

P-179 Computed tomography requesting practise: Are intravenous contrast guidelines being followed and renal function being documented?

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The use of intravenous (IV) contrast agents in computed tomography (CT) imaging has increased dramatically. With the obvious advantages come many potential negatives such as contrast nephropathy. The Royal College of Radiologists has provided clear guidance on identifying those at risk of and avoiding contrast toxicity.

A retrospective audit of CT requesting practise, looking specifically at renal function documentation and assessment on request forms, was carried out. Over 1 week 170 patients underwent a CT scan fulfilling our criteria. 12.9% of these had an impaired eGFR which was not documented in 97.3%. 54.6% of those with an impaired eGFR had IV contrast administered. Notably, 18.8% of the patients did not have an eGFR result within the guidelines timeframe.

Posters were then placed throughout clinical areas to raise staff awareness of guidelines. In a re-audit, of 121 patients, 16.5% had an impaired eGFR, which was not documented in 35%. 45% of patients with an impaired eGFR had IV contrast administered. Further, 7.4% of the patients did not have an eGFR result within the guidelines timeframe.

This data demonstrates that renal function is not being recorded in line with guidelines, and many patients are receiving contrast without documentation that renal function has been considered. After a simple campaign to raise awareness the proportion of requests not documenting impaired renal function fell by 37.8%. Further, the number of patients with impaired renal function receiving IV contrast fell by 9.4%. Future improvements could be made by implementing an eGFR section on CT request forms.

Radiation protection and quality assurance

P-180 A review of QC testing practices across the North West

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CMPE provides an online platform (using Google Apps) to 31 hospitals across the North West which stores, analyses and collates in-house QC data. This study analyses this data in order to compare QC-testing practices across the region to the recommended standards provided by IPEM Report 91.

With regard to testing practices, it was found that the tests which most commonly exceed a tolerance are AEC sensitivity for radiography (77%), dose rate reproducibility for fluoroscopy (58%), dose per image reproducibility for fluorography (74%) and DDI monitoring for CR readers and DR detectors (76% and 53% respectively). Trends in the data strongly suggest that QC testing practices, as opposed to equipment malfunction, are the main reason why test results exceed tolerance.

The standards also recommend that when a tolerance is exceeded corrective action should be initiated but, the data suggests that this is occurring in only 8% of radiography cases, 5% of fluoroscopy/fluorography cases, 3% of DR detector cases and not at all for CR reader tests.

An analysis of testing frequency showed that 77% of radiography, 53% of fluoroscopy, 46% of fluorography, 61% of CR reader and 57% of DR detector tests were not performed within the minimum 90 day testing period.

This study shows that in-house QC testing is not meeting the recommended standards with regard to test performance, corrective action or testing frequency. Raising these concerns with hospitals may help to isolate and remove weaknesses in testing practices and bring testing to a recognised standard across the region.

P-181 Justification of polytrauma CT at a UK major trauma centre

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Aim: Polytrauma CT scans are a key diagnostic tool for major trauma centres. Many decision algorithms are heavily reliant on urgent access to CT imaging that offers rapid and accurate diagnostic work-up of traumatic injuries. However these require irradiation to the whole body often in young patients. Justification therefore needs to be rigorous and should be based on evidence, particularly in the case of doubtful major trauma. Our aim was to identify benchmarks for justification of polytrauma CT requests and apply these benchmarks retrospectively.

Method: A literature search was carried out to identify indications for polytrauma CT scans from published research and guidelines. A suitable set of criteria was then chosen as a benchmark for justification. All polytrauma CT's were retrospectively reviewed using PACS request forms and patient clinical notes over a 2 month period following the launch of a major trauma status at our institution. Justification for polytrauma scans performed during this period was then assessed using the chosen benchmark. Injury severity scores (ISS) from the national trauma registry were also assessed.

Results: A literature review revealed a paucity of published information on the indications for polytrauma CT scans and no consensus currently exists. Although not validated, the indications set out in the REACT2 study were selected as the benchmark for justification. A total of 52 patients underwent polytrauma CT scans. Using this benchmark, 84% of polytrauma CT's in our audit were justified on the basis of request forms alone. When clinical notes were reviewed, 95% of scans were justified. 25% of scans showed no injury. Review of subsequent ISS showed 54% of patients scored greater than 15.

Conclusion: The proportion of polytrauma scans performed at our institution that were justified was satisfactory on the basis of the chosen benchmark. However there is a paucity of published information on the indications for these scans that carry a high radiation dose.

P-182 Can inter- and intra-observer variation in the assessment of threshold contrast detail detectability be improved?

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Assessment of image quality performance of digital imaging equipment includes testing the ability of the system to visualise objects of varying size. Leeds test object, TO20, may be used which contains details of varying diameter and thickness, each detail corresponding to a known contrast level. Observers score images of TO20 by counting the number of visible details in each row. These scores are then used to derive a threshold contrast index (HT (A)). The tolerance recommended by IPEM is a change in HT (A) of more than 30% from baseline.

This study investigates the magnitude of inter- and intra- observer variation in TO20 scoring and the impact of this variation on HT (A). Eighteen observers with a range of experience from one department were invited to score 27 images, comprising an assortment of images created using two nominally identical test objects.

The average results obtained for the two test objects are similar, although observer variation has a large impact on HT (A). The majority of observers' scores are within 20% of the mean HT (A) across the range of detail diameters, and the maximum intra-observer variation is approximately 50%. This makes application of the 30% tolerance difficult.

This presentation discusses how inter- and intra- observer variability may be improved, including discussion of the results of a re-audit. The effect of dissemination of the results to observers, training review, and the feasibility of applying observer correction factors will also be considered.

P-183 The radiation legislation awareness of foundation year doctors

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Aims: More imaging requests are being made by junior doctors as a result of increased accessibility to imaging services. The Foundation Year (FY) Curriculum states that a foundation doctor should 'recognise that ionising radiation can be harmful and is able to justify radiation exposure'. We aim to assess awareness and knowledge of radiation legislation and exposure in FY doctors.

Methods: Paper questionnaires (taken from RCR AuditLive Recipe) were given to FY1 and FY2 doctors at the start of their mandatory teaching sessions. Responses were collected anonymously. The questionnaires requested yes/no answers.

Results: 57 completed questionnaires (response rate 53.7%) were returned. 56% (n=32) of FY doctors were not aware of any governmental regulations surrounding radiation. 33% (n=19) were not aware of any legal obligation to provide accurate information when requesting radiological investigations. Only 16% (n=9) were aware of the RCR guideline 'Making the Best Use of Clinical Radiology Services' (MBUR; latterly "iRefer"); and only 1% (n=1) had used this. Additionally, 79% of doctors have been asked by their seniors to submit imaging requests where they are uncertain of the indication.

Conclusion: The results of this study demonstrate an inadequate understanding of radiation legislation by junior doctors. This can potentially result in an offence being committed by violation of the IR(ME)R guidelines. A dedicated session on IR(M)E)R has now been implemented during the junior doctor induction period at the Trust.

P-184 Low dose computed tomography for orthopaedic pelvic CT

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Objectives: Computed Tomography of the pelvis in Orthopaedics is often used as a preoperative determination of the hip morphology but the patients are often young and in the reproductive age group. Standard CT pelvic imaging exposure doses are high even on newer machines using KV modulation. The emphasis is on mAs modulation for dose reduction.

Contents: Research findings of low dose Pelvic CT. Images were assessed for quality based on the ability to demonstrate cortical bone, trabecular bone, periosteal changes, soft tissue calcification and the ability to provide clarity on the reformatted images to be acceptable for both radiological and surgical interpretation.

Impact: We have by fixed mAs modulation able to reduce dose significantly (>60%) without a compromise in image diagnostic quality. The increased scatter in soft tissues is minimal and acceptable and does not influence image interpretation.

Discussion: Standard CT pelvis for bone morphology fails to resolve soft tissue changes and hence of little diagnostic or clinical use for determination of soft tissue changes. The standard CT Pelvis doses are high despite current modulation techniques. The advances in CT technology permits advanced reconstructive algorithms for image reformatting. The dose determining factor is the coronal dimension at the pelvis rather than the weight of the patient. This is due to the recognised differences in body habitus at the same body weight. The coronal dimension of the patient on scanograms in relation to the table permits a quick guide to level of the fixed mAs modulation. The beam hardening artefacts are also mitigated at lower doses and may be useful where metal internal fixation is present.

P-185 Evaluation of the appropriateness of whole body computer tomography (WBCT) in trauma patients in a tertiary trauma centre

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Aims/objectives: To assess appropriateness of WBCT request in a major trauma centre.

Content: Early identification of life threatening injuries by WBCT improves survival. However, easy accessibility of WBCT and defensive practice have led to increased number of WBCT requests, some inappropriate. This has a potential for excessive demands on radiology and unnecessary radiation to patients.

Relevance: Annual audit of justification in trauma imaging should be carried out by radiology departments. We have prospectively evaluated written requests for WBCT over two months and compared with the RCR standards for justification of polytrauma protocol MDCT.

Impact: To determine appropriateness of written request and adherence to current standards. This is part of a larger study to develop imaging guidelines for use by emergency and trauma specialists.

Outcomes: 56 WBCT scans were performed during the study period. 29% (16/56) requests were deemed by a radiologist to have insufficient information entered onto the electronic request. When more detailed information was verbally obtained from a trauma team leader, WBCT was deemed unjustified according to RCR standard in 6/16

patients. In addition another 6 patients with sufficient electronically information lacked justification for WBCT, giving a total of 21% patients who underwent WBCT without sufficient justification.

Discussion: Trauma lead directly requests radiographer to perform WBCT. In appropriate circumstances it has an immediate positive impact on patient's survival. However, some patients are exposed to unnecessary radiation and discussion with a radiologist should be performed prior to carrying out WBCT scan.

P-186 The use of real time dose monitoring within interventional radiology

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This project examined the use of real time dose monitoring within the Interventional Radiology department, specifically examining the work practises of the interventional team.

This was achieved using data collected from the real time system to examine the doses received by each member of the interventional team and how specific roles are affected more than others. This system has been used in addition to standard TLD/film badge monitoring and has not been implemented as a replacement, rather as a visual tool for improved practise.

The data collected has been examined for trends from both staff members and staffing groups eg. radiologists, Scrub Nurses. This data has been used to make changes in both individual and group work practises. The results have also highlighted specific examinations which have a greater impact on the working team. The data collected has been in the format of 'Job Badge' results, this required staff to sign up for the badges prior to use but has also allowed for unbiased analysis of the individual job roles as the raw data is not assigned to any staff member specifically.

The results have changed the work practises of many of the Interventional staff and have changed how the team works when undertaking specific examinations and the team roles within these exams, this includes how the different approaches for procedures (both operator and exam specific) have affected staff and how in-procedure requirements drug administration, patient concerns etc need to be carried out in a staff safe manner.

P-187 Audit of the formal recording of inpatient plain film radiograph interpretation in patients' notes

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Aims/objectives: To analyse the standard of documentation of inpatient plain radiograph assessment by the referring clinician in patients' notes at Basildon and Thurrock University Hospitals (BTUH).

Content of presentation: Standard, criteria and methods - plain radiographs of 100 in-patients, who had imaging in the previous 24 hours over 3 days, and their case notes were evaluated to look for a documented formal report by the clinician. Standard of 100% was chosen.

Relevance/impact: Ionizing Radiation Medical Exposure Regulations (IRMER) 2000 state that, "the employer shall take steps to ensure that a clinical evaluation of the outcome of each medical exposure is recorded in accordance with the employer's procedures" to ensure patient safety, to provide definitive proof of the plain film assessment and to provide a permanent record for medical litigation.

Outcomes: The result of first audit in September 2012 showed that documentation happened in only 53% of cases. Findings were disseminated to all departments in the Trust highlighting the importance of documentation. The re-audit in 9 months showed a significant improvement of 72% documentation.

Discussion: This audit highlighted an important clinical finding. By doing the first audit and disseminating its findings to relevant departments, resulted in an increase in compliance with IRMER. Some departments are now compliant with the standard whereas others are not. Hopefully, the re-audit will spur other departments to also become compliant. Presenting this audit Nationally will emphasise IRMER and improve patient safety.

P-188 10 kVp rule - an anthropomorphic pelvis phantom imaging study using a CR system: Impact on image quality and effective dose using AEC and manual mode

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Purpose: This study aims to investigate the influence of tube potential (kVp) variation in relation to perceptual image quality and effective dose for pelvis using automatic exposure control (AEC) and non-AEC in a Computed Radiography (CR) system.

Methods and materials: To determine the effects of using AEC and non-AEC by applying the 10 kVp rule in two experiments using an anthropomorphic pelvis phantom. Images were acquired using 10kVp increments (60-120kVp) for both experiments. The first experiment, based on seven AEC combinations, produced 49 images. The mean mAs from each kVp increment were used as a baseline for the second experiment producing 35 images. A total of 84 images were produced and a panel of 5 experienced observers participated for the image scoring using the 2AFC visual grading software. PCXMC software was used to estimate the effective dose.

Results: A decrease in perceptual image quality as the kVp increases was observed both in non-AEC and AEC experiments, however no significant statistical differences ($p>0.05$) were found. Image quality scores from all observers at 10 kVp increments for all mAs values using non-AEC mode demonstrates a better score up to 90kVp. Effective dose results show a statistical significant decrease ($p=0.000$) on the 75th quartile from 0.3 mSv at 60 kVp to 0.1 mSv at 120kVp when applying the 10 kVp rule in non-AEC mode.

Conclusion(s): No significant reduction in perceptual image quality is observed when increasing kVp whilst a marked and significant effective dose reduction is observed.

P-189 3 point patient ID check - Why, Who, When and What?

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Background: The purpose of this study was to assess if patients attending radiology department were being correctly identified prior to the procedure by the operator/responsible health care professional. These are mandatory and included in IRMER 2000 (procedure 5 regarding identification process).

Methodology: Prospective audit was undertaken over a 6-week period across the department. Operators were unaware and were assumed to know about ID checks from local training. 3 variables used to ID patients were name, date of birth and address. All patients should have been correctly identified using all 3 variables before commencement of procedure.

Results: A total of 154 procedures were audited from ultrasound (136/154) followed by fluoroscopy (13/154), MRI (4/154) and CT (1/154). Majority of procedures were performed by Consultants (74) followed by Sonographer (51), Registrars (24) and Radiographers (5). Only 47/154 (less than 33%) procedures had a full 3-point identification performed prior to commencement of examination with all operators falling short of required standard.

Conclusions: Positive patient identification is an innocuous but an extremely important step prior to any diagnostic examination. Failure to correctly identify a patient can have serious consequences like delay of treatment and psychological and emotional trauma to the patient. Some situations can lead to great financial burden on the institutions from improper use of resources and medico-legal proceedings. We propose regular mandatory training of all staff and a mandatory 10 second time out pre procedure led by the operator, in line with WHO safety check list for interventional procedures.

P-190 Comparing the Leeds Test Object TO.CTIQ phantom to the RMI Gammex IQ phantom

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This work is an ongoing assessment of the Leeds Test Object TO.CTIQ phantom. The purpose of this phantom is to cover as much routine level B QA within a single scan to help make CT surveys more efficient.

This phantom is therefore being assessed with two aims, firstly, do the features accurately assess the recommended parameters as per current guidance, and secondly, does phantom choice affect future survey results in terms of baseline comparisons. This assessment will compare the TO.CTIQ against an older RMI Gammex IQ phantom.

The features assessed in the Gammex are:

- Density of: PMMA, Air, Cortical bone (equivalent), Blood (equivalent)
- Resolution
- Slice thickness
- Low contrast detectability

Features in the LTO are:

- Contrast resolution of: Air, Delrin, LDPE, PTFE, and PMMA
- Line Spread Function
- Slice width
- Geometric distortion

To compare test objects both were taken to scanner surveys for a period of 6-8 months. Tests, particularly focusing on noise measurements, were carried out on both phantoms. As the 5 materials in the LTO are used to test contrast and noise, they have a much smaller diameter than the 4 materials in the Gammex. This means that Regions of Interest have to be much smaller and can give higher standard deviation as a result.

The slice profile in the LTO phantom requires a profile to be plotted and the FWHM to be found before calculating slice width. This is sometimes made more difficult by the fact some scanners do not have profile functions, or very limited functions, so images must be exported before an assessment is made. This is not always possible when there are no staff on site that use the equipment and know the correct/best way to get DICOM images off the scanner.

This is a work in progress and both phantoms will be continued to be assessed, where time allows, so conversion factors can be calculated, allowing either phantom to be used.

Other

P-191 Lymphoma - the great imitator

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Aim/objective: This poster provides a pictorial review of a selection of unusual presentations of Lymphoma on imaging. Our aim is to highlight the importance of considering Lymphoma in the differential diagnosis in a wide range of clinical presentations.

Content/relevance: Lymphoma can affect essentially all tissues in the human body producing a variety of imaging appearances. Like a number of other conditions, lymphoma is known as a “great imitator” and should be considered as a possible diagnosis in a wide range of clinical presentations. We retrospectively reviewed a selection of images demonstrating atypical presentations of Lymphoma. Lymphoma was definitively diagnosed on biopsy in all cases. In some patients, Lymphoma was considered in the differential diagnosis following imaging. However, in other cases the suggested diagnosis on imaging was a different diagnosis such as colonic cancer.

Outcome: Although the diagnosis of Lymphoma is usually suggested by widespread lymphadenopathy, we have showcased a selection of unusual presentations of Lymphoma occurring in the absence of significant lymphadenopathy. We have found that Lymphoma can manifest in many ways and can be seen to mimic different pathology. Lymphoma may present in a variety of different forms, therefore, it should be considered in the differential diagnosis of mass lesions.