Management in Radiology: Abstracts from the MIR 2011 Annual Meeting (September 29–30, Nice/FR)

European Society of Radiology (ESR)

MIR (Management in Radiology) provides a forum for education and exchange of ideas and state of the art concepts on management within Europe aimed at enhancing the contribution of Radiology to medicine. MIR addresses not only core managerial issues, but also supportive methods and techniques, especially information and communication technology. All abstracts have been presented at the MIR 2011 Annual Meeting Nice (September 29-30). MIR is a subcommittee of the Professional Organisation Committee of the European Society of Radiology (ESR).

A1 – Implementation of PACS improves communication between radiologists and referring physicians as well as their perception of patient care

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Abstract

Purpose: Clalit Health Services (CHS) is the largest HMO in Israel (3.8 million members) that comprises 11 hospitals and 1,300 outpatient clinics. In 2010, a state-of-the-art Web-deployed PACS was implemented at Meir MC as a primary site. Prior to implementation, the hospital used a CD/DVD-printer system as a storage media and a viewer. The use of a legacy DOS-based RIS was continued. Our aim was to assess the benefits of the state-of-the-art PACS implementation process on:

1. Viewing and image processing
2. Radiologists' perceptions of service
3. Referrals' perceptions of service.

Methods and materials: Two anonymous questionnaires on the PACS implementation were distributed among the hospital physicians; 18/18 radiologists (11 attending and 7 residents) responded twice (March 2010 and March 2011) to a validated 1–7 Likert scale. In addition, 71/106 clinical department staff in July 2010 and 31/52 clinical department staff in March 2011 responded to a referring physician's questionnaire. We hypothesised that cutting-edge PACS may provide better communication and teamwork between radiologists and referring physicians, which would result in an improved perception of the healthcare service provided. *Results:* We found stable referrals' satisfaction from the radiology service (5 [4, 6]; from 5 [4, 5], #7). Interaction with radiology staff (radiologists, office, radiographers) has improved (from 4 to 5 or 6 [US, paediatric radiology], #7). Referrals offered more extensive information to radiologists (4 [4, 4]; from 3 [2, 4], #5) related to the usage of PACS. Decreased redundant study requests, called by referrals {2 [2, 2.5](seldom); from: 3 [2, 4] (half the amount), #5}. Supported by the radiologists' view of redundant study requests: {2 [2, 3] (seldom), #5}. Service provided by referrals has gone up somewhat (6 [5, 6.5]; from 5.5 [5, 6], #7). It improved self-selection of appropriate radiology studies (4 [3, 4]; from: 2 [2, 3], #5). We observed decrease in verbal consultations with radiologists {3 [2, 4]; from 4 [2, 4] (most occasions), #5}. Per pathological cases it stayed unchanged (4, #5). Supported by radiologists' level of discussion versus referrals: (3 [3, 4]; from 4 [3.5, 5] #5). Satisfaction from PACS at the referring department was high (5 [4, 6], #7). The level of PACS usage at the referring department was very high (6 [5, 7], #7).

Conclusion: PACS implementation significantly improves communication and collaboration between the radiologists and referring physicians. Management of PACS implementation can be based on validated questionnaires that allow real-time monitoring of the entire process. Cautious, but decisive management of the change, together with sophisticated tools, are a key to the success. Based on our results, we are in the process of smooth implementation throughout the CHS group.

A2 – An indicator to improve imaging requisition quality. Results of a first nationwide data collection in France

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Abstract

Purpose: Requisitions for radiological examinations can assess coordination between physicians and radiologists and were shown missing important information in some series. The purpose of this study is to present the first results of a quality indicator (QI) evaluating the rate of request forms including appropriate information for radiological examinations, voluntary collected in French healthcare organisations (HCOs).

Methods and materials: The QI was elaborated by the French National Institute for Medical Research, in collaboration with the French Society of Radiology. The first generalisation took place in the second semester of 2010, and was conducted by the French National Authority for Health. Each HCO prospectively selected a random sample of 130 diagnostic exams (ultrasonography, CT scan and MRI) performed on a complete week, and ordered by physicians working within the HCO. If 130 examinations or less were performed during the week, consecutive request forms were analysed. Examinations were included for hospital wards, emergency department, and outpatients. Compliance was calculated for each HCO as the proportion of examinations where: (1) a requisition could be found, (2) including the date, (3) the location of the requester, (4) the name of the ordering physician, (5) the patient identity, (6) his/her birth date, (7) the anatomical area, (8) the clinical context, (9) the question asked by the physician. For each requisition, all the elements had to be present to achieve compliance. An average conformity rate across HCOs was calculated; each HCO's mean and 95% confidence interval was then compared with this average.

Results: From 26,511 examinations evaluated, 25,483 (96.1%) were included for the calculation of the QI, for 198 participant voluntary HCOs. The national mean compliance rate across HCOs was low (43%), and there was a wide heterogeneity across HCOs (min.=0%; max.=100%). Thirty percent of HCOs had a significantly higher rate, 34.8% had a similar rate and 35.2% had a significantly lower rate.

Requisitions were retrieved from 97.3% of examinations included. Lower-rated criteria were request date (81%) and questions asked by the physician (71%), and those best rated were patient identity (99%) and anatomical area (98%). No statistical difference in compliance was observed by imaging modality (ultrasonography=41.2%, CT scan=43.6% and MRI=44.5%), neither by type of programming (emergency=46.5%, planned=43.8%). However, there was a difference of compliance according to the type of requisitions (paper=42.2% vs computerised=55.6%), and the type of department (emergency=45.2%, wards=51%, consultation=44.3%). Administrative data were more often noted on computerised requisitions: date (92.2% vs 79.1%), location of the requester (97% vs 89.8%), ordering physician name (98% vs 86.6%).

Conclusions: Those results showed that radiology requisitions quality could be highly improved, in order to enhance coordination between physicians and radiologists. Heterogeneity of results confirms relevance of the QI, and analysis criteria can target improvement actions. The QI will remain optional, without public disclosure, since in France request forms are rarely computerised and paper request forms are rarely archived, thus precluding retrospective randomised selection. The next round will allow completing the results by trend data.

A3 – Integration of eLearning components in radiological education

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Abstract

Purpose: To meet the challenges of daily clinical work in combination with teaching and research, a comprehensive central resource for archiving content of scientific or educational interest is required. To achieve this, a multidisciplinary PACS was integrated with the teaching database MIRC and the university-wide eLearning platform ILIAS. The combination of these systems enables the user to create and deliver eLearning content in an efficient manner.

Methods and materials: In order to prepare image-based content for eLearning purposes, the digital open source teaching file system MIRC, developed by RSNA, is being used. The PACS is used as a multidisciplinary repository, where images of various modalities are stored. To facilitate the process of creating teaching files in MIRC, a software tool according to the IHE integration profile TCE was developed to serve as an interface between the clinical PACS workstation and the teaching database MIRC. It allows time-efficient creation of teaching files from within the clinical workflow. The departmental MIRC server located in the intranet is used for creation, peer review and internal use of cases. A public MIRC server connected to the internet is used to host peer-reviewed and prepared cases for access and use by students. The public digital teaching database MIRC was combined with the eLearning platform

ILIAS. Students work with ILIAS on web-based clinical cases in the course of radiological lessons, where a direct access to images in the teaching database MIRC is realised. Thereby, students can work independently on clinical cases and the procedure resembles radiological diagnosis. The MIRC-ILIAS integration was evaluated via a categorised questionnaire at the end of the radiological teaching unit.

Results: One hundred and twenty-four students participated the radiological training. Almost 80% evaluated the quality of the integration as good or very good; 84% rated the availability of a Web-based teaching database as important or very important. For improvements, more detailed legends and guided image analysis were requested by the students.

Conclusions: The integration of PACS, MIRC and ILIAS enhances creation, supply and display of image-based material in eLearning environments. The combination of eLearning components with student training can be achieved easily. Students show a high interest for such offered teaching methods. These interactive case discussions raise the interest of students for radiology as a clinical discipline and allow students more active participation within their education.

A4 – CT and MR imaging benchmarks in France

Authors: Beatrice Falise Mirat[1], François Richou[1], Frédéric Albert[2], Laurent Verzeaux[3], Elisabeth Schouman-Clayes[1]; 1) Paris/FR, 2) Roanne/FR, 3) Le Havre/FR. Corresponding author: Beatrice Falise Mirat (e-mail: beatrice.falise-mirat@anap.fr)

Abstract

Purpose: To collect comparative data on the use of CT and MRI scanners in various regions of France to appreciate the current use of the resources and to measure the provided services, especially as regards appointment delays. The study was supported by the National Agency for Performance in health centres (ANAP) and the French Society of Radiology.

Method and materials: Fourteen French regions were prospectively enrolled in the study. Regions and centres voluntarily applied. Qualitative and quantitative data were collected during 28 consecutive days in early 2010.

Results: The activity of 313 CT scanners and 182 MRI units was collected, representing half (54%) of the equipment of these regions, for a total of more than 270,000 exams. Forty to eighty percent of the indicators, according to the sites, could be extracted from the RIS. However, 29% of sites were not using a RIS. Emergency slots being excluded, the median opening time for scheduled CT and MRI scanners was 47.5 h and 57 h per week respectively, the mean occupational rate of the equipment rooms of 60.1% and 81.4% respectively, and the mean examination duration of 10 min and 20 min respectively. The mean number of examinations per unit and per week dropped from 160 for the CT scanners to 111 for MR machines. Appointment delays, emergency situations being excluded, were evaluated as regards specific clinical situations (five different for CT and MR, including one paediatric case). They varied for in-patients from 2 days (CT) to 7 days (MRI) and for out-patients from 7 days (CT) to 23 days (MRI).

Examined regions differed with both techniques. For CT: head (25%), abdomen (20%), musculoskeletal (19%), and thoracic imaging (10%). Fifty-one percent of the MR examinations were musculoskeletal imaging, including spine, and 28% brain imaging. Emergency examinations were mainly performed on CT scanners. On the other hand, the rate of scheduled, valid and ambulatory patients was far more important with MRI.

Conclusion: An inverted correlation between the number of machines and the intensity of use of equipment was observed. Situations were rather heterogeneous for the CT scanners, according to the emergencies rate and the local situation (isolated centres, second or third equipment, interventional radiology). MRI units' use appeared more homogeneously optimised, mainly dedicated to scheduled patients. The major difficulty was to get a correct timestamp of entries and departures from the scanner rooms, thus limiting the "occupation rate" indicator use in current practice.

Clinical relevance/application: This huge study provides a better knowledge of the use of equipment, with objective value for decision-making at national, regional and local levels.

A5 – Enabling inter-PACS radiology quality assurance, improvement and collaboration

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Abstract

Purpose: In several Canadian jurisdictions, radiologists have recently been under review. With its work facing increased scrutiny, the radiology community has realised that it should be proactive with regard to report quality and accuracy. Self-assessments and skills-gap analyses, carried out on an ongoing basis, could help improve overall report quality, accuracy and serve as a proactive response to publicly raised questions around radiology quality. These approaches could be enabled through a Quality Assurance and Collaboration (QAC) system implemented within healthcare networks of any size: locally within small practices and radiology departments, or at the province or country-wide level.

Methods and material: Our concept of a comprehensive and proactive QAC system required the development of

a neutral, non-PACS-specific, cross-platform suite of software applications. One of these applications was designed to enable the peer review of cases sampled automatically, or manually selected by radiologists, from any modality and/or time of day. We have used this peer review application internal to our large collaborative radiology services team. We were also requested by the Ministry of Health of one of the provinces in Canada to review all exams conducted by a radiologist over a period of 3 years. Twenty-eight radiologists reviewed 30,000 cases essentially within 3 months.

We enhanced some components of our peer review application to execute on this large-volume review:

- System enforced methodology: designed to ensure the application of a number of underlying principles such as "blind review" and agreement between at least two independent radiologists relative to a diagnosis.
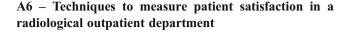- System enforced compliance: the resulting software platform then automated adherence to these principles.
- Unbiased diagnosis and review of findings: to further avoid biasing results, individual reviewers were blinded to any patterns of discrepancy findings.
- Review process consistency and quality monitoring: the process was monitored and statistics collected monthly to look for any patterns of inconsistency or for any statistically significant disagreement between adjudicators and a particular reviewer.
- Quality investigation and sampling: any indications of potential inconsistency were then investigated and, wherever indicated, the exams were re-read a third time by the quality assurance committee.

Results: The process has been customised to allow for internal review and self-assessment with rules-based automated sampling and dynamic workload distribution management.

The objectives of the project were to measure the accuracy of diagnostic results allowing identification of weaknesses that may be addressed by refresher training or mentorship and to ensure that quality diagnostic services are delivered to the patients.

In the case of significant discrepancies, the original radiologist was given the opportunity to immediately address the issue, discuss the case with colleagues, add an addendum to his report and contact the referent physician/patient in a timely fashion. All follow-up actions were tracked.

Conclusions: Enabling a sustainable, on-going, peer-review process integrated with the radiologist's local workflow adds significant value to any local, provincial or nationwide radiology collaboration and communication system, as does an active workload balancing, distribution and radiologist-controlled coverage coordination system.

A6 – Techniques to measure patient satisfaction in a radiological outpatient department

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Abstract

Purpose: To evaluate the practicability of two result-oriented measuring techniques of patient satisfaction in the routine clinical setting of a radiological outpatient department.
Methods and materials: One hundred and fifty-nine patients (55% male; 45% female; mean age, 59.3 years) were interviewed to assess their satisfaction with outpatient computed tomography (CT) examinations. At first, patients were asked to spontaneously recall notably positive and negative aspects [so-called "critical incidents", critical incident technique (CIT)] of the examination. Subsequently a flow chart containing all single steps of the whole examination procedure was shown to all patients. They were asked to point out the positive and negative aspects they perceived at each step [the so-called sequential incident technique (SIT)]. The given answers were thematically classified and both methods were compared.
Results: The interviews based on the CIT resulted in 356 (183 positive and 173 negative) statements concerning spontaneously remembered aspects of the examination process. These statements were categorised in each positive and negative category: treatment of patients by personnel ($n=$ 113, thereof 98 positive and 15 negative, $P<0.001$); workflow and organisation ($n=122$); "CT examination" ($n=66$); ambience ($n=55$). Compared with the CIT, significantly more statements were collected in the subsequent inquiry based on SIT ($P<0.001$). With SIT, overall 1,413 statements could be collected, of which significantly more were positive ($n=939$: 66%) than negative ($n=474$: 34%; $P<0.001$).
Conclusions: Both CIT and SIT, two result-oriented measuring techniques of patient satisfaction, are suitable methods to evaluate perceived patient satisfaction with radiological services such as CT examinations. Hereby, positive results confirm an already satisfactory set-up of the procedures; negative results provide precise approaches for improvements in the procedures.

A7 – Reorganising clinical radiology to respond to today's DRG requirements

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Abstract

Purpose: The clinical radiology of today has an essential impact on the quality of overall clinical care and it also contributes significantly to controlling cost. It focuses on

solving the patient's problem as early and therapy-oriented as possible by means of those modalities that do this most effectively. Internal cost allocation of radiological service to the referring clinic (ICA) does not correspond to this focus properly. The ICA, rather, is provoking diagnostic cascades to extend clinical stay, a very expensive outcome of ICA. Management of today's clinical radiology needs to monitor, for example, the productivity of medical staff, amount of orders per patient by the referring clinic, cases per patient, exams per case, multiple modality use and repeated service by the referring clinic, cost of service by modality, provision of instantaneous service to the referring clinic and, last but not least, impact on quality and cost of clinical stay. This paper provides the proper management and analytical tools to monitor the quality and outcome of radiological service with respect to controlling clinical care.

Methods and materials: Analysing data from RIS specific key operating figures, some of them mentioned under "Purpose", will be received from small, medium and large acute clinics and being benchmarked with clinics of the same category to be used to adjust today's radiological service to present clinical demand.

Results: Provision of a set of specific key operating figures (toolbox) to be used to adjust today's radiological service to present clinical demand as mentioned under "Purpose".

Conclusions: Using this set of specific key operating figures will help you to manage any clinical radiology, satisfying referring clinics as well as the general management of the clinic. The toolbox also provides answers to the questions of diversifying the radiological service and/or centralising or decentralising it.

A8 – Assessment of relevance of peer reviews of clinical reports in an academic institution

Authors: Mansoor Fatehi[1], Nabile M. Safdar[2]; 1) Tehran/IR, 2) Washington DC/US. Corresponding authors: Mansoor Fatehi (e-mail: fatehi@irsr.org)

Abstract

Purpose: In academic radiology departments where radiologists prefer to focus their clinical work on specific subspecialties, being asked to perform ACR peer-review of a study read by other sections can be frustrating and even leading to insufficient attention to details. We have tried to find out why an irrelevant review is asked from a radiologist.

Methods and materials: A total number of 32,223 reviews were retrieved from the Radpeer database, which is updated daily from the report repository of the department. The reviewers were categorised according to their section. All study types were mapped using their CPT code and assigned to one or more section(s) as relevant. Paediatric and trauma sections were excluded, since no specific criteria were available to define the relevance of review based on study type.

Results: Overall, about 22% of reviews did not match the clinical section of the reviewer. The matching percentage of reviews is higher in the neurological (81%) and thoracic (93%) sections but very low in IR (5%) and women's imaging (9%). So the success of Radpeer is very dependent on the section of reviewer since the selection of cases is based on body regions.

Conclusions: CPT codes are not always reliable for selection of relevant studies for peer review. Other data, like location of the modality and patient age, are helpful to direct the best study for review. Automated peer-review systems should be customisable to each academic institution.

A9 – Effects of irreversible image compression on specialised image processing—first results

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Abstract

Purpose: To analyse the effects of irreversible image compression (JPEG2000) on specialised image processing such as 3D volume rendering, computer-aided detection of lung nodules and functional MRI.

Methods and materials: Thirty CTA datasets (1 mm slice thickness), 30 MDCT datasets of lung exams (1 mm slice thickness) and 15 DCE-MRI studies were compressed using compression ratios of 1:8, 1:10 and 1:15. Images of 3D volume rendering were objectively compared using peak signal-to-noise ratio (PSNR) and the HDR-visual difference predictor (HDR-VDP) as well as subjectively by visual rating of two experienced readers. Lung exam datasets were analysed using a server-based CAD software and subsequently examined for false-positive and false-negative results by two experienced readers in consensus review. DCE-MRI datasets were analysed using a pharmacokinetic model and examined for differences in measurements.

Results: Neither objective comparison using the HDR-VDP nor subjective visual rating showed significant differences in 3D computed tomography angiographies using compressed and original datasets. CAD results deteriorated with increasing compression ratio with increasing numbers of false-negative and false-positive findings, reaching almost 20% for high compression ratios.

Final results on the effect of compression on DCE-MRI measurements are still pending at the time.

Conclusions: Irreversible image compression using the JPEG2000 algorithm has different effects in different specialised image processing. While it is safe with regards
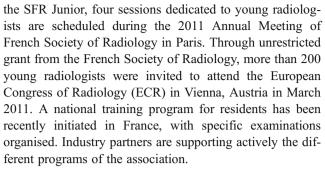
to 3D volume rendering it could have negative influence on computer-aided detection of lung nodules and functional MRI. Further studies are needed to clarify the possibilities and limitations of irreversible image compression on specialised image processing.

A 10 – Organisation of a French association representing residents and fellows

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Abstract

Introduction: UNIR was initially created in 1995 by residents from Paris hospitals under the name UIR (Union des Internes de Radiologie). Until 2007, it was an association based exclusively in Paris. The objectives of the association are to protect resident's interest, to promote education and training, to provide guidelines for training in radiology, to serve as elected representatives for better recognition of the specialty, to take part to national and subspecialty meetings. *Materials and methods:* In October 2007, the first president from outside Paris was elected and the association became nation-based. In 2008, fellows were introduced in the association. There are ten members in the bureau. One president, one general secretary, one treasurer and seven vice-presidents involved in different tasks. One member is in charge of the inter-ministerial relationship and one of the international relationships. There is one fellow representative. Because of changes in radiological practice in France, it was decided to create two positions for teleradiology and academic-private practice interactions. Every year, during the French Meeting of Radiology, the new bureau is elected. This is the opportunity to renew the members of the bureau. In order to inform all residents and fellows about the association, a newspaper entitled *Radioactif* is published and sent to all departments of radiology throughout the country. A website is used to inform members and non-members about congresses, education-specific events, jobs and positions available, news,and so on. Because of changes in the residency program, the college of French radiology teachers requested a more active involvement of the association at each step of the new program. On May 28th 2008, the French Society of Radiology decided to create a Junior Society: SFR Junior. *Results:* The association has now more recognition and is better organised. Before 2007, only a few French universities had a UNIR representative. Nowadays, we have 36 representatives (mainland and overseas territories). These representatives and the bureau form the board of the association. The association has actually 172 members compared with less than 20 in 2007. We obtained reduced rates of registration for young radiologists to attend radiology meetings. UNIR supports research for residents. With the SFR Junior, four sessions dedicated to young radiologists are scheduled during the 2011 Annual Meeting of French Society of Radiology in Paris. Through unrestricted grant from the French Society of Radiology, more than 200 young radiologists were invited to attend the European Congress of Radiology (ECR) in Vienna, Austria in March 2011. A national training program for residents has been recently initiated in France, with specific examinations organised. Industry partners are supporting actively the different programs of the association. *Discussion:* The aim of the association is to enrol more active members and to have more fellows. With the growth of the association, more motivated board members will be necessary and we should think of a different organisation, to be more efficient.

A11 – Hypnotic analgesia as a new tool in medical imaging

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Abstract

Purpose: To improve the patient's well-being during diagnostic examinations and interventional procedures. To enable a new approach for paediatric exams. To provide the staff with a new solution for decreasing stress and managing patient pain. *Methods and materials:* Four radiographers and one radiologist attended a 7-day internal training on hypnotic analgesia in an interdisciplinary environment. This new approach, using a very different language, was implemented in the imaging department, mainly in breast interventional imaging and ultrasonography. The experiment was progressively extended to the other staff members. *Results:* This method was implemented without additional expenses. Staff members had the opportunity to question their own verbal and physical communication. Having a better apprehension of patient and family handling, the staff got more self-confidence in difficult situations. The patient stress during imaging examination was reduced. *Conclusions:* Hypnotic analgesia has proved to be very useful in daily practice. For full achievement of the technique, training of the whole staff (radiographers, radiologists, secretaries) is appropriate, in order to offer the patient a coherent approach during his imaging exam.

A12 – Evaluation of pulmonary nodules on chest CT using iPad2®: preliminary experience

Authors: Lorenzo Faggioni, Emanuele Neri, Paola Sbragia, Simone Angeli, Lorenzo Cini, Dario Luca Lauretti, Davide Caramella, Carlo Bartolozzi; Pisa/IT. Corresponding author: Lorenzo Faggioni (e-mail: lfaggioni@sirm.org).

Abstract

Purpose: Open source software (such as OsiriX) and new, powerful mobile devices have become available that allow the display of a large amount of medical images from several imaging modalities without the need for dedicated stand-alone workstations. Our purpose was to evaluate the effectiveness of the iPad2® as a mobile device for 2D reading of chest CT datasets for the assessment of pulmonary nodules.

Methods and materials: We retrospectively reviewed 28 chest CT examinations performed in patients with pulmonary nodules, for a total of 325 nodules sized between 2 mm and 34 mm. CTC images had been acquired using a 64-row CT and were wirelessly imported in DICOM format on an iPad2® 64 GB (Apple, Cupertino, CA) running OsiriX HD® (www.osirix-viewer.com) from a Macintosh desktop computer (iMac® 3.06 GHz) connected to our hospital PACS and running OsiriX 3.9. Two experienced raters read CTC datasets independently on the iMac® and on the iPad2®. Detection rate and segmental localisation of lesions were recorded for each dataset, as well as the time needed for complete reading of each chest CT examination. Image quality was also visually assessed using a three-point scale (1=poor, 2=fair, 3=good).

Results: All nodules detected on the iMac® were also identified on the iPad2®, and their segmental localisation was correctly assessed in 100% of cases. Image quality was good with both devices and image-reading time was comparable between them (4.72 ± 2.23 min for the iMac® vs 5.14 ± 2.56 min for the iPad2®; $P>0.05$).

Conclusions: The iPad2® can be successfully used for 2D reading of chest CT datasets in patients with pulmonary nodules. Image reading is relatively fast, supporting the hypothesis that the iPad2® could be reliably used for preliminary visualisation of lung nodules. The iPad2® may also find a role for image sharing with non-radiology specialists and for teaching purposes.

A13 – Usage of the iPad2® for preliminary 2D reading of CT colonography studies: preliminary experience

Authors: Lorenzo Faggioni, Emanuele Neri, Simone Angeli, Lorenzo Cini, Eugenia Picano, Davide Caramella, Carlo Bartolozzi; Pisa/IT. Corresponding author: Lorenzo Faggioni (lfaggioni@sirm.org).

Abstract

Purpose: Open-source software (such as OsiriX) and new, powerful mobile devices have become available that allow the display of a large amount of medical images from several imaging modalities without the need for dedicated stand-alone workstations. Our purpose was to evaluate the effectiveness of the iPad2® as a mobile device for 2D reading of CT colonography (CTC) datasets.

Methods and materials: We retrospectively reviewed 29 CTC examinations performed in a colorectal cancer screening setting, for a total of 53 polyps sized between 5 mm and 24 mm. CTC images had been acquired in the supine and prone positions using a low radiation dose and a fecal tagging protocol based on oral administration of iodinated contrast material. All datasets were wirelessly imported in DICOM format on an iPad2® 64 GB (Apple, Cupertino, CA) running OsiriX HD® (www.osirix-viewer.com) from a Macintosh desktop computer (iMac® 3.06 GHz) connected to our hospital PACS and running OsiriX 3.9. Two experienced raters read CTC datasets independently on the iMac® and on the iPad2®. Detection rate and segmental localisation of lesions were recorded for each CTC dataset, as well as the time needed for complete reading of each CTC examination. Image quality was also visually assessed using a three-point scale (1=poor, 2=fair, 3=good).

Results: All lesions detected on the iMac® were also identified on the iPad®, and their segmental localisation was correctly assessed in 100% of cases. Image quality was good with both devices, while image reading time was longer on the iPad2® than on the iMac® (6.17 ± 2.31 vs 4.03 ± 2.17 min, respectively [mean±standard deviation], $P<0.05$). This latter circumstance suggests that the iPad2® is suitable for preliminary 2D reading, rather than for primary reporting of CTC examinations.

Conclusions: The iPad2® allows the display of all colonic lesions detected on the iMac® with high image quality, at the expense of a longer image reading time that makes it more suitable for preliminary 2D reading than for primary reporting of CTC examinations. In this context, the iPad® may also find a role for image sharing with non-radiology specialists and for teaching purposes. Limitations of 2D reading should be overcome by the introduction of software with 3D tools.

A14 – Usage of the iPad2® for preliminary 2D reading of CT pulmonary angiography studies: preliminary experience

Authors: Lorenzo Faggioni, Emanuele Neri, Paola Sbragia, Rachele Pascale, Dario Luca Lauretti, Carlo Bartolozzi; Pisa/IT. Corresponding author: Lorenzo Faggioni (e-mail: lfaggioni@sirm.org).

Abstract

Purpose: Open source software (such as OsiriX) and new, powerful mobile devices have become available, that allow the display of a large amount of medical images from several imaging modalities without the need for dedicated stand-alone workstations. Our purpose was to evaluate the effectiveness of the iPad2® as a mobile device for 2D reading of CT pulmonary angiography (CTPA) datasets.

Methods and materials: We retrospectively reviewed 52 CTPA examinations performed in non-obese patients with a history of lung carcinoma and suspected acute pulmonary embolism. CTPA examinations had been performed on a 64-row CT scanner using a low radiation dose (80 kV tube voltage) protocol. All datasets were wirelessly imported in DICOM format into an iPad2® 64 GB (Apple, Cupertino, CA) running OsiriX HD® (www.osirix-viewer.com) from a Macintosh desktop computer (iMac® 3.06 GHz) connected to our hospital PACS and running OsiriX 3.9. Two raters experienced in chest radiology read CTPA datasets independently on the iMac® and on the iPad2®. Considering the iMac® as the "gold standard", the rate of detection and correct localisation of pulmonary emboli on the iPad® was recorded.

Results: All pulmonary emboli detected on the iMac® were also identified on the iPad2® and their segmental location was correctly assessed in 100% of cases down to subsegmental level. The time needed for 2D reading of CTPA datasets was not significantly different using the iMac® and the iPad2® ($P > 0.05$).

Conclusions: The iPad2® can be successfully used for 2D reading of CTPA datasets, as all pulmonary emboli detected on the iMac® were found and correctly localised on it. These data suggest that the iPad2® can be helpful for 2D reading of CTPA examinations in those situations in which usage of a workstation is impossible or impractical, such as for sharing CTPA images with clinicians in an emergency setting. In this latter scenario, the iPad2® may provide fast but accurate information about the presence and extent of pulmonary embolism, as well as about CT signs of acute right heart failure.
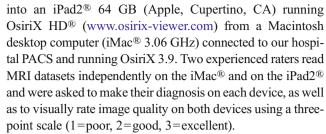
A15 – Usage of the iPad2® for preliminary 2D reading of musculoskeletal MRI studies: preliminary experience

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Abstract

Purpose: Open source software (such as OsiriX) and new, powerful mobile devices have become available that allow the display of a large amount of medical images from several imaging modalities without the need for dedicated stand-alone workstations. Our purpose was to evaluate the effectiveness of the iPad2® as a mobile device for 2D reading of musculoskeletal MRI datasets.

Methods and materials: We retrospectively reviewed 20 MRI examinations of the musculoskeletal system, including nine knee, three shoulder, four ankle, and four spine MRIs. All datasets were wirelessly imported in DICOM format into an iPad2® 64 GB (Apple, Cupertino, CA) running OsiriX HD® (www.osirix-viewer.com) from a Macintosh desktop computer (iMac® 3.06 GHz) connected to our hospital PACS and running OsiriX 3.9. Two experienced raters read MRI datasets independently on the iMac® and on the iPad2® and were asked to make their diagnosis on each device, as well as to visually rate image quality on both devices using a three-point scale (1=poor, 2=good, 3=excellent).

Results: Inter-rater agreement about diagnosis on both devices was 100%. Image quality was deemed good to excellent with both the iMac® and the iPad2® without any significant difference between them ($P > 0.05$). However, the time needed to completely read MRI examinations was significantly longer on the iPad2® than on the iMac® (14.37 ± 3.71 vs 8.52 ± 2.45 min [mean±standard deviation], $P < 0.01$), suggesting that the iPad2® is more suitable for preliminary 2D reading and image sharing rather than for primary evaluation of musculoskeletal MRI studies.

Conclusions: The iPad2® can be successfully used for preliminary 2D reading of musculoskeletal MRI datasets, as readers were able to correctly make their diagnosis on both devices. The iPad2® could also be used for image sharing of musculoskeletal MRI images with other specialists (including those outside the radiological area) and for teaching purposes.

A16 – Lifelong learning in radiology: how self–directed and goal-oriented are we?

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Abstract

Lifelong learning is critical to radiology and the method by which, as professionals, we have kept up to date on new knowledge and developments. Future technologies and scientific discoveries affect radiology and make the commitment to lifelong learning even more critical.

Purpose: To estimate how self-directed and goal-oriented are diagnostic radiologists in formal learning processes (in postgraduate courses).

Methods and materials: Multi-questionnaire multiple-choice surveys were created and anonymous surveys given to 65 specialists of diagnostic radiology who attended different postgraduate courses. Results were processed by the SPSS 11.5 statistical program.

Results: Sixty-five surveys were reviewed. Satisfaction with the specialty was ascertained. Reasons for lifelong learning were: to improve qualification (42%), to improve skills (23%), to have better self-confidence (21%), to improve quality of medicine in the country (8%) and to improve the level of clinic or hospital where a doctor is working

(6%). Reasons for postgraduate education were: to have the newest information in the field (32%), to improve qualification (27%), to have new skills (18%), to have a better position in the clinic (11%), to have a better salary (7%), but 5% as reason named ordinance from a head of department or clinic. The strongest correlation was solved: specialists who were unsatisfied with the specialty could not answer about lifelong learning activities (they do not know the reason why and what to learn). Those radiologist who named a better salary or better position in the clinic as the main reason to learn were more oriented to improve skills in team-working.

Conclusion: A level of satisfaction in the specialty and purposes of learning activities in postgraduates indicate successfulness in lifelong learning processes. Adult learning theories have to be researched in real working life.

A17 – Practical use of the teleradiology in a liberal exercise basin of a geographically limited population (organisation and constraints)

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Abstract

Purpose: We are a team of 14 exclusive liberal electro-radiologists, working in three clinics and two city offices, with access to three scanners and three MRI scanners. We have covered a total basin population of 400,000 inhabitants for 5 years, and have implemented a picture archiving and communications system (PACS) in each entity which provides intercommunication via the SDL network and dedicated lines of France Telecom. We look at data from more than a 1,000 patients daily and all files are archived (DICOM, then WAVELET).

Methods: At each site, the files are searchable and comparisons made. The consistent use of the system allows for off-site data interpretations, permanent care and TV expertise.

Conclusions: We are currently tacking the following:

- Finding solutions to improve the flow (currently ADSL to 4 MVB or even 8 MB): deployment of network wireless versus optical fibre.

- Public access to hospital structures which should allow for more transparency in administrative and/or political problems.

A18 – Service management in a radiology department with the ServiceBlueprint model

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Abstract

Purpose: To describe the ServiceBlueprint model as a suitable method of service management in the routine clinical setting of a radiological department.

Methods and material: ServiceBlueprinting is a concept for the analysis, visualisation, and optimisation of service processes. To investigate whether the model will also provide a suitable representation of medical services, particularly the provision of radiological services; ServiceBlueprints were created for two imaging modalities, computed tomography (CT) and ultrasound (US). To this end, an independent observer analysed 40 CT and 40 US examinations at the radiology department of a university hospital.

Results: The ServiceBlueprint provided an analysis of the status quo of the service processes in both imaging modalities. Weak points in the processes thus became immediately apparent. The model could also be used for personnel management in that it helped to define the roles of staff members from different categories in the value-added process. It served as a basis for the implementation of quality management systems according to total quality management (TQM) and DIN-EN-ISO-9001:2000.

Conclusion: The ServiceBlueprint model is a service management concept that has a multifarious potential in process optimisation, implementation of quality management systems, and human resources management.

Clinical implication: The use of the ServiceBlueprints model is beneficial in the routine clinical setting of a radiological department to visualise and improve examination processes.