A Regional Approach to Musculoskeletal and Trauma Teaching Using a Simulation Centre and Network

Poster No.: P-0144
Congress: ESSR 2015
Type: Educational Poster
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Keywords: eHealth, Trauma, Musculoskeletal bone, Plain radiographic studies, CT, MR, Computer Applications-General
DOI: 10.1594/essr2015/P-0144

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Learning objectives

Improve musculoskeletal and trauma training across the North East of England using a combination of a dedicated simulation suite and a regional network of computers running Osirix.
Background

It has been recognised that the increasing pressures of radiological workload are causing radiology departments to constantly evolve their ways of working and training.\(^1\) This is further compounded by the fact that the U.K. has the second lowest number of radiologists per head of population in Western Europe (4.6 per 100,000). Furthermore, there is unlikely to be a large increase in this number of radiologists in the near future due to the relatively modest increases in training numbers occurring across the country.

Within the North East of England School of Radiology it was felt that one way of evolving our training was through the use of simulation. This could be carried out using a regional validated case archive located within a dedicated simulation suite and linked to training departments.

Although there is evidence of excellent training in individual departments throughout the region, duplication occurs. This includes both the time taken to train and the material used for teaching itself. This in itself is inefficient and increases pressures on already busy departments. A validated case archive helps circumvent this issue by having a central repository of images that can be called upon in any teaching centre to aid with training. A further advantage of a validated case archive covering the entire radiology syllabus is that all trainees should, over the course of their training, be exposed to all of the pathologies within the syllabus as outlined by the Royal College of Radiologists.

Since the advent of Picture Archiving and Communication Systems (PACS) it has been possible to save and archive packets of images with educational themes. Unfortunately the cost of implementing a dedicated region wide PACS training network has until recently been prohibitive. Osirix, a PACS system, running on Apple computers provides a low cost flexible alternative. This system can be deployed relatively cheaply across a region and easily create a dedicated PACS network for training.
A dedicated simulation suite has been established at the University Hospital of North Durham (UHND), in the geographical center of the region (see figure 1). This contains an Osirix PACS server from which 12 retina Apple iMacs run. Each iMac workstation has a 27-inch high resolution, 14.7 million pixel display, allowing for adequate interpretation of both cross sectional and plain film studies (see figure 2). The overall cost for the project was £60,000. This included both the hardware, construction and outfitting of the room housing the main hub at UHND. The cost, without a bulk order discount, for each workstation is £1999 (inc. VAT). The server is a MacPro desktop workstation, with a 20 Terabyte server grade hard disk attached, running in a RAID 5 configuration, giving a usable 15 Terabytes for the validated case archive. Structuring the server in this way allows for rapid data access but also data back up on the same volume. The cost of the server and hard disk comes to £4080. The whole central facility is run over a gigabit Ethernet network, with an external 10Mbps internet connection, both of which have been provided by UHND. A further 20 Terabyte hard disk is stored offsite in case of fire or theft, to maximize data protection. We have also secured the use of a 55inch TV display and WACOM touch screen for demonstrating subtle pathology such as fractures in trauma reporting. The centre was opened on November 24th 2014 by the President of the Royal College of Radiologists Dr. Giles Maskell (see figures 3 & 4). Two further hubs have been created at the Royal Victoria Infirmary in Newcastle (12 iMac workstations) and James Cook University Hospital in Middleborough (4 iMac workstations) and additionally each training department within the region has been given its own workstation.

At each site the iMac workstation is integrated into the local PACS system to allow transferring of the local teaching cases. This is done via the industry standard protocols built into both Osirix and most modern PACS solutions. These cases are then put through a custom anonymisation protocol, specific for that site and PACS system. This removes all DICOM metadata pertaining to the identity of the patient concerned, including name, date of birth, hospital numbers and referring clinician. This has the advantage that across the network there are no cases containing patient identifiable information.

This hub and spoke approach allows each training unit to contribute cases to a central case archive, which is accessible to trainees across the region. Currently this is achieved through the use of 128 bit encrypted hard disks, which physically transfer the already anonymised data between the peripheral centres and central archive. In future it is hoped that a means of cloud storage will allow for remote access of the database not only from departments across the region but also from an individual trainees home. This concept, however, is more difficult to achieve due to the firewalls and data protection regulations that exist within the NHS information technology environment.
With the support of Health Education North East, we have also recruited a clinical fellow to help push forward this project. This post, which includes 5 sessions of clinical work a week and 5 sessions devoted to the project, is aimed at coordinating and educating the trainers and trainees within the region to enable maximal impact, within the shortest time possible. As part of this year the trainee will also undertake a Postgraduate Certificate of Education to allow for further educational development.

This approach has allowed for the creation of packets of learning specifically targeted to critical points of the musculoskeletal training program. These include packets of trauma reporting that can be used to train first year registrars and reporting radiographers in the initial identification of common trauma pathologies. More advanced trauma packets have been created specifically for the FRCR 2B examination. Furthermore the simulation centre is becoming the focal point for the delivery of the musculoskeletal teaching program provided to the junior registrars, this allows both the didactic components of the course and interactive / assessment components to be delivered in the same location. The use of Osirix with local and regional packets of learning has also allowed us to begin training other healthcare professionals. For example, at the Royal Victoria Infirmary we have started an interesting cases meeting with the reporting radiographers, creating a library of cases specific to them that can be reviewed in privacy or as part of a larger teaching group. We have found the flexibility of the system to be impressive and plan to explore other ways of learning such as a formalised discrepancy meeting library and integration with musculoskeletal e-learning for health modules.
**Fig. 1:** Northern Osirix Network

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Fig. 2: Radiology Simulation Centre

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Fig. 3: Opening of Simulation Centre by Dr. Giles Maskell RCR President and Dr. Richard Cooper Head of Northern School of Radiology

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Fig. 4: Simulation Centre demonstration.

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Conclusion

The increasing pressures on all radiology departments have resulted in the need for increased efficiencies in how service and training are delivered. We have undertaken to achieve this by increasing the use of simulation training within our region within both local departments and in a dedicated regional simulation centre. Our primary objectives are to create a validated case archive that reflects the entire radiology syllabus, that is easily accessible across the region and will allow us to maintain the high standard of training offered to both radiologists and non-radiologists alike. In our experience an integrated, collaborative, regional approach to training using a simulation centre and regional network shows enormous potential for helping to deliver these objectives.
References

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