusted analyses. Testing for non-linear relationship with the outcome variable was performed for continuous variables by including a penalised spline on the exposure, and plotting a spline term. Where significant non-linear relationships were demonstrated, variables were categorised before inclusion in the model. An alpha level was set at 0.05 (5%) for interpretation of statistical significance.

Appendix K. Further discussion of study topics

Protecting elective surgery pathways

The demand on critical care services during COVID-19 has been unprecedented. Protecting a small proportion of dedicated critical care beds, even when community SARS-CoV-2 incidence is high, will support vulnerable patients and those with advanced disease to undergo the cancer surgery they require. Newer ways of working, including dedicated postoperative units that can provide adequate support for several surgical patients with lower staffing demands, may be necessary (7). These may need to be away from acute sites that may be subject to COVID-19 surges.

Relationship between COVID-19, lockdowns and non-operation

Whilst all patients had a stated reasons for non-operation related to COVID-19, only a proportion of this were seemingly directly attributable to lockdown measures (for example, patients being unable to travel to hospital during periods with travel restrictions). We hypothesise that country-level stringency measures have a direct impact on hospital procedures and planning through lockdown-related hospital/institutional policies i.e., that health systems change to reflect stringent government policies on containment and movement restriction. This is corroborated by a sensitivity analysis which demonstrated that full and moderate lockdowns independently increased the likelihood of non-operation after adjustment for local SARS-CoV-2 case notification rates. This has important policy implications. Whilst the collateral impact of COVID-19 on other health conditions has been widely discussed, there is little published primary data (i.e., not modelled) that provides information about the direct effects of lockdowns on non-communicable disease (11). These data provide important insight for governments when balancing decisions about whether to extend, increase or decrease the stringency of lockdowns, and the broader societal consequences.

Perspectives for policy during future waves

Resilience of elective cancer surgery remains low across all settings (12). Stepping back up to a full capacity service requires advanced planning to cope with future predicted demand. The added complexities of potential future lockdowns mean that expenditure on protected elective capacity for cancer surgery should be considered now by policy makers at national levels. Future lockdowns under current conditions

will worsen outcomes for patients needing cancer surgery against a background of mounting backlogs and delays in many countries.

References

1. Hale T, Angrist N, Goldszmidt R, Kira B, Petherick A, Phillips T, et al. A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker). Nat Hum Behav. 2021;5(4):529-38.
2. Mohanan M, Malani A, Krishnan K, Acharya A. Prevalence of SARS-CoV-2 in Karnataka, India. Jama. 2021;325(10):1001-3.
3. Mwananyanda L, Gill CJ, MacLeod W, Kwenda G, Pieciak R, Mupila Z, et al. Covid-19 deaths in Africa: prospective systematic postmortem surveillance study. Bmj. 2021;372:n334.
4. Roser M, Ritchie H, Ortiz-Ospina E, Hasell J. Coronavirus Pandemic (COVID-19) OurWorldInData.org2020 [Available from: https://ourworldindata.org/coronavirus.
5. BUPA. BUPA Schedule of Procedures 2021 [Available from: https://codes.bupa.co.uk/home.
6. Mortality and pulmonary complications in patients undergoing surgery with perioperative SARS-CoV-2 infection: an international cohort study. Lancet. 2020;396(10243):27-38.
7. Glasbey JC, Bhangu A. Elective Cancer Surgery in COVID-19-Free Surgical Pathways During the SARS-CoV-2 Pandemic: An International, Multicenter, Comparative Cohort Study. J Clin Oncol. 2020:Jco2001933.
8. Palmqvist CL, Ariyaratnam R, Watters DA, Laing GL, Stupart D, Hider P, et al. Monitoring and evaluating surgical care: defining perioperative mortality rate and standardising data collection. Lancet. 2015;385 Suppl 2:S27.
9. Meara JG, Hagander L, Leather AJ. Surgery and global health: a Lancet Commission. Lancet. 2014;383(9911):12-3.
10. Nepogodiev D, Martin J, Biccard B, Makupe A, Bhangu A. Global burden of postoperative death. Lancet. 2019;393(10170):401.
11. Mansfield KE, Mathur R, Tazare J, Henderson AD, Mulick AR, Carreira H, et al. Indirect acute effects of the COVID-19 pandemic on physical and mental health in the UK: a population-based study. Lancet Digit Health. 2021;3(4):e217-e30.
12. Shaw R. UK Head and neck cancer surgical capacity during the second wave of the COVID-19 pandemic: Have we learned the lessons? COVIDSurg collaborative. Clin Otolaryngol. 2021.