## AI / IMAGING TECHNOLOGIES POSTER PRESENTATIONS

### 085 Diagnosis of normal chest x-rays using an autonomous deep learning algorithm

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**Background:** Deep Learning (DL) algorithms demonstrate great potential to assist radiology departments in managing capacity and improving diagnostic accuracy. Chest X-rays (CXRs) are frequent and complex diagnostic imaging tests, with a significant proportion reported as being normal.
**Purpose:** To evaluate the suitability of a DL algorithm for identifying normality as a rule out test for fully automated diagnosis in frontal adult chest X-rays in an active clinical pathway.
**Materials And Methods:** This multi-centre study included 3,887 CXRs from 4 distinct NHS institutions. A Convolutional Neural Network (CNN) was developed and trained prior to this study and used to classify a subset of exams with the lowest abnormality scores as High Confidence Normal (HCN). For each radiograph, ground truth (GT) was established using two independent reviewers and an arbitrator in case of discrepancy.
**Results:** The DL algorithm was able to classify 15% of all exams as HCN, with a corresponding precision of 97.7%. We show 0.33% of exams were incorrectly classified as HCN, with 84.6% of these exams identified as borderline cases by the radiologist ground truthing process.
**Conclusion:** We show a DL algorithm can achieve a high level of precision as a fully automated diagnostic tool for reporting a subset of CXRs as normal. The removal of 15% of all CXRs has the potential to significantly reduce workload and focus radiology resources on more complex exams. To optimise performance, site-specific deployment of algorithms should occur with robust feedback mechanisms for incorrect classifications.

### P086 Exploring the impact of artificial intelligence software on radiographic practice- a triage tool for radiographers

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**Background:** Artificial Intelligence (AI) has been at the forefront of technological advances in radiology, becoming a popular tool in supporting reporting backlogs. The focus of AI in radiology has been aimed at the role of the radiologist. The role of the radiographer's integration of AI is just gathering momentum and has not been fully explored. This audit aims to explore the potential impact of an AI application on the radiographer's role, and how AI could be used in clinical practice.
**Method:** A pre trained AI programme was applied retrospectively to 40 mobile CXR's acquired over 1 month at one trust. 20 images were selected for analysis, pseudo anonymised and stored in a viewing test bed. Radiographers (n=15) were asked to analyse the CXR without the AI overlay and denote whether they thought the CXR was normal or abnormal. The same radiographers viewed the images again, this time with the AI applied and the same questions asked.
**Results:** This poster will present the findings of the audit and highlight any significant changes in the responses the radiographers gave.
**Summary:** Areas that will be explored are the radiographer's detection of abnormality accuracy, confidence in escalating findings if the image was abnormal (highlighted by human or AI), and who the radiographers chose to escalate their findings too. The hypothesis is to test whether AI can be safely used supporting the radiographer for escalating urgent findings for faster and timelier decision making.

1. Hardy, M. and Harvey, H. (2020) Artificial Intelligence in diagnostic imaging: impact on the radiography profession. The British Journal of Radiology, 93(1108). Available at: https://www.birpublications.org/doi/10.1259/bjr.20190840 [Accessed 22 July 2020] 2. Woznita, N., Nair, A. and Hare, S.S. (2020) COVID-19: A case series to support radiographer preliminary clinical evaluation. Radiography, 26 (3), p. 186-188. Available at: https://www.radiographyonline.com/article/S1078-8174(20)30054-7/fulltext [Accessed 6 August 2020]

### P087 Exploring diffusion-weighted imaging (DWI) within magnetic resonance cholangiopancreatography (MRCP) for the detection of pancreaticobiliary cancer

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The Scottish Government (2019) states that early detection of cancer can reduce premature death and have a positive effect on overall life expectancy. As cancer is becoming a growing concern in the UK, it is important to acknowledge any method that will help improve its detection[1]. MRCP is used for cancer pathways according to NICE Guidelines (2019)[2]. MRCP is a magnetic resonance imaging (MRI) examination that investigates pancreatic-biliary disorders.

Some pitfalls of MRCP include respiratory artefact and gas and debris mimicking pathology[3]. MRI uses a unique tool called DWI. DWI provides information about the microstructural characteristics of tissues by detecting the motion of water molecules in the body[4], this can be seen in the image below. DWI can provide valuable information which can aid and evaluate detection of pathologies and carcinomas[5]. GG&C does not routinely include DWI in a MRCP protocol; a literature review was carried out to assess if DWI could help in the detection of pancreaticobiliary cancers.

[1]THE SCOTTISH GOVERNMENT, 2019. Scottish referral guidelines for suspected cancer. Scotland: Community Health and Social Care Directorate. [viewed 15.10.2020]. [2]NATIONAL INSTITUTE FOR HEALTH AND CARE EXCELLENCE, 2018. Pancreatic cancer in adults: Diagnosis and management. England: National Guideline Alliance. [viewed 14.10.2020]. [3]GRIFFIN, N., CHARLES-EDWARDS, G. & GRANT, L.A., 2012. Magnetic resonance cholangiopancreatography: the ABC of MRCP. Insights Imaging. 3(1), pp.11-21. [4]BITTENCOURT, L., MATOS, C. & COUTINHO, A.C., 2011. Diffusion-Weighted Magnetic Resonance Imaging in the Upper Abdomen: Technical Issues and Clinical Application. Magnetic Resonance Imaging Clinics of North America. 19(1), pp.111-131. [5]YAO, X., KUANG, T., WU, L., FENG, H., LIU, H., CHENG, W., RAO, S., WANG, H. & ZENG, M., 2014. Optimization of MR diffusion-weighted imaging acquisitions for pancreatic cancer at 3.0T. Magnetic Resonance Imaging. 32 (7), pp.875-879. [6]MAAROUF, R.A., ZIDAN, D.Z. & EL-SHINNAWY, M.A., 2013. The added value of diffusion-weighted MR imaging to MR cholangiopancreatography in differentiating malignant from benign extra hepatic biliary strictures. The Egyptian Journal of Radiology and Nuclear Medicine [online]. 44(4), pp.719-726. [7]KANG, K.M., LEE, J.M., SHIN, C.S., BAEK, J.H., KIM, S.H., YOON, J.H., HAN, J.K. & CHOI, B.I., 2013. Added Value of Diffusion-Weighted Imaging to MR Cholangiopancreatography With Unenhanced MR Imaging for Predicting Malignancy or Invasiveness of Intraductal Papillary Mucinous Neoplasm of the Pancreas. Journal of Magnetic Resonance Imaging. 38, pp.555-563. [8]PARK, H.J., JANG, K.M., SONG, S.H., KIM, Y.K., CHA, M.J., CHOI, S.Y. & MIN, K., 2017. Value of unenhanced MRI with diffusion-weighted imaging for detection of primary small (<20mm) solid pancreatic tumours and prediction of pancreatic ductal adenocarcinoma. Clinical Radiology. 72(12), pp.1076-1084.

## DOSE / RADIATION PROTECTION / IMAGING TECHNOLOGIES POSTER PRESENTATIONS

### P088 Erect versus supine lumbar spine radiographs: experiences in the clinical environment regarding quality, dose and pathology

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**Background:** Radiography of the lumbar spine is traditionally performed supine,[1] although there is inconsistency in acquisition techniques within the literature. Previous work has focused on the dose reduction opportunities of PA imaging[1,2] but this study sought to incorporate this with the functional outcomes of weightbearing to implement a standardised PA and lateral erect technique.

**Method:** A retrospective audit and prospective acquisition phase compared patient demographics, image quality and pathological outcomes for supine and erect radiographs of non-trauma lumbar spine. Effective doses were calculated using PCXMC.

**Results:** There were demographic differences between the 144 retrospective and 50 prospective examinations (mean age: 65 vs 57yrs; $p<0.05$. mean BMI 29.1 vs 32.3; $p<0.05$) although gender profiles were similar (female 70% vs 73%; $p=0.728$). Effective dose was on average 30.6% lower for the PA examination ($p<0.05$), although a mean 14% increase was evident in the lateral dose ($p=0.492$). Image quality and intervertebral disc space visualisation was improved in the erect position and it also provided evidence of a leg length discrepancy in 14% of patients.

**Conclusion:** This small-scale evaluation has demonstrated that the erect position can facilitate dose reduction, image quality improvements and pathology not appreciated on supine examinations. Further evaluation and optimisation is required prior to adoption into standard practice.

1. Davey, E. & England, A., 2015. AP versus PA positioning in lumbar spine computed radiography: Image quality and individual organ doses. Radiography 21, pp. 188-196.
2. Alukic, E. & Mekis, N., 2019. Lumbar spine radiography: lower organ dose with the use of the PA projection. Radiation Protection Dosimetry, pp. 1-6.

### P089 Tip apex diameter in dynamic hip screw fixation. Audit to assess practice at an acute general hospital

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Dynamic Hip Screw(DHS) is a procedure used in orthopedics for the fixation of extra-capsular neck of femur fractures. A complication of this procedure is the screw cut out from the femoral head, the prognosis of which is observed through the tip apex distance which is the distance from the tip of screw to apex of the femoral head. A distance of less than 25mm shows a good prognostic value. The purpose of this audit was to see if the principle Tip apex distance were effectively put into practice at a local DGH. A retrospective study was performed using the local NOF audit data for the hospital. 60 Cases over a period of 7 months from January 2018 to July 2018 were assessed. The TAD of each case was measured individually by using intraoperative imaging available on PACS. The measurements were calibrated to minimise projection and magnification errors. Each case was followed up using medical records to look for any postoperative complications. Grade of performing surgeon and intraoperative radiation time was also recorded. The