defined pathway.
Methods: This international multicentre cohort study included patients undergoing elective surgery for 10 solid cancer types, without preoperative suspicion of SARS-CoV-2. Participating hospitals included patients from local emergence of SARS-CoV-2 until 19 April 2020. At the time of surgery, hospitals were defined as having a COVID-19 free surgical pathway (complete segregation of the operating theatre, critical care and inpatient ward areas) or no defined pathway (incomplete or no segregation, areas shared with COVID-19 patients). The primary outcome was 30-day postoperative pulmonary complications (pneumonia, ARDS, unexpected ventilation).
Results: Of 9171 patients from 447 hospitals in 55 countries, 2481 were operated in COVID-19 free surgical pathways. Patients undergoing surgery within COVID-19 free surgical pathways were younger and less comorbid than those in hospitals with no defined pathway, but with similar proportions of major surgery. After adjustment, pulmonary complication rates were lower with COVID-19 free surgical pathways (2.2% versus 4.9%, OR 0.62 [0.44-0.86]). This was consistent in sensitivity analyses and a propensity-score matched model. The postoperative SARS-CoV-2 infection rate was also lower in COVID-19 free surgical pathways (2.1% versus 3.6%; OR 0.53 [0.36-0.76]).
Conclusion: Dedicated COVID-19 free surgical pathways should be established to provide safe elective cancer surgery during current and before future SARS-CoV-2 outbreaks.

70

PREOPERATIVE NASOPHARYNGEAL SWAB TESTING AND POSTOPERATIVE PULMONARY COMPLICATIONS IN PATIENTS UNDERGOING ELECTIVE SURGERY DURING THE SARS-COV-2 PANDEMIC

COVIDSurg Collaborative. *NIHR Global Health Research Unit on Global Surgery, Birmingham, UK*

Introduction: Surgical services are preparing to scale-up in areas affected by COVID-19. This study aimed to evaluate the association between preoperative SARS-CoV-2 testing and postoperative pulmonary complications in patients undergoing elective cancer surgery.
Methods: International cohort study including adult patients undergoing elective surgery for cancer in areas affected by SARS-CoV-2 up to 19 April 2020 (NCT04384926). Patients suspected preoperatively of SARS-CoV-2 infection were excluded. The primary outcome measure was postoperative pulmonary complications at 30 days after surgery. Preoperative testing strategies were adjusted for confounding using mixed-effects models.
Results: Of 8784 patients (432 hospitals, 53 countries), 2303 patients (26.2%) underwent preoperative testing: 1458 (16.6%) had a swab test, 521 (5.9%) CT only, and 324 (3.7%) swab and CT. The overall pulmonary complication rate was 3.9% and SARS-CoV-2 infection rate was 2.6%. After risk adjustment, only a nasopharyngeal swab test (adjusted odds ratio 0.68, 95% confidence interval 0.68-0.98, p=0.040) was associated with lower rates of pulmonary complications. Swab testing remained beneficial before major surgery and in high SARS-CoV-2 population risk areas but not before minor surgery in low incidence areas. For a swab test, the number needed to test to prevent one pulmonary complication increased across major and minor surgery in high incidence areas (18 and 48 respectively), and major and minor surgery in low incidence areas (73 and 387 respectively).
Discussion: Preoperative nasopharyngeal swab testing was beneficial before major surgery and in high SARS-CoV-2 incidence areas. There was no proven benefit of swab testing before minor surgery in low incidence areas.

73

PREDICTING RESPONSE TO NEOADJUVANT THERAPY USING IMAGE CAPTURE FROM DIAGNOSTIC BIOPSIES OF OESOPHAGEAL ADENOCARCINOMA

Saqib Rahman [1], Joe Early [2], Matt De Vries [2], Megan Lloyd [1], Ben Grace [1], Gopal Ramchurn [2], Timothy Underwood [1]. [1] *School of Cancer Sciences, Faculty of Medicine, University of Southampton, UK;* [2] *School of Electronics and Computer Science, Faculty of Engineering and Physical Sciences, University of Southampton, UK*

Introduction: The standard of care for locally advanced oesophageal adenocarcinoma is neoadjuvant chemotherapy (NACT) or chemoradiotherapy (NACRT) followed by surgery. Only a minority of patients (<25%) derive significant survival benefit from neoadjuvant treatment and there are no reliable means of establishing prior to treatment in whom this benefit will occur. In this study, we assessed the utility of features extracted from high-resolution digital microscopy of pre-treatment biopsies in predicting response to neoadjuvant therapy in a machine-learning based modelling framework.
Methods: A total of 46 cases were included in the study. Pre-treatment clinical information, including TNM staging, was obtained, along with diagnostic biopsies. Diagnostic biopsies were converted into high-resolution whole slide-images and features extracted using a pre-trained convolutional neural network (Xception). Elastic net regression models were then trained validated with 200 repeats of 10-fold cross-validation. The response was considered according to Mandard tumour regression grade (TRG).
Results: The 3-year survival was 52.5%. There were 21 (45.7%) responders (TRG1-2) and 25 (54.3%) non-responders (TRG4-5) in the dataset. 29 patients (65.2%) received NACT and 16 (34.8%) received NACRT. A model trained with histopathology slide features performed comparably to RNA-seq data (AUC 0.763 Image, 0.782 RNA-seq). Training a model on segmented slide images exceeded both approaches (AUC 0.870).
Conclusions: Despite using a small dataset, impressive performance in classifying response to neoadjuvant treatment can be achieved, particularly using automated image classification. Further study to refine the methodology is required before expansion to clinical settings.

74

RANDOM SURVIVAL FORESTS FOR PREDICTION OF SURVIVAL AFTER OESOPHAGECTOMY

Saqib Rahman [1], Robert Walker [1], Nick Maynard [2], Nigel Trudgill [3], Tom Crosby [4], David Cromwell [5], Tim Underwood [1]. [1] *School of Cancer Sciences, Faculty of Medicine, University of Southampton, UK;* [2] *Oxford University Hospitals NHS Trust, UK;* [3] *Sandwell and West Birmingham Hospitals NHS Trust, UK;* [4] *Velindre Cancer Centre, Cardiff, UK;* [5] *Clinical Effectiveness Unit, Royal College of Surgeons of England, London, UK*

Introduction: Producing accurate predictions of long-term survival after esophagectomy is challenging. This study investigated how well survival after esophagectomy could be predicted using a Random Survival Forest (RSF) model derived from routinely collected data from a large, well curated, national dataset.
Methods: The study analysed data on patients diagnosed with oesophageal adenocarcinoma or squamous cell carcinoma between 2012 and 2018 in England and Wales who underwent an esophagectomy. Prediction models for overall survival were developed using the RSF method and Cox regression from 41 patient and disease characteristics. Model performance was assessed in terms of its calibration and discrimination (time dependent AUC). Internal validation was conducted using bootstrap resampling.
Results: The study analysed data from 6399 patients, with 2625 deaths during follow-up. Overall survival after surgery was 47.1% at 5 years. The final RSF model included 14 variables and had excellent discrimination on internal validation with a tAUC at 5 years of 84.8% (95%CI 83.1-86.9%), compared to 82.4% (95%CI 81.4-83.3%) for the Cox model. The most important variables were lymph node involvement, pT/ypT stage, circumferential margin involvement and age. There was a wide range of survival estimates even within TNM staging groups, with quintiles of prediction within p/yp Stage 3b ranging from 14.1-46.1% survival at 5 years.
Conclusion: An RSF model for long-term survival after esophagectomy exhibited excellent discrimination and well calibrated predictions. At a patient level, it provides more accuracy than TNM staging alone and could help in the delivery of tailored treatment and follow-up.