SP09.6 Single centre survey of patient satisfaction during radical radiotherapy for head and neck cancer

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Background: Radical radiotherapy (RT) for head and neck cancer (HNC) is extremely challenging for patients. This survey aimed to measure patient's experience and satisfaction during RT.

Method: HNC patients undergoing RT were included. Two surveys were undertaken using questionnaires. The first contained 22 questions with space for free text (distributed December 2019-March 2020). This questionnaire was amended to include 6 additional COVID-19 related questions (distributed June-November 2020). The questionnaires were completed at week 1 and the final week of RT; distributed by the team reviewing or treating the patients. Completed questionnaires were anonymous. Stata v14 was used for analysis. Tests were 2-sided with a p-value <0.05 considered statistically significant.

Results: In total 182 surveys were returned. Distress of attending daily for treatment was associated with distress from wearing the immobilisation mask (Spearman correlation r=0.62, p<0.0001). Distress attending daily and mask distress showed a weak inverse association with overall satisfaction, r=-0.34 (p=0.001) and r=-0.28 (p=0.008), respectively. Patients reporting high levels of distress about attending for radiotherapy, reported higher levels of anxiety about COVID-19 (r=0.40, p=0.005). Written information was received by 95.6% of patients. On a scale of 0 to 10 the median rating of ease at which written information could be understood was 10 (IQR 8-10). Patients who easily understood the written information expressed greater overall satisfaction (r=0.62, p<0.0001). The median overall satisfaction score at the final week was 10 (IQR 9-10).

Conclusion: Despite the difficulties RT for HNC presents, the majority of patients expressed high satisfaction with their treatment experience.

Proffered papers: Chest

SP10.1 Augmenting lung cancer diagnosis on chest radiographs: positioning artificial intelligence to improve radiologist performance

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Introduction: Lung cancer is a leading cause of cancer deaths worldwide, with poor survival rates in many developed nations. Many patients rely on early diagnosis of their lung cancer via chest radiographs (CXRs). Studies show that the majority of missed lung cancers occur on CXRs and are visible in retrospect. This study evaluates the role that artificial intelligence (AI) could play in assisting radiologists as the first reader of CXRs, increasing the accuracy and efficiency of lung cancer diagnosis by flagging positive cases before passing the remaining examinations to standard reporting.

Methods: A dataset of 400 CXRs including 200 difficult lung cancer cases was curated. Exams were reviewed by three FRCR radiologists and an AI algorithm to establish performance in tumour identification. AI and radiologist labels were retrospectively combined to simulate the proposed AI-triage workflow.

Results: When used as a standalone algorithm, AI classification was equivalent to the average radiologist performance. The best overall performances were achieved when AI was combined with radiologists, with an average reduction of missed cancers of 60%. Combination with AI also standardised the performance of radiologists. The greatest improvements were observed when common sources of errors were present, such as distracting findings.

Discussion: In this study, we show that our proposed AI implementation pathway stands to reduce radiologist errors and improve clinician reporting performance. Furthermore, taking a radiologist-centric approach in the development of clinical-AI holds promise for catching systematically missed lung cancers. This represents a tremendous opportunity to improve patient outcomes for lung cancer diagnosis.

SP10.2 Improving the accuracy of COVID-19 Chest X-Ray interpretation through online training

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Objective: The COVID-19 pandemic has demonstrated the need for healthcare professionals to learn quickly and adapt their skills to new challenges. Identification of COVID-19 on chest radiography (CXR) has a key role in patient pathways and is a key skill for clinicians. Report and Imaging Quality Control (RAIQC) is an online platform designed to improve reporting of CXRs. In this multi-centre study, we evaluated the utility of this platform for improving the speed and accuracy of COVID-19 identification on CXR.

Methods: 118 clinicians (72 Junior doctors, 19 ED consultants, 5 radiology registrars, 15 ANPs, and 5 reporting radiographers) from five hospitals were recruited over a 6-month period and underwent online training, consisting of 60 anonymised CXRs over 3 modules. Pre, and post-training assessments of accuracy and speed of reporting were carried out.

Results: All recruits completed the initial assessment with 60 recruits completing all 3 training components. The latter cohort had a mean diagnostic accuracy of 57%, compared to 43% at baseline. Improvements were seen in all healthcare worker subgroups. Junior doctor and Consultant mean reporting time reduced by 27% and 40% respectively after training.

Conclusion: Online training can improve the accuracy and speed of frontline clinicians in identifying COVID-19 on chest radiographs.

Limitations: This study took place in a simulated learning environment, further study is needed to evaluate real-life accuracy of interpretation of COVID-19 Chest radiographs. There may be bias in the results due to the recruits who did not complete training.

SP10.3   Radiation doses by beam direction in interventional cardiology

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Background: Estimating patient and staff dose from X-ray guided procedures in interventional cardiology, and its subsequent optimisation, requires knowledge of the amount of radiation and where on the patient the radiation was delivered [2]. Therefore the amount of radiation at each beam direction and the patient entry point are key parameters for simulations of patient dose or staff exposure to scattered radiation.

Method: This study included all patients undergoing Chronic Total Occlusion (CTO) procedures at our Trust from 2018 to 2019. The data was obtained from the DICOM RDSR event data and was plotted by primary angle and secondary angle. Event dose data was clustered by beam angulation and the average dose per procedure per cluster was calculated according to event type and vessel treatment site [1].

Results: We produced a data set for the average input dose at each beam angulation. The majority of dose, regardless of angulation, is delivered via fluoroscopy. We also showed that the percentage of dose delivered at each angulation for fluoroscopy and acquisition is dependent on the vessel treatment site.

Conclusion: We produced data sets describing the average dose produced during CTO cases at all commonly used views, separated by image capture method (fluoroscopy/acquisition) and vessels treated. This data could be used as an input in models to predict the effect of scattering of radiation delivered at different views to staff and patients. Vessel specific data could be used to optimise room and staff protection.

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SP10.4   Diagnostic accuracy of automated CT pulmonary angiography analysis in suspected pulmonary hypertension

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Background: CT pulmonary angiography (CTPA) is often used in suspected pulmonary hypertension (PH) and right ventricular dilatation is a feature. The study purpose was (a) to determine the diagnostic accuracy of a fully-automated machine learning (ML) tool at detecting PH in patients with suspected PH referred to a specialist centre relative to invasive right heart catheterisation (RHC) and (b) to compare with contemporaneous trans-thoracic echo (TTE).

Method: 162 consecutive patients with suspected PH who underwent CTPA and TTE within 12 months of RHC were retrospectively identified (2017-2019). PH diagnosis was made using RHC gold standard. TTEs were graded low/intermediate/high likelihood of PH (British Society of Echocardiography). CTPAs were uploaded to IMBIO's fully-automated ML-derived RV/LV Analysis™ software for ventricular segmentation and calculation of RV/LV diameter ratio.

Results: RV/LV ≥1 was 86% sensitive and 40% specific for PH when scanned within 12 months of RHC, whilst 'high' likelihood TTE was 61% sensitive and 86% specific. In a subgroup analysis of 34 patients with intermediate TTE, 28 had PH at RHC. Applying RV/LV analysis to this cohort correctly identified 82% (23) who were eventually diagnosed with PH. Area under the receiver-operating-curve for RV/LV diameter for PH diagnosis was 0.723 (95th CI 0.609-0.836), p=0.001. RV/LV diameter ≥0.95 achieved 90% sensitivity and 30% specificity and RV/LV diameter≥1.33 achieved 90%

specificity and 39% sensitivity for PH.

Conclusion: In patients with suspected PH referred to a specialist centre, automated RV/LV thresholds may help rule-in and rule-out PH, with diagnostic utility when TTE is 'intermediate' for PH.

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SP10.6 Faster respiratory diagnosis pathway for GP patients

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Background: The Trust goal of implementing the NOLCP1 and FDS282 has led to the design and implementation of the Faster Respiratory Diagnosis pathway (FReD) which was implemented in June 2019.

Purpose: The pathway objectives includes chest x-rays from GP referrals being reported within 24 hours of being undertaken. Any abnormality, i.e. malignancy (or interstitial lung disease) the patient is referred by radiology for the appropriate CT scan preferably on the chest x-ray day of attendance, or at least within 48 hours. Once the CT has been reported, it is triaged by chest physicians the next working day.

Summary: Results from June 2019 to end December 2020, show that 96% of GP chest x-rays (requested as part of the FReD pathway or upgraded to the pathway) were reported within 24 hours of being undertaken. (Total GP chest x-ray requests 32,000+.). In 2019, 53% of patients had their CT within desired timeframe, which increased to 63% in 2020 (delays were usually patient choice). The CT reports were available to the clinician within 48 hours for 74% of patients in 2019 increasing to 77% in 2020. The FReD pathway has reduced initial chest x-ray to results including CT being available to the chest consultant from 6-8 weeks' minimum to on average 5 days. Feedback from, patients, GPs and the chest physicians have been very positive. We hope to further reduce the time to initial CT and if required to CT guided biopsy. We are looking to model similar formats for other tumour sites.

The Lung Clinical Expert Group National Optimal Lung Cancer Pathway and Implementation Guide (NOLCP) 2017. 28 Day Faster Diagnosis Pathway (FDS28) accessed from the internet on 23 November 2020 https://www.england.nhs.uk/cancer/early-diagnosis/

Proffered papers: Clinical oncology – service

SP11.1 Radiotherapy Go Green and Drink Clean

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Background: Many patients receiving radiotherapy to the pelvis are required to drink a pre-defined volume of water each day to achieve a full bladder, often measured in cups. At our Trust, more than 60,000 plastic cups are used annually, by radiotherapy alone. These single use cups are environmentally unfriendly and an alternative solution to provide patients with a personalised reusable water bottle was explored. The project also aimed to improve compliance with bladder filling for radiotherapy, and so the impact on bladder volumes at the time of treatment was investigated.

Method: A grant application was made to the Trust's cancer charity to purchase custom designed water bottles, with 175 ml (1 cup) graduations on an 800 ml bottle. Bottles were given to patients at their pre-treatment appointment, with instructions on how to fill their bladder for treatment. Cup usage was calculated from orders, one-month pre and post implementation. Bladder volume at treatment, as a percentage of the CT planning volume, was recorded for the same time points and grouped into underfilled (≤50%), small (51-80%), optimal (81-120%), large (121-150%) and overfilled (≥151%).

Results: Cup usage halved from 12,000 cups to 6,000 cups. Percentage of bladder volumes in the optimal range increased from 47% to 54% and decreased in all other categories.

Conclusion: The introduction of water bottles increased bladder filling compliance and reduced plastic cup usage by half. The future will involve changing the remaining cups to a recyclable material to further reduce the environmental impact of radiotherapy preparation.