Aims/objectives: To determine the accuracy of voice recognition software-generated reports compared to the accuracy of electronic imaging requests. We used the RCR AuditLive template (less than 5% errors overall, 0% major errors) to compare our outcomes.

Content: Inpatient CT scans were selected randomly from a four-week period; the electronic imaging request and issued report were analysed separately. We classified errors as: minor (spelling mistakes/small substitutions eg. 'am' v 'an'), moderate (incorrect words/syntax) or major (elements causing misinterpretation eg. missing 'No').

Relevance: Good communication leads to good patient care. Errors could be avoided by a simple spell checking tool or a prompt to review the report/request prior to completion.

Outcomes: 221 scans were included, 88(39.8%) requests and 109(49.3%) reports contained no mistakes. Requests contained 65(29.4%) minor and 35(15.8%) moderate mistakes, compared to 36(16.2%) and 41(18.5%) in the reports. Requests and reports each contained 4(1.8%) major errors. The major errors in the requests were all due to missing significant clinical information. For the reports errors included: Incorrect side (promptly corrected), a missing negative, a missing word ('suggestive of - ') and other ('no large or drain is present').

Discussion: The error rate observed was higher than the RCR standard, but the impact on patient safety of these errors (the majority of which were minor) is unclear; most moderate errors did not alter the sentiment of the report. The higher rate of error within the electronic imaging requests must be addressed as it directly impacts the accuracy of reports.

P-184 Examining the end-user experience of the National Integrated Medical Imaging System (NIMIS)

Jennifer Smith; Hong Kuan Kok; William Torreggiani
Adelaide Meath incorporating the National Children's Hospital

Purpose: The National Integrated Medical Imaging System (NIMIS) is a secure, centralised system for storing and retrieving medical imaging which is currently being rolled out across a number of clinical sites. The purpose of this audit was to obtain feedback from the end-users of NIMIS in order to understand the perceived advantages and disadvantages of NIMIS and its existing interface. A secondary aim was to gather suggestions about potential improvements directly from its end-users.

Materials/methods: A survey was created using an online service provider. It was sent to consultants and non-consultant hospital doctors (NCHDs) at 34 NIMIS sites. The 260 completed responses were analysed in relation to key areas of NIMIS functionality, performance and end-user satisfaction.

Results: The results indicated that while users are generally satisfied with NIMIS, areas exist where its design and functionality could be improved. These areas included difficulty in identifying the appropriate code for a study (34%); dissatisfaction with ordering and viewing scans (32%); and a need for improved communication between end-users and local Radiology departments, with 104 (40%) unsure when to contact the department and 137 (53%) dissatisfied with the feedback they received.

Conclusion: Although generally satisfied, this survey has highlighted issues that need to be addressed in order to improve functionality while promoting patient safety. These improvements relate to IT infrastructure; increased clarity regarding patient records; simplified image ordering; and, the continued improvement of communication between end-users and local Radiology departments.

Emerging technologies

P-185 The use of needle guidance software within interventional radiology

Stephanie Dobson[1]; James Harcus[2]
[1]University Hospital Aintree; [2]Sheffield Hallam University

Cone Beam CT (CBCT) has allowed for the expansion of the examinations/procedures that can be performed within the interventional radiology suite. Many of these procedures were once only possible within CT, however with the avalibility of CBCT and needle guidance software within the interventional suite these exams can be brought into the Interventional setting. This has allowed for the improved safety and care of the patients whilst not limiting the

imaging facitilites avalible to the radiologist. With improved experience, knowledge and confidence in using needle guidance even the most complex cases have the possibility of being performed within the inteventional suite.

P-186 Can CSPINE-CAD software increase diagnostic accuracy and confidence in c-spine imaging?

Michael Gundry[1]; Karen Knapp[1]; Greg Slabaugh[2]; Andrew Appelboam[3]; Adam Reubens[3]; S M Masudur Rahman Al Arif[2]; Michael Phillips[2]

[1]University of Exeter; [2]City University London; [3]Royal Devon and Exeter Hospital

Aims/objectives: To determine if CSPINE computer-aided detection (CAD) software increases diagnostic accuracy and confidence scores in c-spine radiograph interpretation.

Content: 30 lateral c-spine radiographs were reviewed by 21 participants (radiographers and doctors). Each radiograph was diagnosed with a confidence score on a scale of 2-6 (2=0.01-19.99% and 6=80-100% confident). The CSPINE-CAD software (version 1.0.2) was then applied and each radiograph was re-diagnosed and rescored. Questionnaires asked how confident participants felt during testing both without and with the assistance of the software. The software was also tested 10 times by itself to assess its repeatability at indicating the correct injuries.

Relevance/impact: The use of c-spine CAD technology may increase diagnostic confidence and accuracy.

Outcomes: The levels of 80-100% confidence scores increased from 138 correct diagnoses to 144 when using CAD. Questionnaire data showed 80.95% of participants stated they found the software useful as an additional pair of eyes, and participants felt on average 9% more confident when making a diagnosis with the assistance of CAD. Three images scored 10/10 for indicating the known injuries; all three had an increase in diagnostic accuracy after using CAD (for the 5 and above threshold i.e. 60%+), with one radiograph showing an increase of diagnostic accuracy by 38.10%.

Discussion: The data shows an increase in diagnostic accuracy in the 60%+ confidence level when using CSPINE-CAD, but only when the CSPINE-CAD has high repeatability in indicating the injuries. Further improvement and investigation is needed in the accuracy and repeatability of the CSPINE-CAD software.

P-187 Knowledge-based iterative reconstruction: It's efficacy in noise reduction and effect on CT image slice thickness

Caroline Aird[1]; Ken Lau[2]; Kevin Buchan[2]; Paul Leong[1]

[1]Monash Health; [2]Philips Healthcare

Purpose: To assess the efficacy of knowledge-based iterative reconstruction (KBIR) in noise reduction and the implication on slice thickness in contrast enhanced CT abdomen and pelvis (CE-CTAP).

Materials/methods: First group of consecutive adult patients presenting for CE-CTAP were included and scanned with standard radiation dose protocol. Second group of consecutive adult patients for CE-CTAP were scanned with 24% radiation dose-reduced protocol. Axial image reconstructions were performed across both groups at 5mm employing statistical iterative reconstruction (SIR) and 5mm, 4mm, 3mm, 2mm and 1mm using KBIR. Regions of interest (ROI) were positioned in liver, spleen, kidneys, psoas and bladder for all reconstructed images. Attenuation values in Hounsfield units (HU) and standard deviation (SD) representing image noise were recorded and compared.

Results: 32 patients (50% male,mean age 65.4,mean BMI 24) in standard dose and 32 patients (40% male,mean age 64.2 years,mean BMI 25) in reduced dose protocol were recruited. Using two tailed paired samples t-tests, image noise in the 3mm KBIR slices was similar to that of 5mm SIR slice thickness in both standard and dose reduced groups ($p<0.05$) at all measured structures. Image noise in 3mm KBIR slices for the dose reduced group was also comparable to that of 5mm SIR slice thickness of the standard group ($p<0.079$).

Conclusion: KBIR is capable of decreasing radiation dose while reducing imaging noise. It can produce thinner slices of similar image quality to SIR for both standard and reduced dose protocols, potentially improving organ assessment and lesion detection.

P-188 Pioneering telemedicine charity saves lives in war-torn countries miles away from the UK using simple technology

Waheed Arian[1]; Elizabeth Joekes[2]
[1]Aintree University Hospitals NHS Foundation Trust; [2]Royal Liverpool University Hospital

Aims:
. The charity demonstrates that using simple every day technology saves lives and teaches healthcare professionals in Kabul Afghanistan.
. To demonstrate the potential for this charity to expand rapidly in other conflict zones to save lives and teach on emergency topics with radiology being the centre point.

Content: A clinical radiology specialist registrar at an NHS hospital, runs a telehealth charitable trust, which has enabled volunteer UK doctors, backed by the NHS clinical and medical directors as well as the government of Afghanistan, to teach and advise their Afghanistan colleagues using web-based video-conferencing and mobile phones. Dozens of lives are saved at the five Kabul hospitals taking part. Healthcare in Afghanistan and other conflict zones is very basic, despite local doctors' hard work and dedication. Using technology, the charity exhibits that world-class medical knowledge in the UK can be offered to emergency patients thousands of miles away.

Relevance/impact: Due to unsafe access of UK and other European doctors, there is an increasing demand for world-class medical help in conflict zones. The only alternative is telehealth to connect them, which is proven through this charity model.

Discussion: Dozens of lives are already saved in Afghanistan. The potential for this pioneering charity to expand rapidly in conflict zones is immense and vital with help of more volunteers to donate their minimum free time.

P-189 Extending diagnostic information recovered by digital radiographic X-ray imaging

Joshua Cowling[1]; Paul Scott[1]; Gary Gibson[1]; Neil Loxley[1]; Ben Lopez[1,2]; Phil White[3]; Kevin Robson[4]
[1]IBEX Innovations; [2]Durham University; [3]Newcastle University; [4]Newcastle Upon Tyne Hospitals NHS Foundation Trust

Aims: Conventional digital radiography (DR) is limited by X-ray absorption contrast and cannot quantitatively distinguish between thick soft tissue and thin bone, or subtle changes in bone composition. To acquire this kind of information dual energy X-ray absorptiometry (DEXA) scans can be used, which produce a bone mineral density measurement. We demonstrate a novel X-ray technology which allows the recovery of energy sensitive information on a DR system at minimal impact on dose, image quality, and computation time.

Content: We demonstrate the principles behind our multi-absorption plate (MAP) technology which modulates an X-ray beam across a detector and uses this information to infer compositional material information. This is performed in a DR context in a single exposure at clinical dose, with no need for specialised equipment. We also present results from a cadaver study demonstrating our ability to extract relevant information in a near-clinical setting.

Relevance: An extension to DR which collects information similar to DEXA systems without compromising image quality could make separate DEXA measurements in various fracture risk analysis cases redundant. This approach also makes additional diagnostic information about bone composition available from any DR measurement.

Outcomes: Clinical dose DR images of a cadaver are generated demonstrating contrast in "materials" as opposed to absorption, alongside standard clinical images with appropriate dose and image quality. The quality and limitations of this data are contrasted with existing diagnostic methods.

P-190 The limits of blood volume evaluation with dual energy CT

Matthew Dimmock[1]; Sarah Jia En Chine[1]; Richard Bassed[2]; Neil Langlois[3]; Sarah Parsons[2]
[1]Monash University; [2]Victorian Institute of Forensic Medicine; [3]South Australian Attorney-General's Department

CT scanning is being increasingly utilised in forensic centres as a preliminary examination to assist with determining the need for an autopsy. The maximum obtainable image quality in CT is limited by the radiation dose delivered to the patient. However, this constraint does not exist in post-mortem studies, allowing for the full potential use of dual energy (DE) scanning.

Evidence of trauma to subcutaneous fat and scalp injuries have been documented using CT scanning. However, no studies have previously been published regarding the use of DECT to evaluate bruises post-mortem. This study presents an investigation into the analytical process and limitations of DECT in detecting bruise phantoms containing different blood distributions. It was determined that the minimum blood volume that could be differentiated from surrounding fatty tissue is 0.06 mL.The different components of the blood, i.e. serum and erythrocytes, are distinguishable down to 0.4 mL. The effects of the shape of the static blood distribution with respect to the orientation of the scanner are also assessed.

P-191 Dark-field radiography: Harnessing information from small-angle scattering to visualise early stage pulmonary emphysema

Thomas Lown; University Campus Suffolk; Jane Harvey-Lloyd
University Campus Suffolk

Aim: To introduce the emerging techniques of grating-based radiography to analyse small-angle scattering in lung tissue to identify early stage pulmonary emphysema in chronic obstructive pulmonary disease (COPD).

Introduction: COPD describes a collection of lung diseases predominantly caused by smoking, or passive smoking. The damage causes pulmonary emphysema, which can be defined as the permanent enlargement of the air sacs in the lung tissue leading to the decreased ability for gas exchange. It is believed there are around 3 million people affected by the disease in the UK, causing 25,000 deaths a year and costing the NHS up to £1 billion.

Relevance/impact: One in eight people over 35 has COPD that is not properly diagnosed, and will not be identified until presenting as an emergency. Current radiographic imaging modalities offer limited detection and staging options, whereby high resolution computed tomography (HRCT) accumulates considerable radiation dose, ruling it out for screening programmes. Conventional attenuation based radiography has the ability to demonstrate late stage emphysema, but treatment options have by then become significantly reduced. Dark-field radiography has the ability to produce a contrast signal to accurately demonstrate widespread, or regional, alveoli destruction.

Outcomes/discussion: With its ability to accurately image low atomic number structures, such as lung parenchyma, and acquisition techniques which culminate in separate attenuation based, phase-contrast and dark-field signal images, it promises to be an effective emerging modality.

P-192 An experimental investigation into the relationship between exposure index (EI) numbers and image quality on direct digital radiography (DDR)

Elliot Senya; Eglantina Morina; Mohammed Rehman; Samuel Ssekatawa
University of Exeter

Purpose: To investigate the relationship between exposure index and image quality by evaluating the spatial and contrast resolution on the TORCDR test tool. To explore the full potential of Exposure Index in aiding with assessment of image quality of radiographs.

Material/methods: The study was undertaken using the Siemens Multix radiography equipment. A phantom was made consisting of the test tool immersed within a container of lard to mimic the human body. It was exposed at a range of exposure factors with other factors controlled to obtain a set of images. Their varying contrast and spatial resolution were measured by counting the number of low resolution discs and spatial resolution line pairs; analysed by two team members which allowed for inter-observer agreement. Data was recorded and presented in tables and graphs. Five hand x-rays of the phantom were presented to three radiographers for the purpose of subjective ranking based on image quality. The results were analysed, to see how they compared with corresponding exposure numbers.

Results: Statistical analysis of the data obtained is to be carried out to ascertain the relationships between image quality and contrast and spatial resolution in turn linking it to Exposure Index. This analysis will be carried out in the near future.

Conclusion: This study suggests that there is a relationship between image quality and exposure index. There is scope for EI numbers to help objectively guide image quality although further research is required before it can be utilised in clinical practice.

P-193 Radiation dose from pelvic radiography: A comparison of three digital radiography (DR) systems

Andrew England[1]; Paula Evans[2]; Fergus Dunn[3]; Anthony Manning-Stanley[4]; Elizabeth Taylor[2]; Louise Harding[2]
[1]University of Salford; [2]Warrington & Halton Hospitals NHS Trust; [3]IRS Limited; [4]Salford Royal Hospital NHS Trust

Purpose: To compare the radiation dose and image quality between the three digital radiography (DR) systems when undertaking examinations of the pelvis.

Methods: Using a Carestream Directview, Siemens Ysio and a Samsung XGEO a series of antero-posterior (AP) pelvic images were obtained using a phantom. Images were acquired using 75 kVp, outer AEC chambers and the Source to Image Distance (SID) was varied from 115 to 140cm. The phantom was also imaged across two orientations, outer AEC chambers nearest the head and then the feet. Field size, centring point, grid usage and focal spot were fixed throughout the study. For each examination the mAs and source to skin distance were recorded. Entrance surface dose including scatter (ESD) and effective dose (ED) were calculated using the PCXMC software. The resultant images were independently assessed for image quality by two blinded observers using a previously established scoring system.

Results: The lowest ED (0.105 mSv) was achieved at 125 cm, outer AEC nearest the feet and when using Siemens DR. The highest dose (0.161 mSv) was at 105 cm, outer AEC chambers nearest the head and when using Samsung DR. When compared with a reference image (current acquisition parameters) the image obtained with the lowest ED was graded has having the similar image quality.

Conclusion: Based on the equipment and acquisition factors investigated there are differences in ED between DR systems. Such differences should be factored into dose optimisation strategies or attempts should be made to normalise doses between systems.

P-194 Chest radiography: Collimated view of the bases or a full repeat?

Andrew England[1]; Hannah Brookfield[2]; Anthony Manning-Stanley[3]
[1]University of Salford; [2]Aintree University Hospital NHS Trust; [3]Salford Royal Hospital NHS Trust

Purpose: The costophrenic angles/bases may be inadvertently excluded from a chest radiograph (CXR). The aim was to investigate the differences in effective dose (E) from performing a supplementary view of the bases or a full CXR repeat.

Methods: The Monte Carlo based dose modelling software PCXMC was used to estimate E. Within the software a series of clinical scenarios were simulated. They included 85kVp and 120kVp projections, all PA at 180cm and with fixed mAs (5 & 1.5, respectively). The field size within the software was adjusted to include the whole chest and then for a collimated view of the bases. For both kVp settings E was estimated for two full-field CXRs and a full-field CXR plus bases. Differences between the two scenarios were then assessed. Hypothetical patient age/genders were included in the modelling in order to investigate variations in risk of exposure-induced cancer death (REID).

Results: At 85kVp, E for two full-field CXRs and one full-field CXR plus bases were 0.034 and 0.026 mSv, respectively (23% difference). At 120 kVp, E was 0.028 and 0.021 mSv, for two full-field CXRs and one full-field CXR plus bases, respectively (25% differences). The greatest risk reduction was for women aged 18 when moving from two full-field projections to a single CXR plus bases.

Conclusion: Debate still exists regarding whether to undertake a collimated view of the bases or a full repeat. Evidence from this study suggests that a collimated projection of the bases is justified having a lower effective dose and risk.

P-195 A comparison of radiation dose and image quality for fixed tube current (FTC) and automatic tube current (ATC) CT methods for abdominal scanning

Maily Alrowily[1,2]; Andrew England[2]; Peter Hogg[23]
[1]Ministry of Health, Saudi Arabia; [2]University of Salford;[3]Karolinska Institute, Sweden

Background: Tube current is a determinant of radiation dose and image quality in CT scanning. Fixed Tube current (FTC) and Automatic Tube Current Modulation (ATCM) techniques are methods used to ensure acceptable radiation