radiolucent STFBs, producing false negative diagnoses (Carneiro et al., 2020). An alternative quick, inexpensive and non-ionising-radiation modality is ultrasound (Royal college of radiologists (RCR), 2022).

Methods: Seven phantoms (mimicking soft tissue of the hand) were created to house foreign bodies of varying materials and radiopacity. These were imaged in a blind study using ultrasound and direct digital radiography. To minimise researcher bias, a blind survey of radiography staff, apprentices and students at a university was employed to assess the images/videos of the phantoms for the presence of a foreign body.

Results: Respondents (n=50) achieved a mean sensitivity of 95% and a mean specificity of 90% in detecting STFBs in the ultrasound videos and a mean sensitivity of 53% and a mean specificity of 88% in the radiographs.

Conclusion: Under the conditions of the study, general radiography was highly sensitive (99%) and specific (88%) for radiopaque STFBs but had poor sensitivity (9%) for radiolucent STFBs. Whereas ultrasound was highly sensitive and specific in the detection of STFBs of varying densities, suggesting possible superior capabilities for STFB detection. Future in-vivo study is required to investigate the potential positive impact to practice.

1. Carneiro, B.C., Cruz, I.A.N., Chemin, R.N., Rizzetto, T.A., Guimarães, J.B., Silva, F.D., Yoshida Junior, C., Pastore, D., Ormond Filho, A.G., Nico, M.A.C., 2020. Radiographics 40, 1965-1986.
2. Davis, J., Czerniski, B., Au, A., Adhikari, S., Farrell, I., Fields, J.M., 2015. Academic Emergency Medicine 22, 777-787.
3. Ingraham, C.R., Mannelli, L., Robinson, J.D., Linnau, K.F., 2015. Emerg Radiol 22, 425-430.
4. Royal college of radiologists (RCR), 2022. iRefer | [WWW Document]. URL https://www.irefer.org.uk/ (accessed 8.24.22).
5. Tantray, M.D., Rather, A., Manaan, Q., Andleeb, I., Mohammad, M., Gull, Y., 2018. Strategies Trauma Limb Reconstr 13.

CARDIAC / CHEST & LUNG POSTER PRESENTATIONS

P020 Using CT scan measurements on routine surveillance CT in metastatic NET disease to improve the screening for carcinoid heart disease

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Background: Patients with metastatic neuroendocrine tumours (MNET) have surveillance CT scan, therefore non-gated cardiac imaging is acquired. We present preliminary data investigating screening of carcinoid heart disease (CHD) in MNET. We investigated simple measurements on CT thorax that maybe helpful detecting the presence of CHD.

Method: This retrospective single centre study was performed on 73 tertiary cardiology service patients with suspected CHD. All patients had CT scans before and after referral. CT scan nearest to the referral date prior to cardiology intervention was investigated. We measured simple non-gated cardiac CT parameters and assessed for differences in groups with confirmed CHD (41 patients) and non-CHD (32 patients) after cardiology investigation. Parameters include maximum axial short axis of both ventricular internal diameters and ratio (RV/LV), maximum axial long axis of both atrial internal diameters and their ratio (RA/LA). We calculated the dispersion measures and unpaired t-tests. 3 parameters were statistically significant.

Results: 75% of CHD patients and around 75% of non-CHD patients have a RA/LA larger and less than ≈1.4, respectively ($p < 0.0001$). 50% of CHD patients and 75% of non-CHD patients have a right atrial internal diameter greater and lower than approximately 58mm, respectively ($p = 0.002$). Respectively, 50% of CHD patients and 75% of non-CHD patients have a RV/LV above and below 1 ($p = 0.028$).

Conclusion: This preliminary assessment suggests that measuring cardiac CT parameters from routine CT scans maybe useful for identifying early CHD in MNET patients and can be a simple addition to routine reporting.

1. Bhattacharyya, S., Toumpanakis, C., Caplin, M., Davar, J. (2008) Analysis of 150 patients with carcinoid syndrome seen in a single year at one institution in the first decade of the twenty-first century. The American Journal of Cardiology. 101(3):378-81. 2. Ferrari, A., Glasberg, J., Riechelmann, R. (2018) Carcinoid syndrome: update on the pathophysiology and treatment. Clinics (Sao Paulo). 73(Suppl 1): e490s. 3. Ram, P., Panalver, J., Lo, K., Pressman, G. (2019) Carcinoid Heart Disease: Review of Current Knowledge. Texas Heart Institute Journal. 46(1): 21-27.

P021 Radiographer led CTCA - the beginning of the end for routine facilitating beta blocker therapy

Ross Thorpe; Louisa Mayo; Gareth Morgan-Hughes; Rebecca McNally; Stelios Iacovides; Nang Thiriphoo; Ali Powell; Colin Stuckey; Carl Roobottom

Plymouth Hospitals NHS Trust

Background: Cardiac computed tomography coronary angiography (CTCA) is a rapidly advancing technique for assessing coronary artery disease (CAD). Traditionally CTCA imaging involves direct supervision by a radiologist or cardiologist and since inception has required facilitating beta blockers (BB). However, CT technology has improved rapidly as has radiographer and reporter expertise. Utilising this, we instituted a radiographer led cardiac CT service (RLCCTS), without routine BB, which we then studied for quality control (QC).

Methods: RLCCTS started October 2021 using the Revolution Apex CT System (GE Healthcare UK), 20-minute slots. Uniform reporting was agreed including indication, BB administration, demographics, dose length product (DLP) and the coronary artery disease -- reporting and data system (CAD-RADS) score. Uncertain CAD-RADS meant a non-diagnostic scan (NDS). Six months data was collected; stable chest pain patients (SCPP), who have national CTCA QC indicators were analysed.

Results: Of 1475 patients, 447 were not SCPP leaving 1028 SCPP CTCA for analysis. Demographics - mean age 63 years, BMI 29, 50.4% female. BB therapy - 4 patients (2 recalls). Overall, 36/1024 or 3.5% were NDS; median DLP 179mGycm; mean heart rate (HR) 70 beats per minute (BPM).

Conclusion: RLCCTS compares favourably against national data audits. National audit data suggests a 4% NDS rate and a median DLP for SCP patient CTCA of 209mGycm. With wide detector CT technology, experienced radiographers, and reporters, drugless RLCCTS can deliver 20-minute slot CTCA for SCP patients with satisfactory QC indicators.

P022 Evaluating the use of Gradient Echo Imaging for the detection of cerebral microbleeds in acute stroke cases: A literature review and retrospective data analysis in a stroke unit

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Background: Imaging in stroke allows its classification into ischaemic or haemorrhagic, ensuring for time-sensitive treatment to be administered when required. Imaging can also have the ability to detect cerebral microbleeds (CMBs), which may further determine pharmacological intervention in acute stroke. True gradient echo (T2*GRE) magnetic resonance imaging (MRI) has high sensitivity for the detection of CMBs. This sequence is included in the national guidelines; however the implementation of these guidelines can vary depending on local interpretation and scanner capabilities; The aim is to evaluate the use of true T2*GRE imaging for all acute stroke patients, to improve local practice.

Methods: A literature review was used to determine best practice as a reference point. Retrospective data analysis of the native database, spanning a 6-month period, was also used. The data of 281 acute stroke patients with an MRI were analysed. The MRI sequences applied and the final diagnosis were noted for each case.

Results: Of 281 acute stroke patients with MRI, 259 (92.1%) had an acute infarct, 16 (5.69%) acute haemorrhage and 6 (2.14%) had both. Overall, 13 (4.63%) had a diagnosis of CMBs. All these 13 had a true T2*GRE sequence. CMBs were not detected without T2*GRE.

Conclusion: T2*GRE imaging is essential for detecting CMBs. When omitted, CMB incidence rates can be considerably lower than those suggested in the literature. Missing CMB diagnoses in stroke patients may result in suboptimal treatment pathways. It is therefore imperative to always include a true gradient-echo sequence to detect microbleeds in acute stroke cases.

DoH. The Department of Health. Implementing the national stroke strategy- an imaging guide. 2008. Accessed June 2019. Available from: http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_085146?IdcService=GET_FILE&dID=166106&Rendition=Web SoR. The Society of Radiographers. Stroke Imaging Services; Guidance and Advice. 4th Edition. 2015. Accessed June 2019. Available at: https://www.sor.org/learning/document-library/stroke-imaging-services-guidance-and-advice. NICE. Stroke and transient ischaemic attack in over 16s: diagnosis and initial management. NG128. 2019. Accessed June 2019. Available from: https://www.nice.org.uk/guidance/ng128.

P023 A retrospective audit of 3D and 4D image guidance in lung SABR

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Imperial College Healthcare NHS Trust

Intro: Imperial College Healthcare NHS Trust (ICHT) implemented Lung SABR treatment in 2021. The IGRT protocol at each treatment fraction consists of a 3DCBCT acquisition with 6DoF correction for gross positional errors, followed by a 4DCBCT acquisition to assess tumour motion and to capture/correct any residual setup errors. A retrospective evaluation of this verification imaging process was performed to determine if the 4DCBCT was of benefit in ensuring accurate and reproducible patient setup and if this depended on the tumour location.
Method: The online review data for 35 consecutive patients (206 fractions; 18 Right-side, 16 Left-side - 24 Upper, 3 Mid, 8 Lower lobes) was collected from the Varian Aria OIS and analysed to determine if shifts corrected via the 3DCBCT required additional correction following 4DCBCT.
Results: Online corrections determined from the 3DCBCT were made in the Lat/Vert/Long (LVL) directions for 205 fractions and for pitch/roll/rotation (PRR) in 198 fractions. Online analysis of the 4DCBT demonstrated that subsequent PRR correction was only required for 3 fractions, but LVL correction was required at least once for 25 (71%) patients accounting for a total of 67/206 (33%) fractions. Table 1 shows the number of fractions that required correction divided by tumour location, and the mean and maximum shifts.

Conclusion: Although PRR shifts were successfully corrected by 3DCBCT image verification, residual translational shifts were found on 4DCBCT images when reviewing against tumour motion for all tumour locations. It is proposed that 4DCBCT imaging is sufficient in capturing all positional errors, eliminating the need for the 3DCBCT image.

TABLE 1 – (Note: Shifts are absolute values)	VERTICAL			LONGITUDINAL			LATERAL		
Tumour location	Mean (cm)	Max (cm)	% of 4D corrections required	Mean (cm)	Max (cm)	% of 4D corrections required	Mean (cm)	Max (cm)	% of 4D corrections required
Upper Lobe	0.20	0.80	23.6	0.27	0.86	31.4	0.15	0.31	21.4
Middle Lobe	0.20	0.20	5.6	0.16	0.21	11.1	0.00	0.00	0.00
Lower lobe	0.20	0.42	33.3	0.30	0.72	45.8	0.21	0.21	35.4

P024 Identifying incidental breast lesions on CMR using AI

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Background: Cardiovascular magnetic resonance imaging (CMR) is a crucial investigation for patients with cardiovascular disease (von Knobelsdorff-Brenkenhoff et al., 2017). The first few images in a CMR scan frequently reveal incidental extra-cardiac findings, such as breast lesions, but are often interpreted by cardiologists, who may not have undergone training in breast imaging interpretation (Antony et al., 2011). Whilst neural networks have been used to assist image interpretation, they have never been used to identify incidental findings in CMR scans. This study aimed to develop a neural network capable of identifying incidental breast lesions on CMR scans.

Methods: CMR images were organised into normal and abnormal classifications and split into training, validation and testing datasets. Three neural networks were constructed and evaluated using balanced accuracy, validation loss, receiver operator characteristic area under the curve (AUC) and Cohen's Kappa.

Results: Training, validation and testing were conducted using 1643, 201 and 207 images, respectively. With the validation dataset, the EfficientNet-b4 network had the highest accuracy of 85.2% compared to the network built from scratch at 58.6%. The best-performing network achieved an accuracy of 75.1% and Cohen's Kappa of 0.525 in testing, corresponding to an AUC of 0.931 ($p<0.001$), specificity of 95.3% and sensitivity of 61.1% (Figure 1).

Conclusions: The neural network could identify incidences of breast cancer with excellent rule-out performance. This may reflect the lower incidence of breast lesions in the dataset; future studies should focus on developing the model using varied, balanced data. Hopefully, these results will encourage others to develop this technology.

*1. Antony R, Daghem M, McCann GP, Daghem S, Moon J, Pennell DJ, et al. Cardiovascular magnetic resonance activity in the United Kingdom: a survey on behalf of the British Society of Cardiovascular Magnetic Resonance. Journal of Cardiovascular Magnetic Resonance. 2011;**13**(1):57.*

*2. von Knobelsdorff-Brenkenhoff F, Pilz G, Schulz-Menger J. Representation of cardiovascular magnetic resonance in the AHA / ACC guidelines. Journal of Cardiovascular Magnetic Resonance. 2017;**19**(1):70.*

P025 A single centre audit of diagnostic adequacy and complication rates of CT-guided lung biopsy

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Background: Pulmonary lesions suspicious of malignant nature require sampling for histological diagnosis to guide future management. Computed tomography (CT) image-guided lung biopsy (CTLB) is a well-established procedure for this purpose, especially for lesions not accessible to bronchoscopy or sonographic approach. The British Thoracic Society (BTS) published standards for diagnostic and complication rates for CTLB: >90% of samples should be sufficient for histological diagnosis; pneumothorax rate should be <20.5%, and <3.1% if requiring drainage; haemoptysis <5.3%; and death rate <0.15%. This audit aims to assess the rates of these outcomes for CTLB performed in a district general hospital and compare with the standards set by BTS.

Methods: Patients who underwent CTLB during a six-month period from January -- June 2022 were identified using hospital database (n=23). Information on complications and diagnostic sufficiency were collected retrospectively using their biopsy report, follow-up chest x-ray, and pathology report. Admissions within one-month of the procedure were also reviewed to look for all potentially related complications .

Results: Overall sufficient diagnostic rate was 96% (n=22). Pneumothorax rate was 22% (n=5), and 4% (n= 1) required drainage; haemoptysis rate was 4% (n=1); no death was reported in this study (n=0).

Conclusion: At our centre, CT-guided lung biopsy has excellent diagnostic rate exceeding the standard set by the BTS. Rates of pneumothorax regardless of need for drainage were slightly above the standard. Haemoptysis and death rates were acceptable. This study is limited by the small sample size which may inflate the reported rates.

Manhire et al (2003). Guidelines for radiologically guided lung biopsy. Thorax 58 (11): 920-36.

P026 Approaches taken to educate on portable chest x-rays to reduce a high reject rate analysis

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Background: Reject analysis is the monthly audit of understanding a percentage of how many images are of diagnostic quality at first attempt and how many are rejected. (Atkinson, Neep and Starkey, 2020). Although no national guidance on reject analysis rates for projectional radiography, a frequently >15% reject rate was retrieved from the local portable imaging machines. Out department considered this to be high which resulted in a need to understand why images were not diagnostic at first attempt.

Purpose: This poster will explore the rationale and approaches taken to identify radiographer's reasons for rejecting images combined with educating on the arising of any knowledge gaps. An overall aim was to reduce the reject analysis rate for portable chest imaging to reduce radiation dose and efficiency within the department.

Summary of content: A visual representation of the methods used to identify the learning needs of the radiographers, including, a QR delivered survey, an interactive presentation, simulation with x-ray phantom and portable machine and feedback of key learning points from learners. The project includes an element of learners not knowing what they don't know. (Kruger and Dunning, 1999). It will also show the limitations of the methods and the outcomes of the project. Outcomes include; updating learning checklists, manual handling promotion and time with reporting radiographers for newly qualified radiographers in the department. Overall, it will also demonstrate that since identifying and acting on the learning needs the reject rate for portable imaging has lowered.

Atkinson, S., Neep, M. and Starkey, D. (2020) 'Reject rate analysis in digital radiography: an Australian emergency imaging department case study', J Med Radiat Sci. 67, pp. 72– 79. Kruger, J. and Dunning, D. (1999) 'Unskilled and unaware of it: how difficulties in recognizing one's own incompetence lead to inflated self-assessments', J Pers Soc Psychol. 77(6), pp. 1121-34. doi: 10.1037//0022-3514.77.6.1121.

P027 A clinical audit of reporting radiographers and consultant radiologists' ability to identify suspected lung cancer on chest x-ray images and to determine the effectiveness of the fast-track referral system

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University of Liverpool

Background: NICE recommend for a chest X-ray (CXR) as the initial diagnostic test for lung cancer. People with known or suspected lung cancer must be offered a CT thorax with contrast to help confirm or rule out a cancer diagnosis. This audit evaluated a departmental CXR alert system for suspected lung cancer. Radiologists and reporting radiographers alerted CXRs they suspected showed possible lung cancer features. The accuracy of the fast-track system and ability of each reporting group were explored.

Method: 846 cases with lung alerts were analysed and 545 CXRs were audited. The CXRs were split into two groups, the images reported by the radiologists (168) and the images reported by the reporting radiographers (377). Data was collected through PACS and Cerner computer systems to identify if the patient was "positive" or "negative", for lung cancer or had "other findings" as determined by CT.

Results: 32.8% of CXRs flagged for lung cancer were positive, 40.6% were negative, and 26.6% had other findings. Chi square test showed no significant difference between the two reporting groups in their ability to identify lung cancer on CXRs. 27% of CXRs flagged by the radiologists and 35% by the reporting radiographers were positive for lung cancer.

Conclusion: Reporting radiographers and radiologists are not statistically significantly different regarding their ability to identify lung cancer on CXRs and use the fast-track system. The fast-track system worked well, with 59.4 % accuracy rate in identifying a serious pathology, concluding that the system is good but could do better.

P028 New uses for old tools; evaluating 4DCT and 4DCBCT respiratory motion in lung SABR radiotherapy

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The Christie NHS Trust

Background: Breathing induced motion of tumours is a significant source of uncertainty in lung SABR radiotherapy. 4DCT and 4DCBCT are routinely used for accurate delineation and treatment guidance, respectively. The aim of this work was to compare the difference in motion captured by the two modalities.

Method: Twenty lung patients were planned and treated with radical VMAT SABR radiotherapy. Planned motion was measured during radiotherapy planning. Two experienced therapy radiographers measured the respiratory motion of all lesions on #1 of treatment. The tumour was aligned at a set point within ITV on both the exhale and inhale phase. The difference between translation coordinates provided the estimated motion in all three planes as demonstrated by figure 1. The mean of each observer's registration was used to assess
motion.

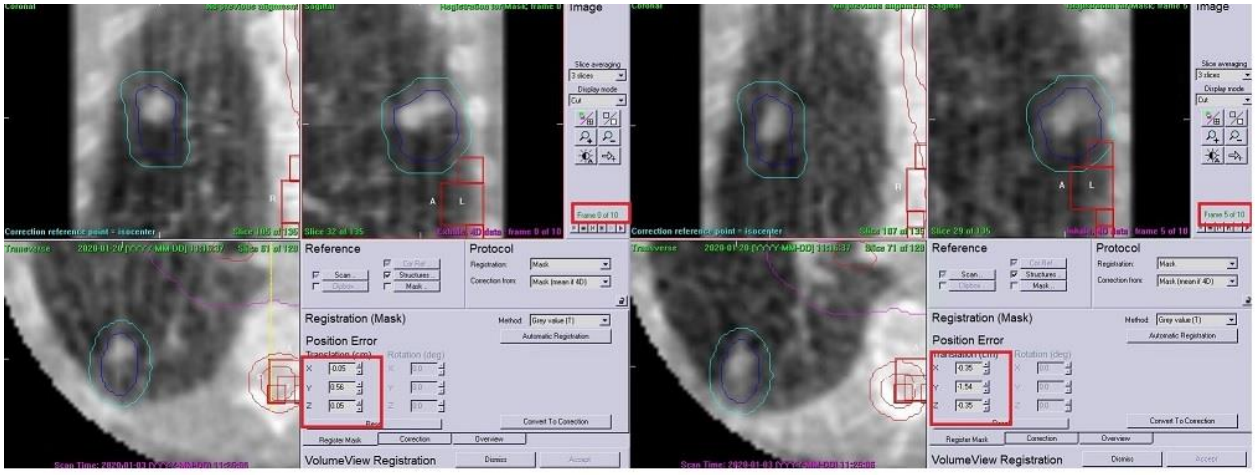
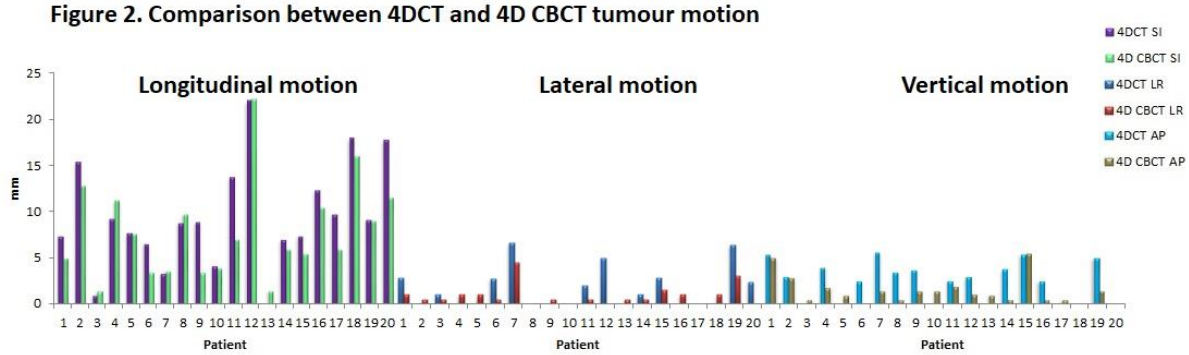


Figure 1. Estimating motion on 4D CBCT using inhale and exhale phases.

Results: Twenty 4DCT and 4DCBCT #1 images were compared. Figure 2 plots the range of motion between 4DCT and 4DCBCT in all three translational planes. Longitudinal motion demonstrated the greatest range of motion. Motion on 4D CBCT was reduced compared to 4DCT for 14 (70%) of patients. Although the magnitude of motion was less for other directions the results were similar regarding reduced motion on 4DCBCT; 14/20 patients (70%) in the lateral direction, 12/20 patients (60%) in the vertical
direction.

Figure 2. Comparison between 4DCT and 4D CBCT tumour motion



Conclusion: Results suggest target motion seen during treatment is less than estimated by 4DCT. Further investigation is required, however this innovative work raises the possibility to reduce departmental ITV-PTV SABR lung margins from from 5mm to 4/3mm and may have a direct impact on patient outcomes.

P029 Interobserver variability of the ATS/ERS/JRS/ALAT diagnostic CT criteria for idiopathic pulmonary fibrosis: A systematic review and meta-analysis

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Background: HRCT is a key element of the diagnostic process for idiopathic pulmonary fibrosis (IPF). The 2011 and 2018 ATS/ERS/JRS/ALAT guidelines sought to produce clear guidelines on the investigation, diagnosis and management of IPF (Raghu et al., 2018). We aimed to calculate through meta-analysis the interobserver variability of the ATS/ERS/JRS/ALAT criteria for diagnosis of IPF on HRCT.

Methods: The protocol for the review was registered with PROSPERO (CRD42022361803). We identified relevant original research papers via a search of Embase, Medline and Cochrane up to September 2022. Studies which calculated the interobserver agreement between chest radiologists using the ATS/ERS/JRS/ALAT diagnostic criteria were considered for inclusion. A modified version of the QUADAS-2 risk of bias tool was used for quality assessment of the included papers. Pooled kappa statistics for the 2011 and 2018 diagnostic criteria were calculated using a random effects model. Kappa values have been interpreted using the Landis and Koch classification (Landis and Koch, 1977).

Results: 8 studies (a total of 1,025 scans) were selected for inclusion in the analysis. One study was found to be at high risk of selection bias. There was an overall kappa value of 0.61 [0.51-0.71]. The 2011 guidelines had a kappa value of 0.55 [0.41-0.68], while the 2018 guidelines had a kappa value of 0.69 [0.57-0.81] (p = 0.13).

Conclusion: Our meta-analysis demonstrates substantial agreement between expert chest radiologists when using the ATS/ERS/JRS/ALAT criteria for the interpretation of HRCT scans. Furthermore, there is no significant difference in interobserver agreement between the 2011 and 2018 versions of the guidelines.

1. Landis, J.R. and Koch, G.G. (1977) 'The Measurement of Observer Agreement for Categorical Data', Biometrics, 33(1), pp. 159-174. Available at: https://doi.org/10.2307/2529310. 2. Raghu, G. et al. (2018) 'Diagnosis of Idiopathic Pulmonary Fibrosis. An Official ATS/ERS/JRS/ALAT Clinical Practice Guideline', American Journal of Respiratory and Critical Care Medicine, 198(5), pp. e44-e68. Available at: https://doi.org/10.1164/rccm.201807-1255ST.