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1. ACUTE STROKE

1.1. CT imaging of acute ischemic stroke

**Presenter:** Ulla Nikupauvo, HUS Medical Imaging Center, Helsinki University Central Hospital, Finland  
**Author:** Ulla Nikupauvo

**Introduction:** Stroke is the most common cause of disability in adults and the second leading cause of death in Finland. In the next two decades, an aging population will double the amount of strokes. Recanalization of the occluded artery and thus limiting the duration of ischemia is the only clinically verified method to minimize the infarct. Fast recanalization lowers the mortality rate and gives a better outcome for the patient. The most significant treatment for acute ischemic stroke is intra-venous thrombolysis (Actilyse) administered no later than 4.5 hours after the symptoms have started. The 4.5 hour time window has raised a demand for better detection and evaluation of an acute ischemic stroke. The imaging choice is generally non-contrast computed tomography (NCCT), since computed tomography (CT) is fast and widely available here. CT protocol for acute ischemic stroke patient includes three phases: NCCT, perfusion CT and CT-angiography (CTA). This protocol provides quantitative and qualitative information of cerebral vasculature. For this type of analysis, multidetector CT (MDCT) and an advanced workstation with proper options is needed. Fast recanalization predicts a better outcome for the patient. The duration of symptoms is therefore vital. By locating, organizing and training the CT emergency department correctly, the time from stroke onset to CT imaging and thrombolysis can be shortened significantly. For years, this has been a priority in Meilahti hospital, Helsinki. After the CT emergency department is notified, patient is brought straight from the ambulance into the CT scan room.

**Methods:** The most important role of NCCT is to rule out conindications such as haemorrhage before the iv-thrombolysis. Perfusion CT provides information of tissue at risk and tissue already destroyed via functional maps: cerebral blood flow, blood volume and mean transit time. CTA shows the location of possible vessel occlusion and verifies its ethiology. If intra-arterial thrombolysis or a mechanical thrombectomy is planned, CTA provides information about arterial anatomy.

**Conclusion/results:** When iv-thrombolysis is considered for a patient with acute ischemic stroke, CT scan is the basic imaging method in Finland. A fast, trained system to treat the patient is vital for minimal ischemic damage to the brain. Imaging is an important part of this chain and the radiographer has an important role to ensure fast imaging with all the right imaging protocols.

1.2. Magnetic resonance imaging in acute stroke

**Presenter:** David Ricardo Danger, HUS Medical Imaging Center, Mobile Imaging, Helsinki University Central Hospital, Finland  
**Author:** David Ricardo Danger

**Background:** The diagnostic tool of acute ischemic stroke is computed tomography with non-contrast (CT). Recently MRI has been used in young patients; MRI has made great progress recently. Imaging times have shortened, resolution and signal-to-noise ratios have improved, and new imaging sequences have been developed. In the acute ischemic stroke, CT images are often normal or show subtle changes only. On the contrary, diffusion-weighted MRI (DWI) can reveal the ischemic lesion in its full extent within minutes; our department have been using DWI procedure as a primary series on the acute ischemic diagnostic follow by PWI and MRA in some cases. However access to MRI scanners is limited both during daytime (overbooked) and, also a few percent of all patients cannot be imaged with MRI because of claustrophobia. Furthermore, some patients have pacemakers (Patients using Pacemaker can be screening in our department, but should be inspected by a radiologist and physics specialist previous the examination.), aneurysm clips, or other ferromagnetic material in their bodies and cannot be safely imaged with MRI.

**Teaching points:** The objective of this clinical presentation is review the use of the DWI and PWI in the acute stroke patients as well as issues concerning the patient and staff safety in our department, underline the radiographer role on the this process, to obtain as soon as possible and on a very safe environment quality images.

**Methods:** Our method was based on the monitoring of patients during the onset-door-needle process in our institution. Over a period of one year.

**Summary:** In conclusion, MRI is increasingly used in the imaging of acute stroke patients, and this trend is welcome. Overall, MRI is diagnosically superior to CT for cerebrovascular indications, but is contraindicated in ≤10% of patients, has limited availability at many hospitals, and can be costly and time-consuming, however the use of PWI and DWI has shown high positive results in the diagnostic evaluation of suspected stroke patients and that is why the radiographer should recognize the use and misuse of these techniques to obtain quality imaging and thus accurate diagnostic.

1.3. Mechanical thrombectomy with acute ischemic stroke patients in the angio suite

**Presenter:** Raisa Simula, HUS Medical Imaging Center, Helsinki University Central Hospital, Finland  
**Authors:** Raisa Simula, Marjut Tenhola, HUS-Medical Imaging Center

**Introduction:** In Meilahti hospital Helsinki, around 50 mechanical thrombectomies (MET) are performed yearly on acute ischemic stroke patients. Working in this procedure can be demanding: it requires efficiency, precision and good interpersonal skills from the radiographer. MET is performed in an angiography suite (Meilahti has 3), where the patient is brought right after a CT-scan. This procedure is prioritized: one angio suite will be kept vacant or an ongoing procedure will be aborted for this. Quick and efficient recanalization can predict good recovery for the patient. As the patient arrives, at least 2 radiographers are needed: one in sterile outfit assisting the radiologist performing MET by preparing and handling the instruments and one who documents the procedure and brings in more equipment. Patient arriving will have at least a nurse and a neurologist arriving with them, also an anaesthesia team if required. It’s the radiographer’s responsibility to ensure everyone is properly protected from radiation. Also, flow of information between everyone is highly important. The procedure starts as the radiologist uses local anaesthesia on the patient’s groin area, then punctures the a. femoralis communis. Through this puncture patient’s a. carotis interna or a. vertebralis will be catheterized. Next, a Digital Subtraction Angiography (DSA) is performed to locate the thrombosis. In Meilahti, removing of the thrombosis will be done with a stent-type device. Instruments and devices used in MET are very long and often difficult to handle. Preparing them requires skill from the radiographer.

**Methods:** This presentation shows how important a radiographer’s role is when performing MET. Key points are efficiency, precision, collaboration with other professionals as well as in-depth understanding of a radiographers role.

**Conclusion/results:** In the future more MET will be performed on acute ischemic stroke patients and more radiographers will be working in this procedure. MET requires collaboration between different professionals. A radiographer is responsible for radiation protection and co-ordinating the medical staff together with the radiologist. Radiographers also perform the DSA-imaging instructed by the radiologist as well as gather and handle the instruments needed.

2. BREAST IMAGING

2.1. A Nigerian Hospital Experience in Breast Imaging

**Presenter:** Mosunmola Oyinade Okedayo, Radiology Department, University of Maiduguri Teaching Hospital, Maiduguri, Borno state, Nigeria  
**Authors:** Mosunmola Oyinade Okedayo, Z. Mustapha, M. Ameadaji, M. Yusuf

**Introduction:** Over the past few decades, in many developed countries, the use of evidence from well conducted, reproducible research studies has been encouraged as basis on which clinical decisions and interventional procedures in healthcare are based. This is termed evidence based practice (EBP). However, Nigeria, like most developing countries, is unable to implement full scale EBP due to inaccessibility to good research evidence, lack of adequate government funding, appropriate staff and patient enlightenment deficit. Globally, breast cancer is the second most common cause of deaths in females. Although its incidence is on the increase among Nigeria women, breast care awareness and interventions are still led to non- governmental organizations and the management
boards of hospitals to institute as there is no national policy on it yet. The Radiology department (mammography unit) of the University of Maiduguri Teaching Hospital installed a GE Senographe DMR (with stereotaxic attachment) and GE LOGIQ ultrasonography machine (with linear probe 12MHz), in 2007. The hospital constituted a multi-disciplinary team (MDT), consisting of the relevant professionals who all have breast care sub-specialty training and are licensed by the relevant local professional regulatory bodies which formulate policies and guidelines for the relevant interventions. They develop the hospital breast care protocol to ensure that the best patient outcome is achieved. This retrospective study is aimed at assessing and documenting the contribution of the breast imaging unit to early detection and best available intervention as a means of evidence based practice.

Methods: The data of all the females imaged at our facility from 2010 to 2013 were reviewed and analyzed. All patients from age 35 had mammograms, while symptomatic patients below the age of 35 years start with sono-mammograms. All masses were biopsied.

Results: A total of 913 females were seen during the study period: Screening 612 (67%), diagnostic 301(33%). Total malignancy detected were 54(6.3%): Screening 8(1.3%), diagnostic 46(15.2%). Nine patients below 35 years had cancer Correlating histological and multi-imaging results has yielded more accurate diagnosis. This study showed a high rate of incidence of malignancy, late presentation and a number of women under 35 years having cancer suggesting that breast care need urgent focus in this locality.

2.2. Breast Diagnosis and Pathology. The Consultant Mammographer's view

Introduction: The journey to become a Consultant Mammographer takes many years to complete, and from qualifying as a basic grade radiographer it can take as long as 10 years, longer for some, to obtain the necessary skills and qualification. The clinical skills, known as core modules, include breast examination and client communication, film reading, breast ultrasound, and breast interventional. They are all academically very challenging to obtain, each module taking approximately one year to complete. The radiographer will quite often be known as an Advanced Practitioner during part of this phase. Completing a Master's Degree and undertaking Research should result in the title of a Consultant Radiographer. A very large volume of work is required to be covered, and this can lead to moments of 'high's' as well as 'low's'. Audit and Research are also subjects that a Consultant Radiographer should be involved in, and are tools that can be used to improve the service. This is by identifying and managing any emerging trends. The result of this can help the Consultant Radiographer to instigate a change in practice, and help improve the patient pathway. Although support may be given from some clinical staff, it is not always given by all. However, with the demand for breast services increasing, the role of the Consultant Radiographer is showing to be more useful in that they can help reduce the clinical workload; working within a clinical setting, and having complete autonomy over the running of a breast clinic helps a busy breast unit on a daily, and weekly basis.

Methods: A Power point presentation showing interesting, and up-to-date, case studies to illustrate the role of the Consultant Mammographer, and how this role can be beneficial within a clinical setting.

Results: Many attributes are required to be successful to gain this role, including determination, motivation, time, and support- and this is not always given. And- despite the best of intentions-, things will sometimes go wrong in a clinical setting- as illustrated in the final case study illustrating a Wire Localization. The number of Consultant Radiographers within the UK is growing, (currently approx. ) but there is still room for many more.

2.3. A proposed training program to support an extended scope of practice for South African mammographers

Introduction: Breast imaging is vital in detecting breast cancer but a shortage of radiologists in the public sector in South Africa contributes to a sub-optimal breast imaging service. Whereas numerous tactics can address the radiologist shortage, this research focuses on developing the professional skills of mammographers to enable them to carry part of the workload of radiologists. Mammographers, already breast imaging specialists in terms of the production of x-ray images, are the logical choice for such development due to their existing base of knowledge in the field. The research question underpinning this study is “What training is needed to extend the mammographer scope of practice in South Africa in terms of breast ultrasound and breast image interpretation?” The aim of the study is to develop, clinically implement, test and refine a training program to equip South African mammographers with breast ultrasound and -image interpretation skills. Currently, South African mammographers are limited by their professional scope of practice to perform only conventional breast x-ray imaging. The developed training program will be underpinned by research evidence and subjected to cycles of refinement in order to present to the Health Professions Council of South Africa (HPCSA) as the first step on the way to extend the professional scope of practice of mammographers. International guidance is taken from the Breast Health Global Initiative who identifies best practices with limited resources in breast health care, as well as the United Kingdom, who played a leading role in mammographer role extension over the past 30 years.

Methods: The study is innovative, exploratory and follows a development research design. Qualitative methods address existing training, formative expert- and post-training feedback. Quantitative data indicates pre- and post-training knowledge.

Results: Anticipated results will be discussed by referring to literature and global trends. In South Africa, breast imaging needs exist mainly in the public sector. However, implementation of the proposed National Health Insurance could further increase the demand in the public sector and affect the availability of radiologists in the private sector. A proactive response to this possible increased pressure would be a multi-skilled mammographer who can perform some functions of a radiologist.

2.4. An Appraisal of Male Breast Imaging- our experience

Introduction: Males are affected by both benign and malignant breast lesions as females, although at a lower frequency. Unlike in the developed countries, Nigeria, like many other developing countries, has no national policy to tackle the scourge of breast cancer. Inadequate public awareness about the role of early detection as a means of reducing morbidity and mortality has not helped in alleviating its increasing burden on the populace. Studies have documented that the incidences of breast cancer is on the increase in the sub-Saharan Africa and about 1% of it affects the males. Gynecomastia and cancer are the commonest lesions affecting the male breast, the former being the most frequent. The patients usually present with history of pain, tenderness and swelling of the breast either bilateral or unilateral. A study on breast malignancies from 1989-2003 in our hospital, showed incidence of male breast cancer to be 3.7% (male to female ratio 1:26), while another study in the same hospital from 2001 to 2005 reported 4.7% of breast cancers were in males (male to female ratio 1:20). They all presented at the hospital at an advanced stage and all occurred pre mammography unit installation. This hospital established a mammography unit with GE Senographe DMR equipment with stereotaxic attachment and GE LOGIQ sono equipment (with linear probe 12MHz) in 2007. A multidisciplinary breast care team (MDT) was constituted to create awareness and formulate policies and breast care protocol for interventions. This retrospective study is aimed at determining and illustrating the pattern of findings among the male patients who attended our mammography facility from installation to date.

Methods: Data of all the ten males who were imaged at the mammography unit of our hospital from September 2007 to December 2013 were retrospectively reviewed and analyzed. Nine had mammograms; all had sonomammograms, while six of them had a core biopsy.

Results: The ten males (mean age 31.1 ± 13. Age range 14-58years), were all diagnosed with benign findings: True gynecomastia 7(70%), acute mastitis1 (10%), pseudo gynecomastia 2 (20%). No case of malignancy was seen Gynecomastia is the most common finding amongst the males in this study. Our protocol of multi-imaging and correlating with histological results has helped in more accurate diagnosis.
3. CT IMAGING

3.1. Best single slice to measure visceral adipose tissue in children

Presenter: Michelle O’Connor, University College Dublin, Ireland
Authors: Michelle O’Connor, John Ryan, Shane Foley

Introduction: Childhood obesity has reached epidemic proportions in Europe. It is now the most prevalent childhood disease. The World Health Organization estimated that over 42 million children worldwide were overweight in 2010. Abdominal obesity is highly prevalent in children. Abdominal adipose tissue can be characterized as subcutaneous or visceral adipose tissue based on its location in the abdomen. Visceral adipose tissue surrounds internal organs in the abdominal cavity. Excessive visceral adipose tissue (VAT) is a significant risk factor for insulin resistance, metabolic syndrome, cardiovascular disease and diabetes. VAT is related to these medical conditions through blood drainage, hormonal factors, inflammation and adipocytokines. Quantifying VAT in children will have a major impact on the early identification of children at elevated health risk and will aid prioritization of health care resources. While the optimal CT single slice location for measuring VAT has been widely investigated in adults, it has yet to be investigated in children. This study investigates 1) the optimal single CT slice location for predicting total abdominal VAT volume in paediatrics and 2) the relations between anthropometric measurements, gender, age and VAT volume.

Methods: A random sample of abdominal CTs were stratified by age and gender. VAT area was measured at each intervertebral level and correlated to total VAT volume. Waist circumference, sagittal diameter, age and gender were evaluated as VAT volume predictors.

Results: The mean abdominal VAT volume was highest in females aged 12-16 years and in males aged 9-12 years. Pubertal weight gain, growth spurs, diet and physical activity level may have attributed to these differences. VAT area at L2-L3 correlated best to overall VAT volume in females and in males 6 years. Regression between WC, SD, age, gender and VAT volume showed that waist circumference was most predictive of VAT volume.(Beta=0.970, p<0.001).

3.2. Role of MDCT In Perfusion Hepatocellular Carcinoma- Newer Technique

Presenter: Lalit Kumar Gupta, Post Graduate Institute Of Medical Education And Research, Chandigarh-India
Authors: Kaival Navyeon, Kartik G., Bansal S.C., Khandelwal N.

Introduction: Hepatocellular Carcinoma (HCC) is the most common liver cancer in India. Multi detector Computed tomography (MDCT) with perfusion imaging is a newer application in which a quantitative map of tissue perfusion is created from dynamic data and displayed using a color scale, allowing quantification of perfusion in absolute units at high spatial resolution. A dynamic study of the selected area of liver is performed in shallow breathing technique. A total of 50 mL of non-ionic iodinated contrast is injected and data is acquired and processed with Body volume perfusion CT (BPVCT) software. Functional maps of BF, TTP, BV, MTT are generated.

Methods: The following parameters. KV: 100, mAs: 150, Slice thickness: 1.5mm, No of scan: 20, no. of image: 2440, exam time: 59.48 sec, Delay: 5 sec, Rotation time: 0.285 and delayed is taken after 120 sec after dynamic imaging covering the whole liver

Results: The hepatic arterial perfusion of HCC is typically increased with decreased in protocol liver perfusion. HBF and HBV increases in HCC compared to background liver tissue and the MTT is decreased. The MTT of HCC is shorter than that of background liver parenchyma and the degree of MTT reduction is correlated to the grade of the malignancy. CTPI is feasible and noninvasive and reproducible technique for quantifying tumor vascularity and angiogenesis in HCC.

3.3. CT Guided Steroid Injections: An optimized dose approach

Presenter: Peter Traise, Hunter New England Imaging (NSW Health), Australia
Authors: Peter Traise/ Dr Beng Tan

Introduction: The use of CT for a variety of both diagnostic and therapeutic procedures is increasing. This can be attributed to technological advances in CT, which have continued to open potential fields of application (McCullough, C., et al. 2009.) However, studies by Brenner and Hall (2007) and Mathews et.al (2013) conclude that the increase in CT use has significant implications of increased cancer risk, especially in a younger population. Consequently, there has been a greater focus on reducing the CT-induced radiation dose by both vendors and end-users of CT imaging equipment. Methods have been implemented to reduce dose, ranging from equipment-based dose modulation, improved sensitivity of detector materials and more recently by revision of CT image reconstruction algorithms. However, availability of latest CT technology in rural areas of Australia are often hampered by high costs of replacement equipment. Thus, other techniques of reducing dose must be employed to improve patient safety. There is an increasing use of CT for needle guidance in therapeutic paraspinal steroid injections. One simple technique, reducing tube current (mA), shows great promise in optimizing radiation dose whilst maintaining sufficient image quality for these procedures to be performed accurately and safely. Preliminary results from a current study in progress by the author would indicate the potential for dose reductions of 60-80% in CT guided steroid injections with little impact on the image quality of needle-tip visualisation.

Methods: Patients were recruited and randomised into two groups, A&B. Group A underwent the procedure with a reduced mA technique; Group B with the standard technique. The dose length product (DLP) was recorded. Images were reviewed for visualisation QA.

Results: Reduction of tube current to factory minimum appears to be a potentially useful and simple method of reducing radiation dose in CT guided interventional procedures where high contrast structures are being visualised. Although data is not yet complete, preliminary results indicate that it is possible to reduce successfully CT DLP between 65-88% of the average dose using a low mA technique without significant degradation of image quality.

3.4. Siberian tiger in computed tomography - image quality considerations

Presenter: Rikke Bramming, Department of Radiology, Odense University Hospital, Denmark
Author: Kristine Skov Hansen, Department of Radiology, Odense University Hospital, Denmark

Introduction: The Siberian tiger of Odense Zoo was suffering from lower back problems such as limping and needed an examination. A number of challenges such as size, weight, hygiene and safety precautions had to be considered. The tiger weighed approximately 300kg and was 4 meters long. Because of its lethal canine nature and quarantine limitations the examination had to be carried out at the Department of Forensic Medicine. It was crucial to get a result of the scan because the Siberian tiger is an endangered species and this specific tiger plays an important role in the genetic preservation of the species.

Methods: With use of a dual-slice Siemens CT scanner the examination was planned and performed as it went along due to the challenging size and weight.

Results: As expected the image quality was far from optimal but it was possible to rule out stenosis of the spinal canal such as a ruptured disc.

3.5. Effectiveness and Acceptability of Newly designed Shoulder Extension Device to improve image quality in Neck CT

Presenter: Woong Yong Cho, Asan Medical Center, Radiology, Seoul, Korea
Author: Woong Yong Cho

Introduction: Deterioration of image quality due to the beam hardening effect caused by the shoulder joints in neck CT images makes it difficult to detect the abnormal lesions and to identify the anatomical tissues. Therefore, we tried to improve the image quality of the neck CT by using a shoulder extension device which fully extended the shoulder joints.

Methods: Patients who underwent neck CT were divided into 3 groups according to weight; A (80kg<), B(60kg<), and C(40kg). For each group, noise of CT images was assessed at 5th and 6th cervical spine level using.

Results: Mean noise values of the CT images using the device were 18.3, 11.4 and 9.7 in group A, B and C, respectively. Mean noise values of the CT images without using the device were 9.8, 7.2 and 4.2 in each group. Dose reduction is the largest in group A so that it is more effective in patients who are heavier. In qualitative evaluation, the score was high as 4.7 out of 5. In the survey, patients rated the inconvenience level as low.
3.6. Computed Tomography (CT) as the most optimal medical imaging method for patients with Ventricular Assist Devices – a retrospective review

Presenter: Ingrid Jolley, Alfred Health (Melbourne), Australia
Author: Ingrid Jolley

Introduction: The insertion of Ventricular Assist Devices (VADs) is one of the treatments applied for patients with chronic heart failure. These devises temporally or permanently support the blood circulation at the volume and rate adequate for normal function of body systems. The insertion of the VADs may cause complications and adverse events, such as device dislodgement and/or malfunction, bleed, cardiac tamponade, infection, fluid accumulations, thrombosis and thromboembolism. Medical imaging plays a major role in clinical monitoring and management of patients with inserted Ventricular Assist Devices. The imaging modalities employed in these examinations include conventional radiography (incl. mobile and fluoroscopy), Computed tomography (CT), Nuclear Medicine (NM), Ultrasound (US) and Digital Subtraction Angiography (DSA). The purpose of this retrospective showcase is to review the benefits of imaging modalities that are applied for examinations of patients who are treated with the VADs and to demonstrate that Computed Tomography is the most optimal imaging method in these investigations.

Methods: A retrospective review of clinical cases (2009-2013) in Alfred Health involving the insertion of VADs and relevant literature (1997–2013) has been performed. 21 selected images represent conventional radiography, CT, NM, US and DSA modalities.

Conclusions: The imaging modalities that are employed for examinations of patients with inserted VADs encompass conventional radiography, CT, NM, US and DSA modalities. Their employment is correlated to the ability of delivering diagnostic information. According to the retrospective review, the Computed Tomography is considered the most optimal imaging method as it provides high contrast and spatial differentiation within the images and allows evaluation of areas not well visualized with other imaging modalities.

3.7. Radiographer’s Competence in Computed Tomography – defining competence dimensions in order to develop self-assessment instrument

Presenter: Marjut Pawsey, HUS Medical Imaging Center, Radiology department in Haartman Hospital, Finland
Author: Marjut Pawsey

Introduction: Radiographer’s work has developed to respond to the increased demands placed on radiology services. Radiographer’s role has changed significantly from 2000 onwards. Digital imaging and the transfer to a digital picture archiving and communication system (PACS) have influenced the radiographer’s role change and the increased demands on competence. This creates challenges for both radiography education and the preceptorship period. A preceptorship period that is well organized and of high quality is important as it influences the employee’s competence, the quality of work and work load. Computed Tomography (CT) is a central part of the radiographer’s work in many Radiology departments. Radiographer’s competence in CT practice includes many fields, from ensuring the examination’s justification and indications, to the patient’s exit from the radiology department and radiologist and physicians receiving diagnostic images. The European Qualification Framework (EQF) competence levels are based on learning outcomes which are described as knowledge, skills and competence. Competence is defined by European radiographer’s competence descriptions as a dynamic concept that integrates knowledge, skills, abilities, values and attitudes. The European radiographer’s competence descriptions were used as theoretical framework in the study. The study reported here is part of a project developing an instrument to measure radiographer’s competence in CT after the preceptorship. The aim was to develop competence criteria for radiographer’s in CT after the preceptorship.

Methods: The data was collected from a systematic literature search and from theme interviews with participants (n=6) having expertise in CT. It was analyzed by theory driven content analysis by using abductive reasoning.

Results: Three main categories were formed; competence in performing the CT-examination, competence in safety and competence in the work environment. From these, radiographer’s competence criteria in CT after preceptorship were created. Criteria can be used for forming preceptorship programs for CT-units and for evaluating and monitoring the preceptorship. They can help to identify the need for individual competence development and accordingly guide the radiographer’s competence development in CT-imaging.

3.8. Post mortem imaging at Tampere University Hospital

Presenter: Mia Mustalahti, Medical Imaging Center and Hospital Pharmacy Tampere University Hospital, Finland
Author: Mia Mustalahti

Introduction: I work as an X-ray nurse at Tampere University Hospital. A year ago, Forensic Medicine received new facilities on our campus, and forensic post mortems in Western Finland, Central Finland and Ostrobothnia were centralised in Tampere. Previously, we had mainly taken plain X-rays of the deceased, but in the new facilities, we also have room for a CT device. However, we have not received the device yet. However, the goal is to introduce Obduction’s CT device during 2014. We have now performed the necessary imaging using first aid’s device, a Ge 64 Lightspeed.

Methods: The imaging request is always submitted by the forensic pathologist. The imaging indications are affected by the site where the deceased person was found, the circumstances, and the statement by the police. Routine tasks are to perform imaging of gunshot wounds, deceased children, suspected cases of homicide, industrial accidents and traffic accidents. Imaging is always performed before the autopsy. With CT, we first take a long scout picture(from head to toe). After that, with one deck, we perform imaging of the skull area, and with another deck from above the outer auditory canal as far as is allowed by the 3,000 slice maximum, usually below the knees. The imaging is performed with thin 0,6mm slices. The images are transferred to a workstation. The radiologist issues statements and builds the necessary 2D and 3D reforms. The forensic pathologist always has access to the statement and the images when he or she is drawing up the final autopsy document. We currently perform about 25 imaging sessions per month, but the number is on the rise. The images are archived in our own Pacs system. For identifying the deceased we also performed some Optg imaging sessions last year. The specialised dentist issues statements on the Optg images.

Results: Since 2013, the number of imaging sessions has been rising. The need is becoming more extensive as more and more forensic pathologists realise the benefits of the imaging. In CT images, it is easy to see foreign objects, air embolisms and fractures which are difficult to see in an autopsy. We are hoping to soon receive the CT device in Obduction’s facilities and thus get more resources to meet the increasing demand. With first aid’s device, we can no longer increase the number of imaging session.

4. Dose Wise Radiographer of the Year 2014

Dose Optimisation in Paediatric Interventional Cardiology

Presenter: Sonyia Mc Fadden, University of Ulster, Belfast, UK
Author: Sonyia Mc Fadden

Introduction: The use of interventional cardiology (IC) has risen dramatically in recent years due to advances in technology, medical devices and increased reliability. Many IC procedures have eradicated the need for open heart surgery in patients with congenital heart defects (CHD) yet these procedures are also responsible for some of the highest radiation exposures in medical departments. Studies have indicated that the radiation risk is 4-8 times higher for infants than for adults in IC and that ionising radiation during childhood may result in a 2-3 fold increase of certain detrimental effects compared to adults. There is a lack of robust evidence in the literature as current studies differ in their risk estimation for paediatric patients, however all published data concur that paediatric patients are highly radiosensitive and are at a higher risk than adults. At present there is limited research on dose guidelines or DRLs for paediatric IC and imaging protocols are usually determined in the clinical department at a local level.

Aims and Objectives: This study aimed to investigate radiation doses in paediatric IC in the UK and Ireland with a view to establishing Local Diagnostic Reference Levels (LDRRLs). The research also sought to determine the IC protocols currently in use in the clinical departments and highlight any variation in practice which might impact upon the radiation
Dose and image quality. The main objective was to recommend best practice with the lowest radiation exposure. 

Methods: Initially a literature review was performed investigating radiation doses in the area of paediatric IC. A prospective study was performed on 440 paediatric patients investigating radiation doses during paediatric IC in two large hospitals in the UK and Ireland. The results were calculated using data on 354 paediatric patients (0-17 years) from one hospital. A questionnaire was then distributed among all the clinical centres in the UK and Ireland investigating radiographic protocols used during IC. The results of the questionnaire informed experimental studies on anthropomorphic phantoms which investigated the different protocols and the corresponding effect on radiation dose and image quality.

Results: The literature review highlighted both a scarcity of published research and great variation in paediatric IC radiation doses internationally. The prospective study identified wide variation in techniques and radiation dose between the two different hospitals performing the same IC procedures. One hospital routinely removed the anti-scatter (AS) grid during the IC examination for patients ≤ 10kg and reported doses up to 50% lower than the other hospital. LDRL were calculated by age and weight groupings. The questionnaire had a response rate of 79% and showed that although IC procedures share common techniques the radiographic protocol varied greatly from one hospital to another. The most common variation in practice is the use of the AS grid and frame rates used during digital acquisition. This was investigated further with the aid of experimental studies using paediatric anthropomorphic phantoms. The results showed that simple modifications can be made to the radiographic protocols using paediatric IC procedures which will give a dose reduction of 27.6% -50% without affecting image quality. The image quality studies showed little variation for the 5 cm phantom and 10cm phantom, however the larger sized 20cm phantom demonstrated a loss in image quality when the AS grid was removed.

Discussion: It is apparent that confusion exists in the clinical departments about dose reduction strategies and what constitutes best practice. This can be attributed to the conflicting evidence in published literature. Radiographic projections used in paediatric IC need to be standardised to ensure the lower dose alternatives are used as often as possible. The proposed LDRL may be used as a clinical aid to alert staff they are approaching a threshold radiation dose. All IC departments should establish their own LDRL in line with international guidelines. In addition to this, regular clinical audit should be utilised to ensure clinical practice is in line with the established LDRL. Any procedure that continually exceeds the LDRL should trigger an investigation into practice.

Conclusions: An international multicentre study needs to be initiated to collate sufficient data to establish DRL in paediatric IC and develop internationally recognised procedural guidelines. This will ensure that all departments adhere to best practice and that all possible dose reductions can be achieved. Removal of the AS grid should be practised for all patients ≤10kg, unless the lack of image quality deems it necessary. A lower frame rate should be used as often as possible during image acquisition consistent with good anatomical detail.

5. DOSE OPTIMIZING

5.1. Radiation justification - no to repeated examinations

Presenter: Tora Hilde Westad Fjeld, Diakonhjemmet Hospital, Norway
Authors: T. H. W. Fjeld, T. H. W. Fjeld, T. H. W. Fjeld

Introduction: To avoid unjustified examinations the first question to be asked is: Has the examination already been done? Repeated examinations are evidently unjustified and can be avoided using CD import / export or electronic transfer between hospitals. We do have the tools, but unnecessary repeated examinations still occur in most radiological departments. This study aims to increase awareness about radiation justification in general and in turn reduce number of repeated examinations. By doing this we aim to decrease collective radiation dose, improve patient flow, spare patient strain and optimise use of resources. We aim to motivate participants at the ISRTT to engage in this kind of optimization work. Yes to meaningful imaging - No to repeated examinations.

Methods: Repeated examinations were reported as adverse events and the underlying causes identified. The occurrence of repeated examinations was monitored and the head of each department were informed bi-monthly and asked to improve routines that was not work.

Results: This study indicates that the main reasons for repeated examinations at our hospital are •previous images not included in patient transfer from other hospitals •suboptimal routines on obtaining previous images •double referrals due to poor communication between doctors •images are transferred, but the referring doctor is not able to locate them in PACS Through the workshops we learned that the level of knowledge about radiation justification among referrers was quite poor.

5.2. The shielding evaluation of radiation dose in an open door operating room during radiographic examinations

Presenter: Weon-Keun Choi, Department of Diagnostic Radiology, Asan Medical Center, Korea
Authors: Chang-Sun Lim, Ichiro Yamaguchi, Kwan-Seop Lee, Dong-Yun Ha

Introduction: According to the the National Council on Radiation Protection and Measurements (NCRP) Report No.147, the shielding of radiation area should not exceed 0.1 mGy/week. We have to close door of operating room during radiographic examinations on the principle of radiation protection. However, we should actually open door operating room for patient safety in the case of emergency patients and pediatrics. Considering this situation, we need to evaluate radiation dose in the case of an open door operating room during radiographic examinations, and to find the ideal method for patient safety and reduce radiation dose.

Methods: From January 2009 to March 2009, radiation dose was measured by attaching five glass dosimeters to the following four areas:(1) the head of the operator/(2) the body of the operating room shielding door including 1.5 mm Pb, (3) the inside of the operating room with an open door, (3) The rear of the operating room opened, and, (4) The background of where the glass dosimeters were kept. We used an electron gamma shower (EGS) program to evaluate shielding effects in the case of an open door operating room toward tube direction contrary to the existing door direction.

Results/Conclusions: Dose rate in area 1 was higher (2.19 mGy/week) than NCRP Report No. 147 (0.1 mGy/week). Dose rate in area 2, 3 and 4 was 0.45 mGy/week, 0.028 mGy /week, and 0.033 mGy/week, respectively. Considering the effects of shielding door direction using the EGS program, an opened shielding door of the operating room facing to the tube direction during radiographic examinations is the ideal method for patient safety and reduction of radiation dose.

5.3. A Holistic Approach to Radiation Safety

Presenter: Bart Leclou, Company RaySafe, Sweden
Author: Leclou

Introduction: One central aspect of radiation safety is the regular quality assurance and servicing of diagnostic x-ray equipment. Only when equipment complies with legal regulations, can it be assumed that it emits only the selected dose during diagnostic x-ray applications. The second central aspect is safety awareness among medical staff working with the equipment who are exposed to scattered radiation represents another important aspect affecting radiation safety. A third central aspect of radiation safety concerns the dose to the patient. When it comes to best practices in radiation safety for patients, some basic guidelines are widely referenced: Medical imaging examinations should only be performed if medically justified (Justification) and if so, patients should receive an optimal x-ray dose which is as low as reasonably achievable (ALARA) while maintaining sufficient image quality to meet the diagnostic need (Optimisation).

Methods: Unfors RaySafe developed trough hardware and software solutions the tools to implement a holistic approach to radiation safety that targets the central aspects; equipment, staff and patient.

Results: The developed solution indicates that a holistic approach improves the overall radiation safety therefore avoids unnecessary radiation exposure to patient and staff.

5.4. Statistics of patient doses in plain radiography and number of radiological examinations in Finland

Presenter: Timo Helasvuo, STUK / Radiation and Nuclear Safety Authority in Finland
Authors: Timo Helasvuo, Elna Hallinen

Introduction: The Finnish Radiation and Nuclear Safety Authority in Finland (STUK) collected the number of radiological examinations classified...
to those made to adult and child patients in Finland in 2011. In 2011, approximately 3.6 million x-ray examinations were made in Finland this number does not include dental x-ray examinations taken in dentist’s offices. Earlier, the number of x-ray examinations has been investigated in 1984, 1995, 2000, 2005, and in 2008. Slightly more than 650 000 ultrasound examinations and 1 261 000 MRI examinations were reported in 2011. So the total number of medical imaging, excluding the dental examinations, go up to near 4.6 million examinations done. STUK conduct patient equivalent dose measurements for plain radiography during every inspection. Inspections are done for all new x-ray units and for older x-ray units every five years. A water + PMMA -phantom corresponding an average patient of about 75 kg is used in the measurements or a standard 4.5 cm thick PMMA -phantom for measurements in mammography. Measurements of ESD are made for Thorax PA and Lumbar spine AP projections and ESD and MGd/AGD for CC projection in mammography using the parameters used for real patients. Sample size since 2010 is approximately 290 x-ray units and 90 mammography units. Various statistics can be drawn from this data (for example the development of patient doses (at least since 1998), dispersion of patient doses, use of additional filtration and its effect on patient dose, use of different sensor techniques and their effect on patient dose etc.).

Methods: The collecting of the number of x-ray examinations was based on the statute of the Ministry of Social Affairs and Health on the medical use of radiation.

Results: In 2011, in proportion to the Finnish population about 677 x-ray examinations per 1000 inhabitants were performed. Dental examinations are excluded in this number. The patient doses (ESD) have been dropping quite consistently and the average doses are to drop even further in the future, since DR technology will become more common. In mammography, despite the linear drop in ESD, the average MGd has stayed fairly constant in the past few years.

5.5. Knowledge, attitudes and practices of medical radiation workers on radiation optimization, African perspective

Presenter: Stephen Bule, Makerere University Kampala, Uganda
Author: Stephen Bule, Msc. College of Health Science, school of medicine, radiology dept. Makerere University

Introduction: Although ionizing radiation is widely used to diagnose some pathology, the relevant hazards are also known to be as an important limitation of its application. It is believed that the awareness of ionizing radiation dose values is one of the main stages in patient’s radiation protection which always refer to optimizing for better health. The purpose of this study has been to investigate the level of radiation workers’ (Radiographers, Imaging Technologists and radiologists) knowledge, attitudes and practices about radiation doses received by patients in radiological investigations.

Methods: Using questionnaire the most commonly requested radiological investigations were listed. 158 radiation workers in several hospitals were asked to identify the average dose of radiation received by patients when they undergo a posterior-anterior hand.

Conclusions: The results indicated that only 56% of radiation worker know the units of radiation absob dose measurement units. Most of them could not correctly estimate the amount of radiation dose received by patients in a routine radiography of hand and majority of them underestimated the radiation dose of other radiological investigations. Despite passing medical physics course during training, it seems that most of medical radiation workers did not have enough knowledge about the amount of radiation.

5.6. Relationship between dose optimization and compression level of digital pediatric chest images acquired by computed radiography

Presenter: Akinidade Dare, Bayero University Kano, Nigeria
Authors: Akinidade Dare1, M. C. Okej2, E. O. Balogun3 and A. Y. Abdulkadir1. 1Department of Medical Radiography, Bayero University Kano, Nigeria, 2University of Nigeria, Enugu campus, Nigeria & 3National Orthopedic Hospital, Lagos, Nigeria

Introduction: The purpose of digital medical image compression is to reduce the size of the image with the goal of decreasing transmission time and reducing storage space. There are two types of image data compression; lossless or reversible compression and lossy or irreversible compression. While in the former, no information is lost when the image is decompressed or reconstructed; in the latter, there is loss of some information, when the image is decompressed. There is growing evidence that lossy compression can be applied without significantly affecting the diagnostic quality of the images. However it is not well known if lossy compression will affect the diagnostic image quality of pediatric chest images. On the other hand, chest radiographic examinations in pediatric pathology should be performed using the lowest possible radiation exposure. Therefore, optimization of image quality and radiation dose in chest radiography has become an important area of research over the last decade. We hypothesize that reducing the patient dose in pediatric chest examination should not compromise the image quality when compressing at 50% level using JPEG wavelet algorithm. The goal of this study was to evaluate the relationship between dose optimization in pediatric chest radiological examinations using computed radiography (CR) and the compression level using JPEG wavelet algorithm. Our specific objectives were to: (1) establish the optimum compression level above which the diagnostic image quality of digital pediatric chest image begins to be affected and (2) determine the effect of patient dose on achievable optimum compression of digital pediatric chest image.

Methods: Pediatric chest X-rays at different doses were done. Each image was subjected to 3 different compression levels. Ranked scores for visibility of details were used as measure of diagnostic image quality in each dose for the 3 compression levels.

Results: Data analysis using SPSS 17.0 for windows indicate that reducing the patient dose in pediatric chest examination does not compromise the image quality when compressing at 50% level using JPEG wavelet algorithm. Reducing dose in pediatric chest X-ray from 6 mAs to 4 mAs double and compression at 50% level corresponding to 1:109 compression ratio does not compromise the image quality. Storage space and transmission time for pediatric chest image can be greatly reduced when patient dose is reduced.

5.7. The reducing radiation doses cheaper

Presenter: Francesc Xavier Ramon, insitut de diagnostic per la image Tarragona, Hospital Joan XXIII, Spain
Authors: Francesc X. Ramon, Alvaro Labata, Francesc Peralbo

Introduction: Many companies spend a lot of money to get methods to reduce the radiation dose, but the best and cheapest modulator is the radiographer. The computed tomography image is acquired with many projections and multiple linear attenuation coefficients. In order to obtain multiple linear attenuation coefficients, we can increase the radiation technique (mA) or we can acquire data more slowly. By adjusting the parameters of data acquisition, we achieve dose reduction of 40% without losing image quality.

Methods: Our purpose was to reduce the value of CTDI in abdominal CT studies done in our hospital where we have a CT Philips Brilliance with 40 channels. To achieve this, we have made the study more slowly, decreasing pitch. This more linear attenuation technique.

Results: When we compared our studies we did previously with the studies we present, we have seen that we have managed to reduce by 45% the value of CTDI obtaining an image with low noise and optimum quality for radiological diagnosis.

5.8. Indication-based Diagnostic Reference Levels for Adult and Pediatric CT-examinations in Finland

Presenter: Atte Lajunen, STUK - Radiation and Nuclear Safety Authority, Finland
Authors: H. Järvinen, STUK - Radiation and Nuclear Safety Authority; M. Kortesniemi, HUS Medical Imaging Center; E. Lantto, HUS Medical Imaging Center; R. Seuri, HUS Medical Imaging Center

Introduction: A diagnostic reference level (DRL) is a predefined dose level, which should not be exceeded in an examination that is conducted appropriately on an average-sized patient. In Finland, the DRLs for most common examinations are given by Radiation and Nuclear Safety Authority (STUK). Currently there are no DRLs for pediatric CT-examinations and the previous DRLs for CT-examinations for adults were issued in 2007 and they covered only examinations conducted on a particular body region. Since the image quality requirements, and thus the dose needed, vary between different indications, there has been a call for indication-based DRLs for CT. The DRLs for adult CT-examinations are based on a dose survey done in 2012. Doses for different examinations were reported from 57 different CT units out of the approximately 100 units that are in use in Finland. Doses were collected from examinations
conducted on a particular body region, based on some indication and from some special examination types. The DRLs for pediatric CT-examinations are proposed and are based on patient data of over 750 patients in 4 university hospitals. Two indications for head CT, four for thorax, two for abdomen and two for whole body CT were considered.

Methods: The DRLs for adults and part of the proposed pediatric DRLs for different age groups are proposed according to the third quartile approach. For the other pediatric examinations, the DRLs are in terms of patient weight using a DRL curve.

Results: The new partially indication-based DRLs for adult CT-examinations came into effect on June 2013 and are given as CTDIvol and DLP values. On average, the DRLs for a particular body region dropped approximately 20% from the previous DRLs. Concerning the pediatric DRLs, for all four indications selected for thorax CT (angiography, infection, trauma, tumour), the same DRL is proposed. For head CT two different DRLs are proposed ("head routine" with higher DRLs and "ventricular size" with lower DR.

5.9. Iterative reconstruction methods in computed tomography

Presenter: Robert Miner, Michener Institute CE, Canada
Authors: Robert Miner

Introduction: Filtered back projection is the dominant computed tomography image reconstruction method used today, though the use of other methods such as iterative reconstruction is increasing. Iterative reconstruction techniques for computed tomography image reconstruction offer improved image quality, lower image noise and lower patient radiation dose.

Methods: Current IR methods will be compared and contrasted. Performance metrics (dose reduction, image quality, image noise and reconstruction times) gained from patient studies, phantom studies and manufacturers product information are discussed.

Results: Iterative image reconstruction can offer significant dose reduction, low image noise and quality images at full or reduced dose levels. Most iterative reconstruction methods require increased image processing times when compared to filtered back projection methods.

5.10. The possibility of performing Dose Analysis using "Radiation Exposure Repository" on retrospective CT data in a mid-size hospital

Presenter: Ting Hei Edward Wong, Hong Kong Sanatorium & Hospital, Hong Kong
Authors: Wong Ting Hei Edward, Gladys Lo, Ben Yu, May Chiu

Introduction: The growth of CT has been cited as the fastest imaging technology used in human medicine. The associated ionizing radiation dominates the growing source of population iatrogenic ionizing radiation exposure. The community becomes aware of the trend particular when incidences of overdose to patients due to improper techniques are publicized. When dose monitoring methods are developed and implemented, institution-specific workflow and vendor-specific technologies happens to be significant barriers. As such, it is difficult for imaging centers to participate in centralized dose registry like ACR’s Dose Index Registry. This study will make use of the automatic extraction function of “Radiation Exposure Repository (RER)” on dose summary pages of >3000 CT examinations collected from a mid-size hospital and explore the possibility to build a Dose Reference Level Registry in a mid-size institution setting.

Methods: A self-developed dose monitoring software called “RER” was launched. K factor conversion table based on b institution setting.

Results: Diagnostic Reference Level of different examinations are acquired. There are some Dose Summary page recognition errors and these are investigated for further improvement of the software. As we have 3 CT machines in our institution, DRL is useful to compare examinations done with different machines and provide a good starting point for machine selection. DRL gives the reader a picture of what is present standard which is essential for new machines or new protocol evaluation in the future.

5.11. The Study of Automatic KV Selection for Radiation Dose Reduction in coronary CT angiography

Presenter: Katsura Egami, Department of Radiology Yokohama Sakae KyoSai Hospital in Japan
Authors: Katsura Egami, Eiji Yasuda, Takae Aoki, Kenichi Hirano, Keiichiro Suzuki, Mitsuyuki Takahashi

Introduction: Practical implementation of lower kV in CT for dose reduction has been hampered by the difficulty in predicting the proper kV and mAs setting for each patient. Our goal is to assess the performance of automatic kV selection tool in reducing radiation dose in Cardiac CT angiography.

Methods: 1601 patients underwent the CTA, expect for using CAREkV was 64 patients, 954 patients CTA were performed using an automatic kV selection tool. Three radio technologist evaluated the image sharpness, noise, artifacts. Dose savings were calculated.

Results: A overall dose reduction of 54.8% (DLP) from the reference 120 kV protocol was achieved (prospectivescan:59.1%, retrospective scan 27.3%). 100% exams were considered to be of the similar quality as previous CTA exam. The automatic kV selection tool provides an efficient and quantitative way to guide the selection of the most dose-efficient kV in CTA.

5.12. Clinical self-assessment and changes in pelvic imaging and patient dose by using higher kVP setting: evaluation in one Finish radiology department in Medical Imaging Centre of Southwest Finland

Presenter: Jarno Huhtanen, Medical Imaging Centre of Southwest Finland
Authors: Huhtanen Jarno, Paasio M., Erjoma P., Tiensuu J., Järvinen J., Hartikainen M.

Introduction: Recent advances in plain film imaging has seen a shift from film-screen (FS) imaging to computed radiography (CR) and digital radiography (DR). Many studies have outlined the possibility for dose savings after FS imaging mostly because of the DR capability for wider dynamic range than FS imaging. Also the reverse is true leading to possibility for dose creep in DR. In DR imaging the importance of dose indicators is essential for radiographers to follow after examinations avoiding dose creep phenomenon. In every examination the ALARA principle should be followed and importance of using dose saving methods in DR. Dose saving methods include e.g. filtration, collimation, using appropriate kVp and mAs combination and SID. Doses do vary in different body parts including dose saving methods. Doses can be estimated either using entrance surface dose (ESD) or dose area product (DAP). DAP is useful in everyday practice because it’s easily evaluated after each examination. Dose measurement varies on different manufacturers and can be measured e.g. in mGycm², mGycm² or mGy cm² so caution is needed if evaluated DAP value between two different systems. Pelvic imaging is an examination that leads to greater radiation dose for patients in DR imaging. Also in pelvic imaging primary radiation is in the field of reproductive organs of male and female so more caution should be used in radiation protection. Many studies have outlined the importance for dose reduction in pelvic imaging. The purpose of this study is to present dose saving method for pelvic imaging (AP projection) in one department in Medical Imaging Centre of Southwest Finland by using higher kVP setting.

Methods: Patients’ were selected randomly. Standard patient orientation was used and higher kVP (N=42,n=32) was used. Patient weight(kg), height(cm) and dose(DAP D Gy cm²) were collected and IQ was evaluated by radiologist (N=1), BMI and dose were compared.

Results: From the 32 images conducted with 96 kVP only three (3) were labelled as “not good” and one being marked as diagnostic. None of the three “not good” resulted in rejection of the image. In BMI and DAP comparison with 85kVP and 96kVp the latter resulted in lower doses for patients’ in Pelvis imaging. No significant reduction in IQ was detected so higher kVP is now being used. Knowledge and assessment about doses and dose-creep is important in DR imaging and in radiographers’ work.
5.13. Practical approach to minimize off focal radiation dose to patient during general radiography

Presenter: Vitharana Gamage Wimalasena, Sri Lanka School of Radiography, The National Hospital of Sri Lanka, Colombo 10, Sri Lanka
Author: V.G.Wimalasena

Introduction: We consider that the patient is adequately protected when the x-ray beam is collimated with the LBD. But it is not true. The light beam diaphragms are not standardized and the x-ray beam collimators are not very much effective in removing the extra focal radiation. The amount of extra focal radiation present is variable from equipment to equipment. During radiography of, specially the abdominal and thoracic areas the tissues outside the collimated area receive and absorb this unnecessary radiation and increase the dose. We cannot say that this will not produce any effect on the patient. The effect of extra focal radiation is not always visible on the images (except on the posterior side of lateral lumbar spine or dorsal spine images) and is neglected. In case of lumbar spine and dorsal spine laterals the percentage of extra focal radiation is very high and they will increase the radiation dose to the more radiation sensitive tissues such as intestine, gonads and the breast. These doses will contribute to the cumulative dose to increase if these patients may undergo further investigations later. Therefore it is high time that we take necessary precautions to prevent this unnecessary radiation reaching the patient if we are really concerned about the minimization of radiation dose to the patient. This experiment shows a pre-patient collimation (using at least 2 mm lead) close to the patient’s body can do this.

Methods: The skull phantom was exposed with the beam collimated just to cover the region, lead four numbers place just outside the collimated margins. It was repeated with a lead mask with an opening equal to the collimated area kept above the phantom.

Conclusions: On the processed first film, the area outside the collimated margins were dark due to the exposure to extra focal radiation. This results in unnecessary radiation dose to patient even if we collimate the beam. The present day collimators are not effective in removing this extra focal radiation. The second film did not show this effect. That means the extra focal radiation fall on patient can be minimized by using additional shielding (collimation) just above the upper surface of the patient.

5.14. Dose optimization in hip joint axio-lateral projection with air gap

Presenter: Susanne Kivistö, Oulu University Hospital, Finland
Authors: Susanne Kivistö, Anja Henner, Seija Mattila

Introduction: The quantity of scattered radiation in x-ray beam reaching a receptor can be reduced by separating the patient’s body and receptor surface, known as an air gap. Scattered radiation leaving a patient’s body is more divergent than the primary x-ray beam. Therefore, scattered radiation spreads out of the primary beam area. The reduction of scattered radiation in proportion to primary radiation increases with air-gap distance 30 cm. The use of an air gap introduces magnification. Therefore, a larger receptor size is required to obtain the same patient coverage but the magnification can be reduced by smaller focus size as well as by increasing the focus-to-receptor distance. Also, increasing the separation distance between the patient and the receptor, increases focal spot blurring. It is usually necessary to use relatively small focal spots with an air-gap technique. This technique is most used in mammography but it is also useful in hip axiolateral projection. When using air gap the mistakes and dose increase caused by grid can be avoided (tilted grid, grid lines).

Methods: The data of hip joint axio-lateral projection was collected in emergency x-ray department with Fuji FDR Acelerlate and wireless flat panel detector. Focus to receptor distance varied from 160 cm to 193 cm (Mean 166 cm).

Results: Patient doses with air gap varied from 1,68 dGycm2 to 10,049 dGycm2 (mean 3,57 dGycm2 ). Mean of the S-value was 509. It shows significant decrease in patient dose compared those with anti-scatter grid. Patient doses can be decreased with air gap instead of anti-scatter grid. In 2009 patient data collected in Health Center showed that with air gap dose decrease can be with air gap even 2/3 compared with grid in hip joint axiolateral projection.

5.15. Posterior-anterior radiograph of lower extremity to reduce radiation exposure to gonad and effective dose

Presenter: Jina Shim, Severance Hospital, Yonsei University College of Medicine, Seoul, Korea
Authors: Jina Shim

Introduction: A standard full-length standing anteroposterior (AP) radiograph of the lower extremity is the most widely used imaging technique in orthopedic measurements for leg-length discrepancy or alignment of lower limbs. Even though the reproduction system is included in the direct x-ray beam exposure in this examination, radiation protection for gonad is not routinely applied. The aim of our study was to determine the advantage of posteroanterior (PA) projection of the lower extremity regarding reduction of radiation exposure to gonad, and determine the effective dose compared to AP projection. In the phantom study, surface doses at the gonad were measured to compare AP, PA, and AP with gonad protection. In this 182 patients study, we calculated the measured dose area product, effective dose and gonad dose using the PCXMC program. There was a problem due to magnification in the study, there were differences between AP and PA projections of the femur and tibia and there was a fundamental matter in the x-ray 2D image. The study showed that gonad and effective doses in PA radiograph for a full-length lower extremity were much lower compared to the standard AP radiograph.

Methods: Radiation exposure to gonad was measured at the testicles in AP both with and without protection and PA without using a humanoid phantom. 182 patients were enrolled to determine the AP and PA of gonad dose and effective dose using PCXMC program.

Results: In the phantom study, the mean value of surface radiation dose to the location of gonads in PA projection without gonad protection was lower than that in AP projection, both with and without protection (p<0.05). In this 182 patients study, effective doses decreased by 47%, testicles and ovaries decreased by 93%, 21%, respectively in the PA radiograph. The gonad and effective doses in the PA radiograph of full-length lower extremity was much lower than a standard AP radiograph.

5.16. Abdominal Examination in KNH using 16 multi slice CT scan: Review of ALARA practice in managing patient dose

Presenter: Catherine Muchuki, Kenyatta National Hospital, Kenya
Author: C.W Muchuki

Introduction: Objective of the study: To assess the justification of abdominal CT examinations carried out, quantify radiation dose and evaluate the optimization of scanning parameters that contribute to radiation dose determination within the ALARA principle in comparison to international standards.

Methods: A retrospective study of 76 patients aged between 30 and 80 years of age referred for abdominal CT scanning at KNH; s department of diagnostic radiology during the period between April to December 2013 using the new protocol.

Conclusions: MDCT as a new and useful technology in medical imaging is providing technical challenges to end users that compromise optimization in reducing patient dose, from Kenyatta National hospitals experience. Local protocol practice was shown not only to have had an impact on the dose but also to have influenced the diagnostic yield of the examinations. Further quality assurance practices are ongoing.

5.17. Evaluation of radiation dose received by patients during dental X-ray imaging in Japan

Presenter: Shoichi Suzuki, Faculty of Radiological Technology, School of Health Sciences, Fujita Health University
Authors: Yuta Matsuuna, Ak Kawaguchi, Masanao Kobayashi, Yumi Kataoka

Objective: Although dental X-ray imaging is increasingly being digitized, and the use of cone-beam computed tomography (CBCT), a device specifically for dental imaging, is spreading at dizzying speed, methods utilizing diagnostic X-ray CT devices that are not designed specifically for dental use are also under consideration. In this study, we compared the radiation dose received under imaging conditions obtained from basic studies by dentists in terms of the doses received by patients when conventional panoramic dental imaging, CBCT, 64-row CT, and 320-row CT were used. There have been few reports of relative comparisons between these devices, even internationally. We therefore evaluated the radiation
5.18. Dose optimization in panoramic dental imaging

Presenter: Anja Henner, Oulu University of Applied Sciences, Finland
Authors: Anja Henner, Heli Põyskõ, Anja-Riitta Pietilä

Introduction: In Finland dental radiology is common and the number of examinations is increasing. About 2,3 million intraoral and about 300,000 panoramic dental examinations are taken yearly and are introduced to children. It is well known that children are more sensitive to radiation than elderly people. That’s why the image quality and dose optimization is important also in dental imaging although the doses are quite low. The purpose of this study was to find out the consequence of referral to the procedure in panoramic imaging of the teeth in order to decrease the patient’s dose. The follow-up of the doses was made in order to find out how permanent is the manner of the dentists to ask the partial OPTG.

Methods: The dose area product (DAP) of different programs in panoramic was measured without patient and they differed a lot. E.g. when using the partial program instead of whole mandible to a seven years old child, the dose is only one third.

Results: After the meeting the dentists started to write better referrals with clear indications and detailed information telling what they want to see from the x-ray. On the basis of this information the radiographer can take whole or partial mandible and set the kv and ma according the required image quality. The dentists have to be reminded of this possibility to make the procedure permanent. This procedure is spreading out all over Finland. It is very easy to decrease the patient dose.

5.19. Authority inspection of Cardiology departments in Norway – Are they making it great in radiation protection?

Presenter: Anders Widmark, Norwegian Radiation Protection Authority, Gjøvik University College, Norway
Authors: Anders Widmark, Reidun D. Silksøet, Eva G. Friberg

Introduction: Interventional cardiology includes high dose procedures like percutan coronary interventions (PCI), pacemaker placements and electrophysiological procedures. Physicians performing interventional cardiology receive the highest occupational doses in Norway. In addition skin burns of patients have been reported. The level of education, training and competence in radiation protection (RP), the existence of a RP culture and the use of conditions used in clinical practice. An anthropomorphic phantom was used for measurements, and the radiation doses were calculated at each point on the surface of the entrance site and internally by using thermoluminescent dosimeters (TLDs).

Results: The radiation dose from standard imaging was around 0.3 mGy at the entrance site. In panoramic imaging, it was around 0.05 mGy on the anterior surface of the dentition, 1.5 mGy to left and right, and 0.5 mGy in the posterior region. In CBCT, these figures were around 0.1 mGy, 5 mGy, and 5 mGy, respectively. For 64-row CT, these were around 150 mGy, 150 mGy, and 130 mGy, while for 320-row CT, these were around 4 mGy, 5 mGy, and 20 mGy.

Conclusions: The radiation dose received by dental patients was lowest when standard imaging was used, while among panoramic, CBCT, 64-row CT, and 320-row CT, which could be evaluated in the same region, the dose was highest for 64-row CT. The radiation dose at the eyes in particular was around 50 mGy. This demonstrated the need for measures to reduce the dose, such as using a protective mask, without decreasing image quality. The results of this study have enabled an assessment of the radiation dose received by patients during dental imaging in Japan.

5.20. Radiation Exposure to Patients during ERCP: Results from a Multicenter Study in Finland

Presenter: Ekatlerina Saukko, Radiological Department of Ul-Hospital, The Medical Imaging Centre of Southwest Finland
Author: Ekatlerina Saukko

Introduction: Endoscopic retrograde cholangiopancreatography (ERCP) is essential tool in the treatment of the hepatobiliary system. MRCP has rapidly replaced diagnostic ERCP in various pancreaticobiliary disorders. ERCP is highly technical and demanding invasive procedure which carries a potential risk of complications. With a high amount of x-ray fluoroscopy and digital radiographs performed during ERCP, it makes it undoubtedly an interventional radiology procedure. However, ERCP is not generally performed by a radiologist but by a gastroenterologist or even by a general surgeon. It’s obvious, that an ERCP procedure has the potential to cause high patient dose and therefore requires attention regarding radiation protection. Radiation exposure to the patient should be optimized such that the dose is the lowest necessary to refill the clinical aim, which is known as the ALARA (as low as reasonably achievable) principle. Besides the patient, an endoscopist and the other staff in the procedure room are exposed to ionizing radiation during ERCP, as well. They may participate in several hundred procedures per year, but most of the patients undergoing maximum a few ERCP during the year.

The aim of this study was to determine the radiation doses to patients during ERCP. Furthermore, the purpose of this study was to evaluate the risk of radiation-induced injury in ERCP and to estimate the patient’s effective dose, as an indicator of the risk for stochastic effect. A multicenter study that included ten hospitals was carried out in Finland.

Methods: A total of 227 patient radiation doses in ERCP were recorded during 4-month period in 2012. ESD was estimated by using thermoluminescent dosimeters (TLD) implemented in one of the hospitals. Effective dose was calculated from DAP measurements.

Results: The patient radiation doses in ERCP varied significantly in this study. In therapeutic ERCP patient received a greater radiation dose compared to diagnostic ERCP. The increase in frequency and complexity of ERCP procedures indicate the possibility of an increase in radiation exposure to patient. The results suggest that efforts at optimization and dose reduction in ERCP should be made. Nevertheless, ERCP requires the same radiation protection practice as all IR procedures.

5.21. The radiation know-how of the operating theatre staff in Finland

Presenter: Piia Heikkilä, University of Oulu, Finland
Authors: Heikkilä Piia, Henner Anja, Ahonen Sanna-Mari, Tenkanen-Rautaloloki Petra, Pirinen Markku

Introduction: Nowadays, the use of radiation is an integral part of the work in the operating theatres. Fluoroscopy-guided procedures are mostly demanding and complicated, and cause quite high radiation doses for the patients and the staff. Orthopaedic, traumatology and spine surgery procedures, for example, are done in operating theatres. Nurses and practical nurses use the mobile C-arms, but they don’t necessarily have adequate skills in radiation protection. There might be lack of radiation know-how among the operating theatre staff, because of the low level of education in radiation protection. Nevertheless, various operating theatre procedures require the use of fluoroscopy. There are several studies of radiation doses of the operating theatre staff and the patients, but a few studies of the radiation know-how of the operating theatre staff. The aim of this study was to survey the radiation know-how of the operating theatre staff in Finland. The topic has not been studied in Finland before. The use of radiation in operating theatres was also an essential theme of the EMAN project. The study was implemented in cooperation with the Radiation and Nuclear Safety Authority in Finland (STUK).

Methods: The radiation know-how among operating room staff was studied by an electronic questionnaire in spring 2012. The questionnaire...
was created for this study. There were 31 operating rooms among the respondents (n=31), and the response rate was 35%.

Conclusions / Results: Operating room staff has lack of radiation knowledge and they need more education in radiation protection. They know that the use of protective shields and short fluoroscopy time decrease the radiation dose, but other ways to optimize the doses are not well known. Radiographers work as a radiation user in operating rooms e.g. in UK, which could be one of the solutions in Finland, too. It’s important that operating room staff has ability to apply their knowledge about radiation safety to practice.

5.22. Patient information in radiological examinations - the research and development process

Presenter: Leila Ukkola, Oulu University Hospital, Finland
Authors: Leila Ukkola, Heljä Oikarinen, Anja Henner

Introduction: Each radiation examination should be justified: the benefit should be greater than the expected harm caused by radiation. The patient must be involved in the process of justification; in fact, informed consent is part of shared decision-making. However, information in connection with radiation examinations is usually limited. The personnel’s knowledge related to the doses and risks of radiation is often incomplete, the units describing the dose are complicated and the language used can be difficult. The International Atomic Energy Agency has pointed out that patient information should be improved. This research and development process concerning patient information in connection with radiological examinations was performed in the Department of Diagnostic Radiology, Oulu University Hospital. The purpose of the process is to find out the experiences and expectations of referring practitioners, adult patients, paediatric patients (or their parents), and radiation users concerning the information prior to radiological examinations using ionising radiation. The aim is to clarify the contents of information and the responsibilities involved and to enhance the practice of informed consent and safety culture in radiology.

Methods: The patients were interviewed using a questionnaire, while parents of paediatric patients and referring practitioners completed self-administered questionnaires. A questionnaire was also developed for the staff of the radiology department.

Results: The information received by the patients or parents of paediatric patients is inadequate and the patients wish to receive diverse information from different sources. Referring practitioners inform their patients irregularly, but they recognise their responsibility in this task. In conclusion, information for the patients in connection with radiological examinations seems to be insufficient. The final results of the process can be utilised for recommendations in order to develop patient information.

5.23. A Study on the film analysis of the Digital wireless detector according to the dose increase and the location variation

Presenter: Yu Young Eun, Jeonbuk university hospital, South Korea
Authors: Yu Young Eun, Ko Ju Young

Introduction: Lately, through the wireless LAN communication (IEEE 802.11a/b/g/n) function and thereof, the digital wireless portable detector has been developed to provide more convenience and we can get the digital radiography image faster and more easily. Film/ screen method has approx. 10 1.5(1-30) variation range, while the digital detector has 10 1(1-10000) variation range, so that there isn’t much resolution difference per dose variation, which can be a factor of the exposure dose increases. Also, intended was the provision of the proper guidelines of the digital wireless detectors for the emergency and the critical patients by evaluating the influences on the film resolution of the focus and the grid central displacement per the portable characteristics and the location displacement within the detector.

Methods: In this experiment I used the SIMAZU company’s Elmo-T6 Digital Mobile X-ray system and e’Tor (14x17” Wireless detector), ANTI-SCATTER GRID:10.1 (200 lines/Inch) F.D 130cm Inter spacer AL, Chest & head phantom, and achieved per dose increase

Results: On the one hand, I could feel the rough texture in the low dose of 0.5mAs in the film variation per dose increase and perceived visually the film difference of the proper dose 1-2mAs; on the other hand in the case of 3mAs, I perceived the low contrast due to the saturation phenomenon in lung area. The image J program used histogram, surface plot, and the plot profile analysis results show that, as the location displacement, the focus and grid, and the head phantom center increase.

5.24. Dose optimization in imaging of Young Scoliosis patients

Presenters: Minna Tikkanen, Mari Parkkinen, Oulu University Hospital, Finland
Authors: Minna Tikkanen, Mari Parkkinen Anja Henner

Introduction: Scoliosis means a back that curves like an “S” or a “C.” It may or may not be noticeable to others. While small curves generally do not cause problems, larger curves can cause discomfort. Scoliosis is not a disease, but rather it is a term used to describe any abnormal, sideways curvature of the spine. Scoliosis most typically occurs in individuals 10 to 18 years old and is often detected by school screenings or regular physician visits but there are also younger patients. Most of the scoliosis patients are young girls. Due to the age and long treatment period with several x-rays it is important optimize the dose carefully.

Methods: Already in 1995 the grid was moved away and the scoliosis x-rays were taken with air gap of 25 cm. The image receptor to focus distance increased from 170 cm to 200 cm and focus size was changed from 1,2mm to 0,6 mm. Later with CR system kVp was increased from 63kV to 90 kV and tube current decreased from 64 mAs to 6 mAs. Since 2010 DR from Fuji was installed. Now 90 kV is still in use, but mAs varies form 0.8 mAs to 3,2 mAs. Image quality was analyzed by pediatric radiologists.

Results: The Entrance surface dose (ESD) was decreased in 1995 from 1,31 mGy to 0,16 mGy with CR. With DR system mean ESD is 0,033mgY (range 0,017 mgY-59,9 mgY). In the latest data patients’ weight varied between 33kg-80 kg and height from 130 cm to 169 cm. There is no anti-scatter grid in use in scoliosis imaging with DR system and the air ga is only 10 cm. Image quality is still good enough according to pediatric radiologists. First x-rays from scoliosis is taken with lower kV and higher mAs but next ones with higher (90kV). If possible the projection is taken posterior – anterior (pa) and the breasts are protected with lead shields. Added filtration is 0,1 mmCu+1mmAl and focal spot is 0.6 mm.

5.25. Mobile chest radiographs without grid

Presenter: Teemu Hyppänen, HUS Medical Imaging Center, Finland
Author: Teemu Hyppänen

Introduction: Imaging chest radiographs without grid is a quite new method. However it is a technique which is quickly expanding in mobile x-ray imaging. Without grid imaging technique can save patient dose multiple times. Chest radiographs without grid is in its most beneficial use when imaging intensive care patients. They are x-rayed often so the multiple dose save is utilized many times. As major drawbacks it cannot be used with large sized patients and the technique is dependent on certain x-ray equipment. In Switzerland they have also started to use without grid technique in native abdomen, pelvis and lumbar spine radiographs. In Finland chest radiographs without grid are in use with at least ten mobile x-ray systems. With those systems most of the chest radiographs are taken without grid. As thorax is the most popular x-ray examination this technique gives great opportunities on optimizing patient dose. The method has also been used with fixed x-ray systems.

Methods: This presentations aim is to review the technique to take mobile chest radiographs without grid. Assets and issues of the technique will be explained on the radiographer’s point of view. The dose saving is demonstrated with a dose collection.

Results: Without grid technique has many practical use assets as well as it saves patient dose. As limitations it cannot be used with large-sized patients and the detector has to be enough sensitive to take diagnostic radiographs. At this time there aren’t many detectors in the market that are enough sensitive for without grid imaging. Considering populations without grid technique can save patient dose huge amounts as its use spreads around the world.

6. EBR


Presenter: Niina Kärnä, Kanto-Häme Central Hospital, Finland
Authors: Kärnä Niina, Akula U.-M., Metsäla E.
Introduction: The key elements of quality management are audits. The idea of audits is to compare the clinical practice with the standards of best practice. This will offer information on both strengths and issues for development. The audits should be regular and they can be external or internal. The latter include self-audits, which usually comprise of three phases: planning and preparation, execution and evaluation. Clinical image quality means the visualization of normal anatomical structures at the diagnostic level. A plain radiographic examination is the most common basic examination whereby clinical image quality should be systematically assessed by the organization. Clinical image quality can be assessed using quality criteria and appropriate technical criteria. Visual grading is an established method for assessment of clinical image quality. The assessment can be absolute or relative and the scale for assessment can consist of 2–5 steps. A diagnostically adequate plain radiographic examination improves patient care and reveals the competence of a radiographer. However, adequate and constant clinical image quality requires multidisciplinary collaboration. Patients’ freedom of choice concerning the place for examinations and care is now national in Finland. This creates a need for quality information on which to base decisions. Previous studies on this topic are apparently few. The purpose of this development work was to carry out the self-assessment of clinical image quality in plain radiography of adult patients’ lungs and knees according to the best practice. The work was done for Kanta-Häme Central Hospital (KHCH) and there were three co-operative organizations.

Methods: An applied systematic literature review and a qualitative study were performed. Articles and self-assessment documents and interviews from co-operative organizations were analyzed. A quantitative pilot study of the developed practice was conducted.

Results: Little evidence-based data was found and practices varied. The clinical image quality at KHCH is good, but issues for development also became apparent. The assessors’ experiences were mainly positive. The results can be utilized at KHCH for the development of quality, and the developed practice can be applied even more widely as a bank of ideas. The role of radiographers could be strengthened. There is a need for standards that could enhance the implementation of self-assessments.

6.2. Evidence Based Practice at Medical Imaging Center of Tampere University Hospital

Presenter: Karoliina Heikkilä, Medical Imaging Center and Hospital Pharmacy of Tampere University Hospital, Finland

Authors: Heikkilä Karoliina, Paimensalo-Karell

Introduction: Working group was set up at the Medical Imaging Center during the year 2012 as part of wider EBP project. The task was to develop evidence based practice (EBP). Group decided to focus on developing competence of the EBP and research utilization among radiographers and nurses initiative started by a small survey where the aim was to describe the level of know-how of the EBP among nursing staff. Survey also gave information about areas that needed to develop so EBP could become part of the everyday practice. The results showed EBP knowledge deficiency among radiographers and nurses (n=56). Though respondents considered research evidence to be significant for their work and research utilization to be part of their job, skills for database searching and information retrieval was considered to be inadequate. Respondents also pointed out that they weren't familiar with the research information of their own field. Findings showed that bringing new evidence in practice was considered to be mainly task of the managers or physicians and physicists. Also students weren’t counseled to search information during their guided clinical training. On the basis of the results group decided to organize training to develop database searching and information retrieval skills. First session was in spring 2013 and it was held by two nursing staff members who had continued their studies. Aim was to familiarize participants with the use of research databases. Key words were radiography, research, evidence based practice and professional development. The articles that met the inclusion criteria were critically appraised by two readers. The respondents consider enhanced knowledge and increased knowledge as a benefit for the profession and for the individual radiographers. The pressure of performing a high volume of examinations and keeping waiting lists down seems to be the main reason for the lack of academic involvement.

7. EDUCATION

7.1. Workshop in Haiti: Issues and Challenges

Presenter: Cynthia Cowling, Monash University, Australia

Author: Cynthia Cowling

Introduction: In April of 2013, the ISRRT in conjunction with the St Alphonsus Foundation organized two workshops, one in the basics of radiography and one in ultrasound. The ISRRT had become very aware of the many issues around the delivery of medical imaging services in Haiti and had received the report from Pan American Health Organization (PAHO) regarding the needs and obstacles. The workshops were in part an opportunity to see exactly what the issues were. The presentation documents the activities of the workshop and describes the issues and complexities encountered, some common to delivery in any emerging country and some unique to Haiti. It also looks at the issue of downstream follow up of workshop activities through a comparison with another recent ISRRT workshop in Uganda.

Methods: Schedules, reports and evaluations from Haiti and Uganda will be shared, analysed and discussed

Results: The presentation provides an overview of workshops in emerging nations and queries the long term benefits. The presentation will be of particular interest to individuals or associations who are contemplating the provision of similar workshops in Haiti and elsewhere.
that safe and high-quality care is delivered to all patients. Even though new knowledge is critical for performing at the highest standards, there is a paucity of research investigating the knowledge updating practices of MRS professionals, as well as the factors that afford or constrain this important activity.

Methods: This study implemented a two-phase sequential mixed methods design. Phase 1 involved semi-structured interviews with 28 MRS professionals. Phase 2 involved the development and administration of a questionnaire to Australian MRS professionals.

Results: Participation in the survey was N=362. This study identified the primary information sources used and areas of knowledge updated by MRS professionals. Statistically significant positive relationships were observed between use of information sources to update knowledge and enrolment in a CPD program, membership of a professional society, greater physical and effective access in the workplace. This study has provided a more nuanced understanding of factors impacting on knowledge updating activity

7.5. Advanced Practice Curriculum Design Using a Modified Delphi Technique

Presenter: Kirstie Matthews, Monash University, Australia
Authors: Kristie Matthews; Catherine Osborne; Caroline Wright

Introduction: National access to radiation oncology services for cancer patients is a recognised issue in Australia, and workforce re-modelling including radiation therapy advanced practitioners is seen as a possible solution. Advanced practice for radiation therapists has evolved in a largely ad-hoc way in Australia, and such roles that are in existence have been implemented to streamline the patient pathway; however there is little formal evidence to support particular models of training or evaluation of clinical impact. To promote a more co-ordinated approach to advancing radiation therapy practice, Monash University were granted funding from the Commonwealth Department of Health through their Better Access to Radiation Oncology’ strategy to direct a project entitled ‘Development and Implementation of a National Educational Curriculum Framework for Advancing Radiation Therapy Practice’. In collaboration with University of Newcastle, University of South Australia, Queensland University of Technology, and RMIT University, a multi-faceted research project was undertaken to inform curriculum design, including literature review, stakeholder surveys, semi-structured interviews, and a modified Delphi technique. This paper will present the method and results of the modified Delphi technique component of the research strategy, and discuss how this evidence has been utilised to inform the resultant radiation therapy advanced practice curriculum.

Methods: A Delphi panel was recruited from senior radiation oncologists, radiation therapists, medical physicists, and academics. A two-round Delphi technique was undertaken to determine the characteristics of advanced practitioners and curriculum model.

Results: The Delphi technique generated a comprehensive list of knowledge, skills, attributes, and learning outcomes of advanced practitioners, and preferred curriculum model. This evidence has been incorporated into an Australian radiation therapy advanced practice curriculum framework that will be launched in July 2014.

7.6. Mrs Whyte’s Amazing Guide for Students

Presenter: Lorraine Whyte, Beatson West of Scotland Cancer Centre, UK
Author: Lorraine Whyte

Introduction: This project began in an attempt to produce a guidebook for student health radiographers, higher education institutes and practice placement providers. This was to improve under-graduate clinical placements at the Beatson and identify the gaps in our provision of clinical training and put our own practice as clinical educators under the microscope. The project also aimed to not only describe but try to understand the experiences of our students during their clinical placements in the department. Stories are generated using the Touchpoint method and the benefits of this approach allows practitioners to see in a more balanced way both the positive and negative aspects of an experience.

Methods: Data was generated using the “Touchpoint” method. This method focuses on emotion by asking the test subject to consider a key point in their journey and select from a range of emotion words those that best describe their feelings about it.
7.7. Radiography Service-Learning: student experiences in relation to reciprocity, personal growth and the development of critical thinking skills

Presenter: René Botha, Central University of Technology, South Africa
Authors: RW Botha, J Bezuidenhout, MM Nel

Introduction: Reciprocity in Service-Learning is created by the “interplay between teaching and learning”. Active learning places strong emphasis on dialogue and deliberation as primary modes of teaching and learning. Service-Learning includes activities and resources that draw from and build upon students’ own experiences, creative ideas, and “funds of knowledge” to increase and diversify the intellectual resources available to all students. Additionally Service-Learning enriches the lives of students since it promotes personal, social, and intellectual growth, as well as civic responsibility. Service-Learning promotes students’ self-improvement and self-actualisation and enriches the lives of all students. Literature also indicates that Service-Learning assists in the development of students’ critical thinking skills, the reasoning process that involves reflecting on ideas, actions and decisions. Since Service-Learning requires a complex set of abilities and a willingness to deal with ideas’, critical thinking is not a discrete isolated skill, but is conceptualised and learned within a specific discipline. The purpose of this study was to analyse whether Radiography Service-Learning cultivates reciprocity, personal growth and critical thinking in students.

Methods: Students and communities were paired into five groups. Students (n=68) completed a structured reflection and participated in interviews after each visit. Students also completed the Watson-Glaser Critical Thinking tool pre- and post interventions.

Results / conclusions: Feedback from the reflections and interviews showed that Service-Learning enhanced the curriculum and reinforced prior knowledge. Students collaborated, used additional resources and had to simplify information. The Service-Learning experience was positive (90.3%) and it challenged (33.5%) and reinforced (50%) students’ values and beliefs. The results of the critical thinking pre-test was 77.72% and for the post-test 81.22%, indicating an increase of the students’ critical thinking abilities.

7.8. Attitudes and perceptions of students and teachers about problem based learning in the radiography curriculum at Makerere University, Uganda

Presenter: Aloysius Gonzaga Mubuuke, Makerere University School of Medicine, Uganda
Authors: Kiguli-Malwadde Elsie, Businge Francis, Mubuuke Aloysius Gonzaga

Introduction: The College of Health Sciences, Makerere University has been training health professionals since 1924 using a lecture based curriculum. After a curriculum review, the curriculum was changed to Problem Based Learning (PBL)/Community Based Education and Service (PBL/COBES) for all undergraduate programmes of which radiography is part. This study was carried out to find the attitudes and perceptions of students and faculty about PBL in the radiography curriculum. This study focused on finding out the attitudes and perceptions of students and teachers about PBL in the radiography curriculum.

Methods: It was a cross-sectional descriptive study in which self-administered questionnaires were used and focus group discussions conducted with both radiography students and faculty.

Results: All the students and 80% of teachers rated PBL highly as a good instructional method. 100% of the students and 100% of the teachers reported that PBL is a gateway to the acquisition of key generic skills like team work, problem-solving and self-directed learning. In adequate learning resources as well as student assessment in PBL were noted as the major challenges.

7.9. Using 3D simulation environment to enhance patient care, student communication skills and interdisciplinary learning across multiple healthcare disciplines in Australia – Preliminary Findings

Presenter: Charlotte Sale, Andrew Love Cancer Centre and RMIT University, Australia
Authors: Sale, C; Poy, D; Dobos, M; Sim, J

Introduction: Healthcare practitioners often struggle in the area of patient communication skills. Student exposure to clinical settings is limited, ad-hoc and variable. While it is appropriate for practitioners to handle difficult communication situations, this further limits student learning opportunities. Although, the traditional mode of face-to-face role play is still being used in some undergraduate curriculum in developing student communication skills, an alternative mode of simulated learning presents multiple advantages. This project has been funded by Health Workforce Australia and builds on a previous study in the cancer care setting. This project aims to engage professional entry students and practitioners in the use simulation learning by extending collaborations between universities and clinical centres across Victoria, Australia. It is aimed to develop and enhance communication skills of professional entry students in radiation science, chiropractic and nursing. Project Aims and Expected Outcomes: •extend the benefit of simulation learning to five groups of professional entry students in health sciences; •extend and strengthen education collaborations on simulation learning between universities education programs and across Victoria’s providers; •engage radiation science and sonography practitioners on the use of simulated learning resources via a collaborative state-wide approach; •develop high quality three-dimensional (3D) simulated learning resources on patient communication for participating professions; and •provide equal access to simulated learning resources especially for students in regional and rural regions.

Methods: The project uses a virtual learning platform for role play. The project will develop discipline specific scenarios that range from simple interactions to challenging cases that students may not be exposed to when on clinical placement.

Results/Conclusions: At the time of abstract submission, the project was in the implementation phase. As part of this paper, preliminary findings of this Health Workforce Australia funded project will be presented at the conference. In previous research, Sim et al (2010, 2011) and Sale and Sim (2012) found participants use of 3D simulated learning to be fun, engaging, interactive and stimulating - enhancing their learning.

7.10. Effective dose calculation – tool for dose optimization

Presenter: Anja Henner, Oulu University of Applied Sciences, Finland
Author: Anja Henner

Introduction: Effective dose in x-ray examination is the sum of the weighted average absorbed doses in all the tissues and organs of the body. International Commission on Radiological Protection (ICRP) has produced a list of tissue weighting factors for a number of organs and tissues. These factors have changed e.g. in 1991 (ICRP60) and 2007 (ICRP 103). Reason for this is new information of the sensitivity of the tissues to radiation. Since more time runs after atomic bombs were dropped in Japan, the more scientific research and results are found by the survivors and their next generations. According to ICRP 103 (2007) effective dose is not suitable for risk estimation of one patient. In teaching purposes it is easy to show the effects of small changes to the dose and risk due to radiation. Calculation of effective dose is based on the Monte Carlo technique or direct organ dose measurements. PCKMC is a widespread and well tested Monte Carlo program for calculating patients’ organs doses and the effective dose in medical X-ray examinations developed in Finland.

Methods: Student can make her / him familiar with the program by watching a recorded guide (Video clip) on a learning platform. The program is installed on computers at school. Students have collected earlier data for ESD (Entrance Surface Dose) calculation.

Results: Typical examinations used are chest and lumbar spine. The PCKMC program calculates the whole body effective dose according to tissue weighting factors from ICRP 60 (1991) and ICRP 103 (2007) so in these examinations it is easy to find difference in ap / pa projection. Effect of added filtration, distance, exposed area and increase / decrease in kVp are easily demonstrated. It is also easy to find differences in effective dose between female and male with the same dose as well as the correlation.
7.11. Imaging Technology Reveals the Impact of Physical, Mental and Emotional Stress in the Patient's Back Story

Presenter: Lazetta Church, Freelance writer, Stress Management
Facilitator, U.S.A
Author: Lazetta Church, M.A.

Introduction: Imaging technologies are powerful tools used to reveal the physical impact of stress in a patient's life. The evaluation of the data collected during an imaging procedure demonstrates the extent of physical damage that has taken place. In addition, the patient's awareness and fear of what may be revealed may cause more stress. Therefore it is up to the technologist to use empathy and be aware that many patients have a back story that lead them to the imaging department. This slide presentation includes five areas of discussion; (1) identification of the types of stress, (2) the impact stress has on the health, (3) the ways in which imaging modalities reveals the physical effects of stress, (4) the importance of understanding that patient's are stressed, and empathy as well as technical skill are paramount for optimal patient care. and (5) relaxation methods technologists can use to decrease personal stress and optimize patient care. Case studies will be used to demonstrate the reasons a patient enters the imaging department. Next, we address the imaging modalities used to reveal specific physical issues, for example a heart patient may have a back story which includes recent loss and after grieving for a period of time the patient ends up in a cath lab. The information gathered during the procedure shows how stress from loss effected the patient's body.

Methods: The slide presentation and handouts will include case studies and research materials from radiologists, physicians and other health care professional.

Results: Even though, imaging technology reveals the physiological impact of mental, physical, and emotional stress, with the help of an empathetic, understanding, skillful technical staff imaging can also enhance health care and help the patient get back on the path to better health.

7.12. Mentorology – A training resource for both mentors and students

Presenter: Min Ku, Australian Institute of Radiography
Authors: Min Ku, Vaissy Jelbart

Introduction: Educational gaming is a process that appears to have been given little credence as a valid teaching tool. However as educationalists, we are aware and recognize that there are different types of learning styles, hence further exploration into this field was warranted. Students of today are exposed to a variety of technology and many different types of teaching when compared with five years ago. They are incredibly technologically savvy and love things that are rapidly moving which keep them engaged and stimulated. Using the traditional didactic approach to teaching is a massive challenge. Students want everything and expect everything now, however in a clinical environment; this is not possible as it is all about the patient and their requirements.

Methods: To bridge the gap between mentors and students, a novel approach was taken to enhance learning for these students through the use of a designed board game. This board game is used to simulate incidences that occur within a live clinical environment.

Results: Through this innovative teaching strategy, a dynamic learning environment is created, enabling an active learning process in a “safe” environment with immediate feedback. Experiential learning allows students and their mentors to understand a concept, generalize and apply their understanding to new and unfamiliar situations. This presentation will explore a novel and fully engaging method to enhance the learning of new students and graduates in a clinical environment.


Presenter: Adam Steward, Western Health, Melbourne, Australia
Authors: Adam Steward, Greg Trypis, Fempe Akdemir, Samantha Wu

Introduction: Over the past decade in Australia there exists a growing trend among universities to move toward a four-year degree program. This is in contrast to the traditional three-year degree with a further one-year clinical practice component to adequately prepare students for entry into the profession. Anecdotally there is a perceived divide in the clinical maturity and work readiness of those students completing a four-year degree, which is presumed secondary to the reduction in clinical contact hours. There is little local evidence based literature and study to support what is the preferred duration and structure of clinical practice embedded into training programs. We are in a unique position in Victoria hosting students of both programs, which allows us the opportunity to assess all aspects of clinical practice within the two options available for entry into the profession. For this study we have surveyed the industry to extract and document the thoughts of the profession as to the appropriateness of the duration and context of clinical training and how it is embedded into the training programs on offer within Australia.

Methods: Surveys were conducted on Chief Radiographers that ultimately employ the graduating students, Tutor Radiographers responsible for the nurturing of the students in the programs and the students completing the courses on offer.

Results: Our study received a response rate of more than 60% for all survey groups, indicating the genuine desire for the profession to be heard. The study has affirmed the necessity of extended periods of clinical practice and the requirement for a carefully integrated academic program that does not inhibit ongoing clinical opportunity. It has also revealed a significant difference in the development of some graduating radiographers.

7.14. The ISRRT Image Interpretation and Pattern Recognition Workshops in English Speaking Africa: the needs, challenges and way forward with comparison to the status in South Africa

Presenter: Cynthia Cowling, Director of Education ISRRT, Australia
Author: Jenny Motto, University of Johannesburg, South Africa

Introduction: This presentation aims to give a brief overview of the activities the ISRRT has been engaged in, in Tanzania, Ghana, Uganda, Malawi and Zambia. The author of the paper, in my capacity as the ISRRT co-ordinator of Education in Africa, has been a facilitator in these workshops and felt it appropriate to share my experiences and thoughts with the many ISRRT members and SORSA members, who attend this congress. A presentation on the activities in English speaking Africa was presented at the Congress in Canada in 2012. Subsequent to this presentation I have given a lot of thought to how we, as ISRRT representatives, can improve our interaction with and assistance to these countries. The strengths of the respective countries, the needs of the countries in Africa, challenges experienced, the skills gaps identified and the ways in which the ISRRT can assist in the future by possibly changing the way we facilitate these workshops, as well as the fun we had, will be highlighted. The challenges, needs and skills gaps will be compared to the findings of my Doctoral research I am currently doing on role extension with specific reference to pattern recognition and image interpretation in South Africa.

Methods: Evaluation forms completed by workshop participants, answers to quizzes that were part of the workshops, interaction with the delegates during the workshops and requests received from radiographers in Africa formed the basis of achieving the objectives of the presentation. Relevant data collected through focus group interviews and a questionnaire from my research will be used to make the comparison.

Conclusion: It may be necessary to change our approach in order to provide the very necessary assistance to radiographers in English speaking Africa with special reference to Image Interpretation and Pattern Recognition. Developing and “developed” counties may not be that different with respect to image interpretation. As the ISRRT we can do so much provided the specific country’s needs are addressed, appropriate interventions are offered and follow up workshops are implemented. As a global NGO, a WHO and IAEA affiliate, the ISRRT has the skills and experienced and can make to make a difference in the lives of radiographers in Africa.

7.15. The use of social media in radiography: an overview

Presenter: Cynthia Cowling, Monash University, Australia
Authors: Cynthia Cowling and Celeste Lawson

Introduction: As Generation Y and Digital Natives make their way into careers in radiography, the manner of communication has changed. No longer are radiographers getting their information from universities and academic journals. The new radiographers (and the patients) are more connected than ever before. Information is now provided via news sites, blogs, podcasts, twitter, wiki, video, mobile apps, and search engines, as well as traditional locations like clinical sites, slideshows or educational
to be addressed if the IEMRT is to be successful on the exam and therefore ready for employment. There is a great deal of information for the IEMRT to review and analyze. Information about the profession and practice in Canada and how it differs, information about coming to Canada and the stress of writing an exam that is competency-based as opposed to a knowledge exam that many are more familiar with writing. Bridging programs are very expensive, there are very few and they are located in larger centres. The pass rate for the IEMRT on the CAMRT certification exam is low. Therefore over the past few years CAMRT has created a number of tools to help the IEMRT assess their status and better prepare for the certification exam.

**Methods:** Research was conducted with funding through the Government of Canada’s Foreign Credential Recognition Program to evaluate the assessment and certification processes, to identify the challenges and barriers IEMRTs experience and make recommendations.

**Results:** The research supported government funding to develop exam preparatory courses for radiological technology, the greatest cohort of IEMRTs, practice exams, self-assessment tools, learning modules on competency-based exams and an employment information. The CAMRT has collaborated with other healthcare organizations to work on projects and produce other tools. A new proposal is requesting funding a therapy exam preparatory course and for work on identifying alternate career paths for the IEMRT.

### 7.18. A Survey Investigating Australian Radiation Therapists’ Behavioural Responses to Fitness to Practise Scenarios

**Presenter:** Caroline Wright, Monash University, Australia

**Authors:** Caroline Wright, Michal Schneider, Brian Jolly, Marilyn Baird

**Introduction:** In Australia, the majority of the health professions are regulated by a national registration and accreditation scheme. A consequence of the implementation of this “national scheme” is that universities need to ensure their graduates are “fit to practise” (FTP). FTP is recognised in Australia as one of the criteria by which the medical radiation science (MRS) professions are regulated. However, as our previous research found, there remains confusion as to practitioner understanding of the concept and how it relates to day to day practice. We found that radiation therapists (RTs) conceptualise FTP in terms of either behaviour, qualification, state of mind or as a continuum of professional experience, with mental health, physical health, self-awareness, technical skills, professional skills, knowledge, continuing professional development, experience and values/ethics contributing to a practitioner’s overall FTP. The aim of this study was to investigate RTs’ behavioural responses to authentic scenarios of sub-optimal practice and to ascertain how often they had experienced similar issues relating to FTP and how prepared they felt to deal with these.

**Methods:** A mixed-method design using on-line surveys was used for data collection. Eight authentic, expert-validated, scenarios were piloted prior to surveying practitioners. Recruitment was via electronic mail-out. Grounded theory guided data analysis.

**Results:** 693 responses from180 Australian RTs were coded. Four themes emerged from RTs responses; physical action, immediate verbal response, practitioner as informant and practitioner perspectives to the scenario. These results suggest that; educational institutions should ensure reliability and validity in their selection processes; FTP and its regulation should be part of the curriculum; practitioners require education on FTP and how to exercise reporting mechanisms within the national scheme.

### 7.19. Radiation protection education for the users of mobile C-arm

**Presenter:** Anja Henner, Oulu University of Applied Sciences, Finland

**Author:** Anja Henner

**Introduction:** Nurses and medical doctors are allowed to use the mobile C-arm in operating theatres and emergency rooms in Finland. According to Finnish legislation nurses working in operating theatres have to have 40 hours (1,5 ects) course in radiation protection in Bachelor degree. Training includes fundamentals of Radiation Physics and Radiation Biology, Radiation Protection Provisions, Radiation Safety Measures at the Workplace and Medical Use of Radiation in the area of mobile C-arm. The purpose of this study was to find what the critical points in education are and how well the key factors affecting to the radiation protection and safe use of mobile C-arm in operating theatres and emergency are learned during the course.
Methods: The course consists of 5 areas given in EU legislation. There are 16 hours lectures and 2 hours demonstration with c-arm, 2 hours written exam and 20 hours independent work (reading legislation and articles). Features and technical parameters of C-arm.

Results: About 80% of the participants passed the test in first time and only 1% needed third exam. Mostly participating were nurses and nurse students. The most difficult areas were the basic concepts: radiation and it’s features, effects of radiation at the molecular, cellular and tissue levels, deterministic and stochastic effects of radiation, dose motoring and categories A and B, controlled and supervised areas and monitoring of radiation exposure of workers.

7.20. Interprofessional learning of trauma patient’s imaging and collaboration

Presenter: Aino-Lisa Jussila, Oulu University of Applied Sciences, Oulu, Finland

Author: Jussila Aino-Lisa

Introduction: The group of 27 students - representing nursing, physiotherapy, radiography paramedics and social work - is presented with a problem or ‘trigger’ and they are allotted a certain amount of time to consider what they already know about the trigger and what they don’t know. From the discussion, the group decides what they should learn in order to solve the trigger. During the following week, the students seek out and assimilate new information. A week after their initial group meeting, the students reconvene to resolve/solve the trigger with their new-found knowledge. The tutor or ‘facilitator’ sits in on the student group sessions and ensures the students stay on track with their learning activities.

Methods: The students were expected 1) to be active in the learning process, 2) to be able to explain about what they know and do; their perception of this suggested it helped them consolidate their own understanding, 3) to be able to make new links.

Results: It was noted that the opportunity to interact with people ‘you would not normally interact with’ helps to reinforce your own knowledge. It was explained that telling somebody else about what you know and what you do can help consolidate your own understanding. It was considered an excellent way to make new links and contacts and communicate with people from Italy, Portugal, Romania, Greece, Namibia, Lithuania and Finland.


Presenter: Timmerie Cohen, Virginia Commonwealth University, U.S.A

Authors: Timmerie Cohen, Virginia Commonwealth University; M. Ferell Justice, Virginia Commonwealth University; Melanie C. Dempsey Virginia Commonwealth University

Introduction: This research compared three clinical preparedness domains, communication ability, social comfort, and clinical confidence, between US-born and non-US born radiation sciences students. The aim of the study was to determine if there were perceived differences in clinical preparedness between them. Student’s place of birth was found to be an influencing factor in each of the clinical preparedness domains. Informing faculty, clinical instructors, and hospital staff of the perceived differences in clinical education preparedness among non-US born students may serve as a catalyst for instructional change. Educators can then formulate instructional strategies to better prepare non-US born students.

Methods: A quantitative design compared the perceived levels of communication ability, social comfort, and clinical confidence between students born in the US and those who were not born in the US. Means were tested for each of the 24 survey questions.

Results: It was found that a student’s place of birth was an influencing factor in each of the clinical preparedness domains. Realizing that cultural influences can affect clinical education experiences, clinical instructors can formulate modifications or additions in instruction that help non-US born students feel more clinically prepared. Modifications in instruction could heighten awareness of the barriers non-US born students may encounter in clinical education.

7.22. Competencies in dental imaging: systematic literature review

Presenter: Anja Henner, Oulu University of Applied Sciences, Finland

Authors: Anja Henner 1, Eija Metsälä2, Marja Ekholm 3, 1 Oulu University of Applied Sciences, 2 Metropolia University of Applied Sciences 3 Helsinki University institute of dentistry

Introduction: Dental radiography accounts for nearly one third of the total number of radiological examinations in the European Union. Radiographers, dentists and oral hygienists perform panoramic, intraoral and now also cone beam computer tomography (CBCT) examinations. Therefore special attention is needed with regard to radiation protection and dose optimization. In order to lower patient doses the staff performing dental examinations must have competence in imaging as well as in radiation protection issues. A systematic review of the core competencies needed by health care staff; radiographers, dental hygienists and dentists performing digital dental radiological imaging quality assurance was accomplished.

Methods: Following databases were searched: Pubmed, Cinahl, Pro Quest and IEEEExplore digital library. Some dental imaging journals and doctoral thesis (Finnish universities) were searched. The search was performed using both MeSH-terms and keywords by option.

Results: All together 1119 titles about the topic were found with the keywords and Mesh-terms used. After this the titles were looked from the viewpoint of relevance and most of the titles (n=1022) were found irrelevant. Abstracts of studies with the relevant looking titles were reviewed (n=97). After that 57 papers were read in full text and final selection mostly on the basis of methodological quality was made. This resulted 43 papers.

7.23. Finding ways to fortify the student learning experience

Presenter: Andrea Thompson, Unitec, NZ and University of Auckland, New Zealand

Author: Andrea Thompson

Introduction: A curriculum comprising a significant academic and clinical component is designed to prepare medical radiation technology (MRT) students for their role as medical radiation technologists. Importantly, the academic and clinical components are integrated to achieve this goal, however, it can be demanding for the students who need to meet nonclinical educational requirements and expectations. The medical imaging curriculum is frequently reviewed and updated to ensure relevancy and currency of learning outcomes, teaching and learning approaches, and assessment procedures. However, in addition to addressing the procedural aspects of a curriculum, it is imperative that students’ experiences of learning are taken into account. Consideration must be given to the curriculum as ‘experienced’ (Barnett & Coate, 2005; Billett, 2000). Students’ experiences of learning should be valued and considered in planning teaching and learning approaches. It is essential, therefore, to develop a more holistic understanding of the educational experience for the students and to establish how their learning is supported so that teaching and learning processes can be fostered and improved. This action research study was structured in two phases. Phase One uncovered the learning experiences of MRT students. Phase Two instigated a learning partnership initiative to improve support for MRT students and their teachers (MRTs). Two key developments, which emerged during the action research process, included the introduction of an online platform to augment the learning partnership and personal digital assistants (PDAs) for students to collect evidence of their clinical learning.

Methods: In the qualitative action research study, data was generated from focus groups, interviews, observation in the clinical and academic settings and a series of meetings which informed subsequent steps in the action research process.

Results: The learning partnership initiative provided a new way to enhance teaching and learning in the clinical setting. However, the findings of this thesis have revealed some significant tensions for teaching and learning for MRTs, students and clinical tutors. Recommendations of the study include curriculum revision that redefines knowledge for practice and assessment requirements, support for MRTs in their teaching role and consideration of a redistribution of funding for clinical education.
7.24. A work integrated learning education and training programme for radiography in South Africa

Presenter: Jeanetta Du Plessis, Central University of Technology, Free State, South Africa
Authors: Ms. J du Plessis; Dr. J Beuzienhouth

Introduction: With the enforced inclusion of work-integrated learning as a structured part of many qualifications in South Africa since 2007, this research study provides valuable information regarding the processes to be followed in the re-curriculum process and the implementation of best practice in work-integrated learning in Radiography education at higher education institutions in South Africa. The aim of this study was to conduct a critical analysis of the current practices in the delivery of work-integrated learning at universities offering Radiography training in South Africa. This analysis was done to identify strengths and weaknesses in the current practice of work-integrated learning in Radiography training with the intention to optimise the delivery of radiographic services by training work-ready graduates. The necessity of the investigation was supported by concerns voiced by more-and-more employers about the quality of the graduates exiting from Radiography training. The ultimate goal of the study was to develop an education and training programme for work-integrated learning in Radiography in South Africa in order to ensure better service delivery to the community. The development of an education and training programme for work-integrated learning from the results of the study will inform programmes in Radiography and other health related professions regarding curriculum design, teaching and learning and assessment practices in the work-integrated learning environment ensuring the delivery of quality graduates for the labour market in South Africa.

Methods: To provide the necessary information on the perceptions of and current practices for work-integrated learning, semi-structured questionnaires were used. Three different questionnaires were circulated to three different groups of participants.

Results: The results from the investigation showed that in many instances work-integrated learning does not exist in the format it is intended to be and that practices related to work-integrated learning are still dominated by workplace learning. By ascertaining that workplace learning is a structured part of work-integrated learning, curriculum developers can benefit from the results of this study to rectify shortcomings in the work-integrated learning components of their training.

7.25. Education of Radiography Students in a Rural Setting in Australia

Presenter: Hazel Harries-Jones, University of Newcastle Department of Rural Health, NSW, Australia
Authors: H Harries-Jones, T Smith. University of Newcastle Department of Rural Health, NSW, Australia

Introduction: Access to equitable health care services for rural and remote Australians is long-standing, serious problem. Rural health services and health outcomes are significantly worse than in the major cities. Improving the recruitment and retention of staff has been a major means of addressing this problem and providing the opportunity for health care students to spend part of their course in a rural area has been seen as an innovative way of attracting future staff to rural areas. University Departments of Rural Health were first set up in 1998 and there are now 11 across Australia, funded by the Australian Department of Health. These centres have grown into thriving multidisciplinary student communities where students from multiple health professions are able to continue to follow their programmes of study remote from their main campus. The University Of Newcastle Department Of Rural Health (UoNDRH) is one such centre, which was set up in 2002. Diagnostic Radiography students from Newcastle are able to spend their final year at one of two rural sites. The presence of University education facilities also provides local practitioners with access to libraries, academic staff and CPD opportunities.

Methods: Lectures are by video conference from the main campus, with tutorials delivered locally. Clinical time is spent at local imaging centres. Extra-curricular activities include interprofessional learning, community engagement and cultural training.

Results: In 2003, 24 radiography students undertook the program (99 student-weeks). In 2013, 59 students participated (413 student-weeks). In 2012/13, 100% secured pre-registration year posts. Longitudinal studies follow graduate practice in rural areas. The UoNDRH gives students a unique set of experiences useful for their future career and it is a popular alternative to studying on the main campus. They develop a more holistic view of healthcare and understand the roles of other professions.

7.26. Evolution of Curriculum Delivery for a Radiation Therapy Distance Education Program 10 Years Post Implementation; Embracing the Electronic Era

Presenter: Caroline Wright, Monash University, Australia
Authors: Caroline Wright, Catherine Osborne, Kellie Knight

Introduction: The Master of Medical Radiations in Radiation Therapy (M(MRR)) is a unique graduate entry program which was the first of its kind in Australia. It is delivered by distance education, over two calendar years incorporating 63 weeks of clinical placement. This mode of delivery makes it ideal for clinical centres in regional and remote areas of Australia that find recruitment and retention of students and staff a challenge. However, with this model they can recruit local students and retain them in the workforce post-graduation. The program commenced in 2003 with the majority of theoretical content being delivered as hard copy material, supported with an on-line learning platform for discussion and reflection. Over the past decade, there have been significant advances in curriculum delivery, including use of the VERT simulated learning environment and a greater emphasis on the use of electronic learning systems and resources, such as on-line assessment and ‘real-time’ on-line support sessions. This paper describes how the curriculum has evolved to embrace these innovations and new educational technologies. It discusses how we have adapted these for delivery off campus to meet the needs of our distance education students and continue to provide a quality program.

Methods: This paper is a commentary and critical reflection with respect to current literature on how curriculum delivery has evolved in the electronic era. A review of the literature was undertaken on electronic databases to support the authors’ reflections.

Results: New educational technologies have had a significant impact on curriculum delivery for our distance education program. Implementation of these technologies is resource intensive in the first instance however, student support has been strengthened. As there continues to be an increase in the rural and regional radiation therapy service across Australia, our innovative program will continue to adapt to provide a flexible but robust model of radiation therapy entry level education.

7.27. Maintaining privacy and professionalism in an age of social networking

Presenter: Lori Boyd, Monash University, Melbourne, Australia
Author: Lori Boyd

Introduction: The use of social media platforms such as Facebook has increased exponentially in the past decade. In 2013 it was estimated that there were 1.26 billion Facebook users worldwide with over 50% penetration of the North American market. Health professionals are heavy users of social networking sites. Research has found that in 2013 in the U.S. over 60% of health care professionals enhanced their social profile and furthermore that only one in three health professionals refrained from posting negative content on their or other’s sites. Professional health organizations and regulatory health boards are aware that Facebook is regularly accessed by both health professionals and patients and that these interactions can lead to problems related to privacy breaches and unprofessional conduct by practitioners - especially when personal health information is discussed or uploaded. In the U.S. it is estimated that 59% of all health workers are blocked from accessing social media networks while at work. However, such measures cannot adequately address the problem of privacy breaches and unprofessionalism with social networking. As a result of a number of high profile cases, many health institutions, health professional associations and regulatory boards have developed guidelines and policies on the use of social media by employees and members - especially those representing physicians, nurses and pharmacists. This presentation considers both the benefits and potential risks associated with the use of social media by radiographers and suggests methods to decrease online breaches of privacy and other instances of unprofessional conduct related to the use of social networking sites.

Methods: A literature search was conducted on issues related to the use of social media in healthcare and related policies and guidelines. Key features of these issues, policies and guidelines are characterized and presented.
Results: This comparative analysis concludes that educators, professional associations and international health organizations such as the ISRR all have a leadership role to play in educating health professionals on the dangers of the use of social media to interact with other health professionals and with patients – especially where personal health information is involved.

7.28. An overview of Radiological Technology Education and Training in Nepal

**Presenter:** Thakur Prasad Lamsal, **Sub-Regional Hospital, Dadeldhura, Nepal**

**Author:** Thakur Prasad Lamsal

**Introduction:** As a developing country, the health care sector in Nepal has very limited resources. Nepal is still struggling to improve and manage even conventional radiological examinations. Radiological Services in Nepal started in 1923 and the first health related training program started in 1933 at Nepal Rajikey Ayurved School. However, formal radiological education in Nepal started in 1936. Since 2008 3 three years diploma radiography courses has been conducting across the country. In Nepal there are 125 vocational health training institutes and among them only 15 are conducting radiography educations. Bachelor level radiography education is taught in two universities whereas master level radiography course is taught in one and next university is in pipeline. Radiography teaching methodology like audiovisual and computer aided methods are being used, whereas the curriculum’s are not based on problem based learning. Continuing professional programme isn’t familiar around the students and professionals. Radiography licensed accreditation organization; Nepal Health Professionals Council has established their curricula, minimum standards of education/training guidelines and code of ethics but monitoring and evaluation activates were not done regularly across the nation. Activities on quality assurance and radiation protection were never done by both Council for Technical Education and Vocational Training and Nepal Health Professional Council. Optimizing patient care is a cross cutting issue globally, hence to obtain such objective from Nepal, here we should promptly established a standardization of education and training Nepalese Radiological Technology Education.

**Methods:** A review of historical documents and interviews with selected officials from Nepalese Radiological community were performed. A combination of desk review has also been done related to policies, strategies, and plans among the profession.

**Conclusions:** The situation of Nepalese radiography education is alarming; in the sense of increasing quantitative production with a decrease in qualitative services. Training of mid-level staff is regarded to be of low quality whereas standardization of education and training is minimal. Regular monitoring and evaluation doesn’t exist in the field of radiography education by concerned authorities. Quality radiological Services will only exist in Nepal when it has provision of effective legislative authority.

7.29. Standardised training and assessment in radiation safety for diagnostic radiographers

**Presenter:** Belinda Van Der Merwe, **Central University of Technology CUT**, Free State, South Africa

**Author:** B vd Merwe

**Introduction:** In South Africa, the Department of Health Directorate Radiation Control, lists the responsibilities of license holders of medical x-ray equipment in the Code of Practice for users of medical x-ray equipment. The licence holder and responsible person must apart from equipment requirements, ensure that persons occupationally exposed to ionizing radiation (radiation workers) are identified and issued with personal radiation monitoring devices (PRMD’s). The code mandates further that every radiation worker receive education regarding the risks and safety rules of ionizing radiation. Diagnostic radiographers and radiologists employed in x-ray departments are potentially exposed to ionizing radiation and therefore radiation workers. Entry level radiation workers, as example, the first year radiography student or registrar are legally required to be monitored and issued with dosimeters as soon as they are placed in clinical practice. Tertiary curriculums of these disciplines include academic exposure in the aspects pertaining to ionizing radiation but standardisation concerning the teaching of radiography students as dosimeter holders by higher education institutions is not certain. The authentic interpretation of the qualification exit level outcomes of every tertiary institution in S.A may have the potential to result in differences in content and assessment. In South Africa currently no standardised training course for dosimeter holders in diagnostic radiography exists. It is assumed that dosimeter holders adhere to ionising safety regulations but it is imperative to provide evidence of fulfilment in the light of the statement that most over exposures are generally caused by human error. This study can serve as a directive for higher education institutions as well as licence holders that will benefit if evidence of fulfilment of the education of radiographers as radiation workers in the hazards and risks of ionising radiation can be confirmed.

**Method:** A Delphi process established a set of criteria needed for the academic development and implementation of a training course for diagnostic radiography students. The Delphi process involved a qualitative approach to determine the objectives for the dosimeter training course. The second part of the study was to determine the knowledge of the radiation worker regarding the decided outcomes before the teaching and learning (T & L) activities and to conclude the effect of the planned T & L activities on the accomplishment of the outcomes by means of a post questionnaire. Two questionnaires were compiled, basic, for the first year radiography student and advanced for the graduate (representing the potential licence holder of x-ray equipment).

**Conclusion:** The opinion of the Delphi experts guided the outcomes of a standardised training course. The value of this study is to ensure that radiography students will be equipped with sufficient knowledge to implement regulations and requirements to ensure that the radiation exposure to radiation workers and patients is kept ALARA.

7.30. A novel approach to medical imaging pre-clinical skills training

**Presenter:** Debbie Starkey, **Queensland University of Technology, Australia**

**Authors:** D.Starkey; P. Rowntree; T.Gunn; P.Bridge, **Queensland University of Technology, Discipline of Medical Radiation Science**

**Introduction:** The Medical Imaging Training Immersive Environment (MITIE) is a reality developed a virtual reality platform for students of Medical Imaging. The software application was developed at Queensland University of Technology (QUT) through funding support from a Health Workforce Australia “Simulated Learning Environments” grant.. At QUT, MITIE has been utilized as a training technology for students to develop and enhance clinical skills in medical imaging positioning. The software program enables students to practice the positioning of the radiographic equipment and the patient for a range of patient examinations and view the outcomes. The resultant image can be compared and manipulated to meet the given “gold standard” for positioning. The MITIE system is able to be utilised as either a desktop 2D version or for use in a 3D immersion projection laboratory. Current modules are: General radiography “C” Arm Fluoroscopy in the context of an Operating theatre Computed Tomography.

**Methods:** This presentation will demonstrate the system and describe the current applications and experiences with the integration of MITIE into the Medical Imaging Curriculum. Qualitative analysis of student feedback following the use of MITIE will be given.

**Results:** The introduction of the MITIE training system has complemented the existing opportunities which students have in the development of pre-clinical skills using a conventional medical imaging laboratory and the associated PACS components for image viewing. It has also broadened the opportunities for skills development in the process of obtaining an image using a CT scanner and C–arm units prior to encountering them in clinical practice.

7.31. What influences the organization of specialized radiography training?

**Presenter:** Piret Vahtramäe, **Tartu Health Care College, Estonia**

**Authors:** Vahtramäe, P., Läänelaid, Z.

**Introduction:** Each patient has the right to receive high quality health services, including diagnostic imaging and radiotherapy services. To provide these high quality services the professionals should have specialized training in different fields of diagnostic imaging and radiotherapy, although the conduct of the specialized training courses is often compromised by the limited amount of human and financial resources that are available.

**Methods:** Overview of 1) development of a specialized training curriculum, 2) evaluation of the curriculum and training process by students, experts and teachers, 3) employment of the graduates and the factors influencing the sustainability of the curriculum.
Results: The specialized training curriculum for radiographers in the fields of ultrasound, nuclear medicine and radiotherapy was developed. The sustainability of the specialized training is facilitated by the need for trained specialists of the health institutions and presence of the curriculum. The factors that inhibit the sustainability of training are the lack of the need for regular and permanent training and limited financial resources. The problem could be solved by international training.

7.32. The Use of Simulation in Diagnostic Imaging Programs

Presenter: Cindy Humphries, SAIT Polytechnic - Calgary, Alberta, Canada
Author: Cindy Humphries

Introduction: With the accessibility of educational practicum placement sites at a premium and classes increasing in size, it is becoming increasingly hard to have students experience and become competent in everything they need to accomplish while in the clinical setting. Simulation is being used more and more to allow the student to build confidence and proficiency in competencies prior to going out to their practicum placements. Simulation is a great bridge between theory and clinical practice. It offers a safe environment for the student to develop critical thinking, adaptive techniques and confidence in their skills. It also allows for time to debrief immediately afterwards where this may not be possible in the busy clinical setting. The use of simulation allows the student to learn hands on and reach a higher level of performance prior to practicing their skills on actual patients. This allows for improved quality and patient safety within the clinical environment. The Diagnostic Imaging programs at SAIT Polytechnic in Calgary, Alberta, Canada have tried several types of simulation labs over the last few years. Based on our experiences, the different types of simulation labs tried will be explained as well as the feedback received from the students, Instructors and other participants involved.

Methods: The simulations tried consisted of using: 1) 2nd year students and trauma make-up, 2) professional settings, 3) mock clinics, 4) interprofessional scenarios and 5) the Human Patient Simulation Lab.

Results: Simulation was found to be a positive experience for the students regardless of the complexity of the simulation. The exposure to different scenarios prior to clinical placements allowed them to have some prior experience to help them when they come across similar scenarios in the clinical setting for the first time. Feedback from the Student Liaisons in the clinical setting was that the students were better prepared for the clinical setting with the use of simulation.

7.33. Masters level education in quality assurance in dental imaging

Presenter: Eija Metsälä, Helsinki Metropolia University of Applied Sciences, Finland

Introduction: Aim is to describe Masters level web-based course produced about dental imaging quality assurance. Dental imaging is increasing and becoming more demanding. Many health care professionals perform dental x-ray examinations with varying levels of education about examination techniques, radiation safety and dose optimization and quality assurance (QA) procedures of dental imaging devices. In Finland, dental imaging may be performed by a dentist, physician, or radiographer. This presentation describes Masters level web-based course produced about dental imaging quality assurance. Methods Pedagogy and contents of the course applies evidence-based method of developing curriculums. In defining relevant level of competence, European quality framework (EQF) level 7 was the guiding principle.

Conclusions: Amount of dental imaging is increasing and also wide range of health care professionals is taking part it and associated quality assurance procedures. This is why also dental hygienists, radiographers and dentists need wider understanding about how to develop QA procedures and quality assurance. Project described here respond for this need for its own part.

7.34. Importance of quality assurance in dental imaging – viewpoint of education

Presenter: Eija Metsälä, Helsinki Metropolia University of Applied Sciences, Finland

Introduction: Although doses incurred during dental examinations are relatively low, dental radiography accounts for nearly one third of the total number of radiological examinations in the European Union. Project purpose was to develop evidence-based (EB) digital imaging and quality assurance (QA) for dental X-RAY equipment and viewing conditions. Specific aims were to develop: curriculum, evidence and web -based pedagogy, e-learning materials for dental imaging and viewing conditions, X-RAY equipment quality assurance and dose optimization.

Methods: The project benefits the EB method of developing curriculums. This means that the core competencies, learning outcomes and contents as well as learning material will be developed applying the principles of EB practice. Also the pedagogy of the e-learning course applies these principles. Before the development work started it was made a survey about the educational needs of health care staff about dental imaging QA. Also systematic review of dental imaging QA procedures was made.

Results: Project produced 15 ECTS educational e-learning package for Bachelor and Masters level about dental imaging QA. Bachelor level modules comprise technical basics of imaging and quality assurance, QA in introral imaging, QA in panoramic imaging and QA in cone beam ct. It also contains a module about patient dose assessment.

Conclusions: Special attention to radiation protection and follow up of doses and image quality is needed in a form of education to the health care staff taking dental x-rays. The educational package produced in this project support the dental imaging quality assurance competence of dental hygienists, radiographers and dentists.

7.35. Expanding high impact practices to engage deeper learning in the radiologic science curriculum

Presenter: Sarah Baker, Indiana University School of Medicine, U.S.A
Author: Sarah Baker

Introduction: Radiologic Sciences education is dynamic and ever changing to meet the needs of our students. To assist our students to meet the evolving educational challenges and to prepare students for higher levels of integrative learning between didactic and clinical components it is imperative that we engage students in deeper learning. Kuh (2008) has identified a full range of experiences dubbed “high impact practices” which contribute to students’ intellectual and professional development and provide enrichment experiences to classroom learning in structured and educationally meaningful ways. These practices allow for integrating learning in a more holistic fashion from start to finish within our educational programs. High impact practices provide a means to integrate real-world practices (such as clinical education/internships/practicum), with formal classroom. Effective educational practices, employing a variety of active learning pedagogies identified as high impact practices are: first-year seminars and experiences; common intellectual experiences; learning communities; writing-intensive courses; collaborative assignments and projects; undergraduate research; diversity/global learning; service learning, community-based learning; internships, and capstone courses and projects. While internships/practicum/clinical education are imbedded within our curriculum, many of the other “high impact practices” are incorporated in varying degrees or not at all. The presentation will focus on the potential ways to expand high impact practices within our curriculum and re-shape learning and student engagement.

Methods: The powerful pedagogies associated with high impact practices which embrace active learning and deeper approaches to learning along with reflection will be discussed within the context of radiologic sciences along with associated positive outcomes.

Results: Adherence to a curriculum with radiologic sciences that incorporates active learning, critical thinking and problem solving skills
provides technologists with the necessary technical and professional skills to practice in our dynamic profession. Incorporation of high impact practices within our curriculum will allow for deeper student learning, higher student engagement, and increased application which will benefit patient care.

8. GENERAL RADIOGRAPHY

8.1. Radiographer in field hospital

Presenter: Nina Nieminen, Päijät-Hämeen Sosiaali-ja terveysyhdistyö, Lahti, Finland

Author: Nina Nieminen

Introduction: The International Red Cross assists in many different situations. Help is often needed after an earthquake, tsunami or war. I have been part of the Finnish Red Cross International Reserve since 2006. In January 2010, a massive earthquake rattled Haiti. The International Red Cross decided to send field hospital to Haiti. Part of the hospital equipment and staff flew on a charter flight from Helsinki via Berlin to Haiti. Our hospital was quite large (started with 120 beds) and it had everything: outpatient department, intensive care unit, wards, laboratory, x-ray, pharmacy, operating room and sterilization. The hospital grounds also included sleeping tents for the staff. The x-ray tent had its own detailed layout and the logistics team helped me set it up. The x-ray machine I used was a Siemens Polymobil III. The developing system (table model) was old-fashioned, but it worked. The developing system was integrated into a “darkroom”, which was actually just a dark tent. Radiation protection was also taken care of. The process for treating patients was simple. Patients first went to registration, then to see a doctor and finally to the x-ray area. Usually only ap/pa was taken (for example thorax, hip, leg). Hip and pelvis fractures were extremely common. People in Haiti do not speak English, so I had my own interpreter. I stayed in Haiti close to five weeks. Our hospital was open 24 hours a day, 7 days a week with no days off. I carried a radio with me at all times because I was the only radiographer at the hospital. Not many radiographers are interested in working and living in these types of difficult and extreme conditions. It is very challenging, but at the same time rewarding.

Methods: In field hospital radiographer is responsible for x-ray and ultrasound machine. Radiographers job is to take basic x-rays and be part of hospital staff.

Results: To be part of Red Cross International reserve is one way to help people. Working in field hospital is really team work: everybody helps each other. In this way you can connect your work and free time. Radiographer needs many skills to get good x-ray. Basic knowledge from anatomy and good technical skills gives you good basic to work. Working in difficult and different conditions is challenging, but when you get good photo, it is rewarding for everybody.

8.2. Practicing Forensic Radiology after a Natural Disaster: A Radiographer’s experience in Haiti

Presenter: James Temme, University of Nebraska Medical Center, U.S.A

Author: James B. Temme

Introduction: On January 12, 2010 a 7.0 earthquake devastated the city of Port au Prince, Haiti, leaving at least 230,000 dead, 200,000 injured and one million homeless. The aftermath overwhelmed the Haitian government of this impoverished country. Massive aid poured into Haiti from many countries, including the USA. Many of the dead were United States citizens who needed to be recovered and identified. To help in the process of recovering and identifying the remains of American citizens, the Disaster Mortuary Operational Response Team (DMORT), a unit of the National Disaster Medical System (NDMS) of the United States government was deployed. DMORTs are composed of private citizens, each with a particular field of expertise, who are activated in the event of a disaster. The Radiographer plays a major role as a member of this team. DMORT’s role in Haiti, the interdisciplinary team members and their responsibilities with specific emphasis on the role of the Radiographer will be discussed in this presentation. The difficulties poise in performing this type of US government operation in another country in the immediate aftermath of a natural disaster are presented. The personal experiences of a radiographer during his two week experience in Haiti as a member of DMORT are discussed. The types of radiographic equipment, imaging receptors and positioning techniques utilized will be presented.

Conclusions: Using radiography to help identify deceased individuals or human remains is a landmark contribution to forensic science. For many years forensic pathologists have used radiography to acquire a permanent record of part of a deceased person’s anatomy and pathology before performing an autopsy. Radiographic images are a representation of the patient’s anatomic structures and serve various purposes. Comparison of ante mortem and postmortem images may be useful.

8.3. Radiology in Haiti: Challenges and Rewards in a Developing Country

Presenter: Barb Tomasini, Saint Alphonsus Regional Medical Center, U.S.A

Author: Barb Tomasini

Introduction: In 1997, I assessed radiology capabilities at Saint Damien’s Hospital in Port au Prince, Haiti. Because of extreme poverty, donated equipment and a volunteer team of experts were utilized to establish a radiology department at St Damien’s. Since that time x-ray has expanded from portable film x-ray and chemical processing to digital imaging. Digital radiology remains successful at Saint Damien’s, Haiti. There are now multiple, diagnostic modalities and the number of digital procedures has increased significantly. Through the generosity of radiologists, teleradiology services were donated after 2010 earthquake.

Methods: The successful progression of portable x-ray to digital imaging in Haiti required a combination of clinical skill, generosity, trust, fortuitous construction, and shared commitments in the face of technological, cultural and natural challenges.

Results: Radiology is possible in developing countries. Challenges including the 2010 earthquake are discussed. Subsequent rewards are outlined. Radiology has provided a better diagnostic healthcare experience at St. Damien’s Hospital. Critical thinking with a passion to help in developing countries is a positive option for Radiographers. Ongoing commitment to radiographer education in Haiti is a future goal that will help provide sustainability for Haiti’s radiology future.

8.4. The technical studies of measurement and calculation method of coordinate localization of intraocular foreign bodies with DR

Presenter: Xinpei Chen, The First People’s Hospital of Xuzhou, China

Authors: Chen Xinpei, Dai Xiuhong

Introduction: Eye foreign body is a kind of common traumatic eye disease. In recent years, along with the increase in individual companies and for insufficient recognition of safety protection work with the eye, eye foreign body has a tendency to increase. There are multiple ways of ocular foreign body positioning, such as CT, DR, B can be fixing the eye foreign body check to wait. DR ocular foreign body positioning can provide clinical foreign bodies in the corneal limbus, up and down depending on the shape axis, such as nasal temporal side is before and after the axis and the relevant values, especially use of DR image post-processing workstation advanced image post-processing software, can be adjusted for density and magnification, etc., also can carry on the measurement and calculation of the foreign body image, make the previous low density smaller foreign bodies are able to better show up, make up for the deficiency of the traditional X-ray.

Methods: Taken the eye socket is lateral slice in the patients after the implementation of the ocular surface anesthesia put starting after the balloon inside the locator, measure the coordinate values of foreign bodies in the image workstation.

Results: The coordinates positioning effect of intraocular foreign bodies with DR whether positioning diagnostic data information, X-ray radiation dose, deformation and distortion of foreign bodies, and screening patients expenditures, DR inspection techniques are not as inferior as CT examination technology, therefore DR which used to check the metallic eye foreign body positioning should be as the preferred method to promote and applications.
8.5. Principles and clinical application of multi-resolution image processing in computed radiography

**Presenter:** Motohiro Tabuchi, Dojinai Konko hospital, Japan  
**Author:** Motohiro Tabuchi

**Introduction:** Medical X-ray imaging creates processed images with subjective contrast. In screen film (SF) systems it is difficult to depict images if the subjective contrast is very high. For example, the thorax contains lungs (high radiolucency) and bone (low radiolucency) and therefore has very high subjective contrast, which results in missing information due to the performance limits of SF systems. On the other hand, computed radiography (CR) systems can work more flexibly than SF systems by using frequency processing for images with very high levels of contrast. To solve this problem, CR systems employ sharpening processing in order to depict a wide range of contrast with a low gradation, using high pass filters that suppress fluctuation of the direct current (DC) component between local images. Before development of CR systems, two output methods were used which preserved the DC component to approximate SF images and sharpened images with high pass filters. However, this style of processing was not universally adopted due to a feeling of degraded reliability created by resampling images with a coarse reading pitch and by using an artificial signal in imaging processing. Therefore, even though improvements in reading the sampling pitch and obtaining actual-sized images have been made, the present mainstream method is just an iteration of former methods that were used to approximate SF. This paper proposes that images that are mainly composed of an alternating current (AC) component are valid for clinical detection of abnormalities also seen in X-ray images that use a fluctuating DC component, such as in X-ray images of the thorax.

**Methods:** Three kinds of multi-resolution images were processed by changing the addition ratio of the original images. Subjective evaluation was performed through a questionnaire survey of 10 clinicians and received operating curve (ROC) analysis.

**Conclusions:** The majority of examiners preferred reading conventional images. However, ROC analysis denotes that the proposed method improved recognition performance for detection of abnormalities. This paper proposes that more active use of variable frequency properties of CR systems can help clinicians depict a wide range of image resolutions with a low gradation. This method is effective in images with high subjective contrast such as those of the thorax.

8.6. Abnormal incidents concerning x-ray in healthcare, cases reported to Finnish Radiation and Nuclear Safety Authority (STUK)

**Presenter:** Elina Hallinen, Finnish Radiation and Nuclear Safety Authority (STUK)  
**Author:** Elina Hallinen

**Introduction:** According to the Finnish Radiation Degree (1512/1991) section 17 deals with notifications of abnormal events (abnormal incidents) as follows “STUK shall be notified of the following without delay: any abnormal event pertaining to the use of radiation that is substantially detrimental to safety at the place where the radiation is used or in its environs, or any other abnormal observation or information of essential significance for the radiation safety of workers or the environment.” Until 2010 the frequency of reported incidences concerning x-rays in healthcare was approximately one reported case every other year. Since then the amount of reports has risen due to active promotion for reporting the incidences. In year 2013 total of 64 cases of abnormal incidences were reported concerning x-ray in healthcare. In this oral presentation statistics and individual cases of reported abnormal incidents are presented.

**Methods:** Each abnormal incidence is reported individually. Necessary additional information is requested and/or actions are taken by STUK.

**Results:** There have not been reported incidences, which would have required intervention by STUK. Statistics of types of events, causes of the events, exposed parties, exposure levels etc. can be drawn. The reported abnormal incidents in the past few years have given a moderate view and understanding of what kind of processes are vulnerable to failures. Individual cases can be used for educational purposes to enhance radiation safety.

8.7. Is My Digital X-Ray Image Acceptable For Diagnosis?

**Presenter:** Philip Ballinger, The Ohio State University, U.S.A  
**Author:** Philip W. Ballinger

**Introduction:** We routinely ask ourselves; Is my image acceptable? The question when viewing a digital x-ray image can have multiple answers. To assist in answering, phantom and patient images are analyzed and reviewed to provide examples regarding how the image is affected by pathology, proper and inadequate collimation, use of lead shielding, positioning and other operator controlled situations. Current literature reports cases where radiographers may overexpose a region of interest and use post-processing to “center” and show a “properly positioned patient”. Multiple phantom images are reviewed to show how images can be adjusted and the differences between CR and DR images. The basics of using collimation, lead rubber and consistency of the operator are also demonstrated. The four basic exposure index values used by the major equipment manufacturers are compared and contrasted which show the direct and indirect relations used which further leads to confusion between radiographers in different facilities and countries.

**Methods:** Reviewing patient images and creating images using phantoms, the limits and limitations of digital radiographic equipment are identified and interpreted.

**Conclusions/Results:** If improperly used, digital radiographic equipment can produce images for diagnosis with increased radiation exposure to the patient while compromising the quality of the image.

8.8. Does e-learning prepare radiographers to provide a preliminary clinical evaluation for musculoskeletal trauma images?

**Presenter:** Beverly Snaith, Mid Yorkshire Hospitals NHS Trust, Wakefield, UK  
**Authors:** Snaith B; Lewis E; Lancaster A; Flintham K; Hardy M

**Introduction:** In the UK radiographers are expected to contribute to trauma decision making through preliminary clinical evaluation (commenting). Evidence has shown that lack of confidence and training are perceived barriers to the implementation of commenting. A strategy to address this has been the development of an online training package (e-LH Image Interpretation) by the CoR and DH. This paper reports the initial findings from a single centre study to evaluate the effectiveness of this training in preparing radiographers to participate in commenting. It will specifically focus on the pre-learning assessment of knowledge and language used by radiographers when writing their comments.

**Methods:** A prospective pre-test/post-test design was used with online questionnaires to identify radiographers’ self-reported confidence and image interpretation tests. Outcome measures include specificity, sensitivity, and comment content analysis.

**Results:** The sample included 18 radiographers each interpreting 2 banks of up to 50 musculoskeletal trauma cases in simulated clinical conditions. Initial analysis demonstrated marked variation in structure and length of comments. Common errors and correlation between confidence and accuracy will be reported. Content analysis provides additional insight into use of terminology and recognition of incidental findings. Post-test analysis will demonstrate the potential role of e-learning and is ongoing.

8.9. Self-assessment of wrist radiographs

**Presenter:** Susanne Kvistö, Oulu University Hospital, Finland  
**Authors:** Susanne Kvistö, Ullamari Kuismin, Tarja Holtinkoski, Terhi Nevala

**Introduction:** The purpose of this self-assessment project was to improve the quality of wrist radiography so that possible erroneous assessments in patient treatment, caused by inferior projections, could be minimised and high-quality, diagnostic radiographs could be produced. In an internal audit of the Emergency Radiology Unit, attention was focused on overly long image areas and inaccurate projections in orthopaedic radiography. Radiologists had received feedback from the clinics because of inferior wrist radiographs. Also, self-assessment as a part of quality control had been brought up during training arranged by the Society of Radiographers in Finland. All of these issues contributed to the initiation of self-assessment in the Emergency Radiology Unit of OUH (Oulu University Hospital) in the spring of 2012.

**Methods:** The leaders of the self-assessment project first acquired information on what self-assessment means and what it is based on. The
clinical audit’s specialist team’s recommendation no. 7 functioned as a guideline (Ref 1). The self-assessment project team gathered wrist self-assessment radiographs taken in the Emergency Radiography Unit altogether three times. The first two times we gathered 18 wrist radiographs of patients and the last time, 10 radiographs. The staff of the Emergency Radiography Unit assessed the radiographs using OUH’s criteria for a good radiograph.

**Results:** The first time the implementers of the self-assessment project randomly gathered 18 wrist radiographs in the Emergency Radiography Unit and we created an Excel table for the assessment. Together with the staff we assessed the radiographs according to five different criteria for a good radiograph given in the imaging instructions, one criterion at a time. We assessed whether or not each criterion was met. We used a strict assessment scale: either the radiograph met the criteria or it did not. As an outcome, 63% of the assessed images met the criteria for a good radiograph. The self-assessment clearly indicated that the criteria for a good radiograph which we used were not sufficient. The leaders of the self-assessment project informed the team in charge of OUH’s imaging instructions about this and the criteria for a good radiograph and the imaging instructions were modified. Now the criteria became more precise, concrete and supportive of the radiographer’s work. Now there were 11 criteria for a good radiograph.

### 8.10. The effect of body morphology, source image distance and patient orientation on perceived rotation on chest radiographs

**Presenter:** Maryann Hardy, University of Bradford, UK  
**Authors:** Maryann Hardy, Blake Scotland, Lisa Herron

**Introduction:** Chest radiography is a commonly undertaken radiographic examination but achievement of reference standard images can be challenging due to patient condition and positioning compliance. One common positioning fault reported is patient rotation around the sagittal plane. Traditionally, this has been assessed by examining the distance between the medial end of the clavicles and a line drawn through spinous processes at level of the clavicles. Where the distances between the medial end of clavicles and spinous process line are not equal, patient rotation around the sagittal plane is assumed with a greater variation in distance implying a greater degree of rotation. However, no identified published study has compared radiographic appearances of rotation with actual known rotation or considered the impact of body morphology, in particular the antero-posterior (AP) diameter of the thoracic cavity, or source image distance on radiographic appearance and assessment of rotation. Neither was it clear from the literature what the average AP diameter of the thorax at the level of the clavicles was in adults populations. This 3 phase experimental study was undertaken to estimate the AP diameter variation in adult populations and establish the effect of changes in body morphology, source image distance and patient orientation on radiographic appearances of rotation.

**Methods:** A prototype model was used. The model could be rotated about the centre to replicate clinical practice. Images were acquired at 0°/2°/5°/7°/10°/15° rotation and at 100/150/180cm SID with model in both AP and PA orientation.

**Results:** For the same degree of actual rotation, a wider AP diameter, shorter source image distance and PA orientation increased the radiographic appearance of rotation. The clinical importance of this finding is in questioning the continued appropriateness of the clavicle-spinous process measure for assessing rotation and recognising the possible impact that variations in body morphology, source image distance and patient orientation may have on the rotational threshold for repeating examinations.

### 8.11. The number of inappropriate spine radiographs in a primary care setting is decreased by active guideline implementation

**Presenter:** Heljä Oikarinen, Oulu University Hospital  
**Authors:** Oikarinen H, Talvonen P, Niinimäki J, Liukkonen E, Mattila S, Tervonen O

**Introduction:** It has been estimated that over 100 million European citizens suffer from chronic musculoskeletal pain. Radiographs of the spine are common. However, they are of limited value and do not improve outcome unless there are clinical “red flags” present suggesting serious pathology, such as fracture, infection, cancer, or inflammatory disease. Furthermore, the radiation doses of spine radiographs, especially of the lumbar spine, are among the highest in conventional x-rays and radiation is delivered to some of the most radiosensitive organs. Imaging guidelines have been published in several countries, but their implementation has been inadequate and unjustified spine radiographs are a universal problem. The role of both practitioners and radiographers is fundamental in assessing justification of spine x-rays. It is known that guideline implementation may be improved by well-focused interventions. In some studies, distribution of guidelines with an educational message or lectures and feedback has succeeded in reducing general practitioners’ spine radiograph referrals. The purpose of this study was to find out whether active guideline implementation with education can reduce the number of spine radiographs in a city health centre. Furthermore, justification of the examinations performed was also in focus.

**Methods:** Guidelines for spine x-rays and educational lectures were provided to referring practitioners, radiographers and radiologists. The number of spine radiographs and justification of examinations performed before and after interventions were surveyed.

**Results:** The number of spine radiographs decreased by 51%. The level of justification was poor even after interventions, with only justification of the lumbar spine x-rays improving significantly. The number of spine radiographs can be decreased significantly without an increase in the number of spine MRI examinations. As a result, radiation burden is decreased and resources are released for appropriate examinations. However, evaluation of justification is not easy and more education is needed.

### 8.12. Undiagnosed lung lesions in chest images

**Presenter:** Borgny Ween, Oslo and Akershus University College of Applied Sciences, Norway  
**Author:** Ween, Borgny

**Background:** Chest radiography is used as the primary examination for a range of clinical questions, including lung cancer. Undiagnosed lung lesions are one of the most frequent causes of malpractice issues, caused by several reasons; among them suboptimal radiography. To document the localization of primarily unidentified, and later diagnosed, locations of lung lesions; might be a help for the radiographer while as the image quality of patients images is to be reviewed. The aim was to identify the frequency and localization of primarily unidentified, and later diagnosed, locations of lung lesions.

**Methods:** A literature review was conducted for unidentified, missed, overlooked or undiagnosed lung lesions, wherewith from only studies containing figures illustrating the localization of lung lesions were chosen. The different papers’ localizations of lung lesions are summed up and illustrated.

**Results:** will be presented as frequency and also the image distribution of missed lesions. Findings and their implications will be discussed in relation to specific criteria in the quality criteria assessments of chest images.

**Conclusion:** We propose that the study can be followed up by a systematic mentor-guided training program that links perception of image quality to feedback about the image retake decisions, if required.

### 8.13. Fluoroscopic rotational radiography vs. plain digital radiographs in patients with a total ankle replacement in regards to periprosthetic cysts

**Presenter:** Janni Jensen, Odense University Hospital, Denmark  
**Authors:** J. Jensen, L. Ludvigsen, J. Freskjær, O. Gerke, T. Torfing

**Introduction:** Idiopathic, post-traumatic or inflammatory osteoarthritis in the ankle joint may in end stages cause severe pain, malalignment or subluxation. The surgical options for this patient group are restricted primarily to arthrodesis or a total ankle replacement (TAR). Although preserving range of motion, a TAR is not without possible complications, with long-term studies indicating, that manifestation of periprosthetic bone cysts are a frequent occurrence for these patients. The presence, exact magnitude and etiology of periprosthetic cysts are a topic of varying disagreement in the literature, as is the choice of best postoperative imaging modality although plain radiographs seem to be the preferred or most used modality. The purpose of this prospective study was to assess the diagnostic value of weight bearing rotational radiography (fluoroscopy with 3D multi planar reconstructed images much like computed tomography (CT) images) in patients with a Scandinavian total ankle...
replacement (STAR) and compare the accuracy of rotational radiography to that of plain digital radiographs, hypothesizing that rotational radiography will show more and larger periprosthetic cysts. All participants underwent rotational radiography and plain radiographs in the same session. This was an independent study approved by the local ethical board.

Methods: 42 consecutive patients with a STAR were enrolled. All images were randomized and reviewed independently by blinded musculoskeletal radiologists in regards to size and location of cysts. Cysts were measured in three planes when possible.

Results: Significantly more cysts were detected on rotational radiography (74 vs. 55), P=0.03 (McNemar’s test). The average size of cysts on rotational radiography were 1653mm³ vs. 813mm³ on radiographs, P<0.001 (Wilcoxon signed rank test). An inter-observer agreement of κ=0.24 (κ=0.1), 95% CI [-0.08, -0.41] and an intra-observer agreement of the senior radiologist at κ=0.20 (p=0.3), 95% CI (0.23, 0.62) highlight the importance of experience when interpreting rotational radiography images.


Presenter: Eugene Frank, Mayo Clinic/Foundation, U.S.A
Authors: Eugene D. Frank, Jeffrey Brezee, Charlotte Brunholzl

Introduction: Guinea, West Africa is one of the most underdeveloped countries of the world. The conditions of the medical clinics and hospitals in the country are bleak. Some development is starting to emerge in the private sector. Electricity is present in the major cities only and electrical blackouts are common in medical facilities. Sanitation is a significant unmet need. The medical facilities are over crowded and medical equipment is in disrepair. Training of radiographers and x-ray operators is nonexistent. Medical communication is very limited between neighbor countries.

Methods: Our three-person radiography team from Mayo Clinic, working through our evangelical Christian church, obtained a refurbished G.E. AMX-4 x-ray machine and a new Fuji tabletop digital processor with two plates and shipped it to Guinea in container.

Results: The three-person radiography team traveled to Guinea, unpacked the radiography equipment and set it up in a newly built addition to the hospital. The hospital has its own 110 Volt power supply and the equipment worked excellent. X-rays were taken on local people for the first time in history. The closest x-ray facility to the town is 300 miles. Many issues came forth and we will discuss those in the presentation.

8.15. Imaging of gastrointestinal perforation: is there a place for plain radiography?

Presenter: Man Lok Chan, Uniradiology, Australia
Authors: ML Chan, A Steward, M Schneider

Introduction: The value of plain radiography to identify gastrointestinal (GI) perforation is questionable while computed tomography (CT) has relatively high detection rate for GI perforation. This study aimed to compare the sensitivity of plain radiography and CT in the detection of GI perforation, thus to determine if a preliminary plain radiographic examination query for GI perforation should remain as a practical approach.

Methods: A retrospective study was conducted at a large public hospital in Melbourne, Australia. The interpretation of radiology reports on plain radiographic and CT examinations over a period of 17 months were compared with the patient discharge summaries.

Results: Eighty-one plain radiographic examinations were analysed and 56 cases(69%) did not show GI perforation, of which 44/56 cases(79%) were false negatives. The sensitivities of plain radiography and CT in the detection of GI perforation were 23% and 78% respectively. Overall, 64/81 patients(79%) were referred to CT after the initial radiographic examinations. In conclusion, CT is the preferred preliminary imaging modality in the detection of GI perforation.

8.16. Radiographic skills in a field hospital

Presenter: Kim Pelle Christensen, OUH Odense University Hospital, Denmark
Author: Kim Pelle Christensen

Introduction: To report on the differences between emergency radiography in a hospital setting vs field ER from the viewpoint of a radiographer in the x-ray dept. in a field hospital in Camp Bastion, Afghanistan ’09. The workload and visualization of the difference between the injuries obtained in the battlefield are demonstrated and the different degrees of trauma from the Emergency Medicine to fatal trauma and the mechanisms of injury will be discussed. Radiographers has to cope with Blast-IED, blast, fragmentation v foot patrol, IED, blast, fragmentation v vehicle, Grenade, RPG, missile, Gun-shot wounds, Motor vehicle accidents, Burns, Falls and Stab wounds. Many of the injured persons are Multiple casualty incidents, which also calls for special radiographic skills. Alongside the radiographer needs general radiographic skills as the ER-room contains DR, CT, US and fluoroscopy and the radiographer must also perform examinations in the Operating Room.

Methods: A summary of personal experience compared to the basic skills of a radiographer

Results: Emergency Radiography in the field demands both specialized and general radiographic skills. The radiographers work in an international environment under a lot of pressure and stress, and must handle situations that are beyond the scope of the general radiography education

8.17. A Report from voluntary work in x-ray departments

Presenter: Ritva Marttila, North Karelia Central Hospital, Finland
Author: Ritva Marttila

Introduction: ADRA Finland, which is a part of Seventh-day Adventist Church, makes development co-operation in many countries. I have worked as a volunteer radiographer in two projects, in Kenya and in Ukraine. At the beginning of the projects hospitals and their needs and circumstances were evaluated by ADRA Finland. We planned, what kind of equipment and aid are needed. Some Finnish hospitals had donated x-ray equipment, which had been used about ten years, but still in good condition. ADRA was responsible to transport them. At last a Finnish radiographer and a mechanic travelled to start the action. Imaging with donated device succeeded well during both projects. We were able to make the developing process stable and we used normal exposure values. Fortunately, the imaging with donated equipment is still going on successfully in both hospitals. In my presentation I shall evaluate, what kind of development co-operation is suitable to x-ray departments in the countries, which need development aid. I shall find practical resolutions to the questions: what is relevant to recipients and what is possible to donors. I shall also consider, is it better to give as aid knowledge and skills or equipment.

Methods: During the project the mechanic maintained devices and the radiographer prepared the developing process to work. X-ray images were taken with portable x-ray equipment. Images were construed by local doctors. The imaging process became correct.

Results: Donated equipment has to be in good condition and simple to use. Because local maintenance is often missing, the device must be easy to maintain. Instructions for use and manuals are needed. Donors have also to take into the consideration environmental factors. The disposal of broken equipment must be done by modern concept. Finally the interest and ability of local radiographers, who continue to work with device, is the most important thing to get development aid successful.

8.18. Radiographer on an island

Presenter: Kristiina Korpi, Ålands hälso- och sjukvård, Finland
Author: Kristiina Korpi

Introduction: What is it like to be a radiographer on an island? What are the challenges and are there any benefits? Åland is an autonomous, demilitarised, Swedish-speaking region of Finland. It is a group of more than 6000 islands. 65 of them are inhabited. Public healthcare on Åland is provided by Åland’s Public Healthcare Service (ÅHS). There is one hospital, located in the northern part of Mariehamn and healthcare clinics in most municipalities. I would like to present you some special features of how it is to work on our hospital as a radiographer. There are 12 radiographers
and one radiologist (+one vacancy) working on the only radiological department. We serve a population of 28,600 which is three doubled during a tourist season. There are 20 ferry and cruising ship arrivals a day in the island and quite often sick and injured travelers are taken care of in our hospital. Swedish language is also a special feature. Transportation and weather are challenges as well as recruiting personnel to the department. We perform more than 17,500 conventional, CT, US, MRI and mammography examinations a year, and of course mammography screening. Patients come from all categories and all ages. Our group works well together and has a great sense of responsibility. Radiologist is not usually available outside of working hours but we frequently co-operate with university hospitals in Turku, Helsinki and Uppsala in Sweden. We work on quality issues and send personnel to courses both in Finland and Sweden. Next clinical audit will be carried out in 2015.

Results: In this short presentation I will take you to a tour on Åland Islands and share of experiences as a radiographer on an island.

8.19. Radiographer’s role of the procurement process of the digital imaging system

Presenter: Tuomas Hukkanen, HUS Medical Imaging Center, Administration / Procurement Unit, Finland
Author: Tuomas Hukkanen

Introduction: When purchasing equipment to an x-ray department, there are typically many different professionals involved in the procurement process. Main users of equipment are always needed when comparing offered equipment and making the final decision, so a radiographer plays an important role concerning to procurement process of digital radiographic system. The best way to utilize radiographer’s expertise is to increase his/her own awareness of the role and influence of radiographer in the procurement process. This can be best accomplished when radiographer is well aware of the progress of the procurement process and of the tasks, rights and responsibilities involved. The aim of this thesis is to increase radiographers knowledge of their role and influence in the procurement process of digital radiographic system, so that radiographers expertise may be best utilized during the acquisition.

Methods: The data was collected using theme interview with three employees of procurement unit and focus group interview with participants (N=9) having expertise in procurement process of digital radiographic system. They were analyzed by content analysis.

Results: According to results a radiographer has an important role in the procurement process of a digital radiographic system including several tasks during the process. A radiographer has bigger role in the procurement process of digital radiographic system than in that of the other imaging methods. To minimize risks and to ensure the high quality of the acquisition a radiographer’s active participation in the procurement is necessary.

8.20. John Thomas Sign: what does it stand for?

Presenter: Man Lok Chan, Uniradiology, Australia
Authors: ML Chan, A Steward

Introduction: The John Thomas sign is a legendary myth in the world of radiography. It is defined as a prominent soft tissue radiological sign seen on an AP pelvis radiographic image, but its clinical application is restricted to male patients only. It was believed that the John Thomas sign could indicate any pathology underlining in the pelvis or hips. Nonetheless, it was believed that the John Thomas sign could be used in the clinical practice. It should not be overestimated, as it does not represent a definitive diagnosis. The John Thomas sign is a reliable radiological sign to identify a hip fracture. Furthermore, this research project provides a deeper understanding of the mechanism of male reproductive organ in order to uncover the mystery of the John Thomas sign.

8.21. Validity of self-reports of fractures in postmenopausal women

Presenter: Liisa Ollikainen-Paananen, Bone and Cartilage Research Unit/UEF, Finland
Authors: Liisa Ollikainen-Paananen & Risto Honkanen

Introduction: Postal survey is a feasible way to collect health information for epidemiological research. However, concern has been expressed about the validity of self-reported information gathered from the participants. Earlier studies on the validity of self-reporting have usually investigated issues such as chronic illnesses or female reproductive history. Some of these studies also include a review of fractures; these studies indicate both accurate reporting and underreporting of fractures. The accuracy of self-reports of fractures has previously been studied in greater detail by the Study of Osteoporotic Fractures, which found that self-reports by elderly women included 11 percent false positives of all fracture reports in postal surveys, whereas in phone interviews they remembered all the fractures they had sustained during the previous four months. We examined the validity of self-reports of fractures in a postal inquiry to postmenopausal women by using the data of the Kuopio Osteoporosis Risk Factor and Prevention Study (OSTPRE). The survey was sent to all the 11220 women aged 67-76 years and resident in Eastern Finland, in 2009. The fracture questionnaire of the survey included information about the site, year, and mechanism of past fractures in 2004-2009. A total of 9096 women (79, 6 percent) responded to the survey.

Methods: Validity of self-reports was examined by comparing responses to the fracture question on the survey with the participant’s medical records in RIS-PACS –information system among members of fractures and control groups.

Results: Validity of self-reports of past fractures in a postal inquiry to postmenopausal women is not perfect: both over- and underreporting do occur. However, self-report of major fractures such as wrist fracture is relatively accurate. On the other hand, minor fractures rather often remain unreported, if the reporting period is several years.

8.22. From EURATOM treaty to EU guidelines: Clinical Audit RP 159

Presenter: Päivi Wood, Society of Radiographers in Finland
Authors: Päivi Wood

Introduction: The EC directive 97/43/EURATOM introduced the concept of Clinical Audit for the assessment of radiological practices. The Member States were required to implement clinical audits in accordance with national procedures. This concept is of high importance for the improvement of the quality of imaging practices. In the past years the implementation of clinical audits has been commenced in a number of varying “national procedures”. Need for guidance was obvious to achieve meaningful results. European Guidelines were published in 2009. The EC guideline is to provide guidance on clinical auditing in order to improve implementation of Article 6.4 of Council Directive 97/43/ EURATOM. The guideline provides comprehensive information on existing procedures and criteria for clinical audit in radiological practices: diagnostic radiology, nuclear medicine and radiotherapy. Clinical audit is not research, quality system audits nor regulatory inspections and it is systematic and planned activity. Clinical audit is a systematic review of medical radiological procedures which seeks to improve the quality and the outcome of patient care through structured review. Clinical audit should be a multi-disciplinary, multi-professional activity. Follow general accepted rules and standards which are based on international, national or local legal regulations, or on guidelines developed by international, national or local medical and clinical professional societies.

Methods: A short history of clinical audits and experiences

Conclusions: Clinical audit should address the practical clinical work by professionals and assess the local practice against the defined good practice. It should cover the whole clinical pathway in radiological practices, but it can also be partial but should eventually become comprehensive. Clinical audit should address the three main elements: structure, process and outcome. And finally all parties involved in the process must respect confidentiality.
8.23. Have clinical audits been effective in Finland?

Presenter: Kirs I Miettunen, Labquality Ltd.
Author: Kirs I Miettunen

Introduction: Clinical audit is a way to find out if healthcare is being provided in line with standards. In this study I will focus on clinical audits of x-ray departments in Finland. Clinical audit definition; a systematic examination or review of medical radiological procedures which seeks to improve the quality and the outcome of patient care through structured review whereby radiological practices, procedures and results are examined against agreed standards for good medical radiological procedures, with modification of practices where indicated and the application of new standards if necessary (www.clinicalaudit.net). The concept of Clinical Audit was introduced by the European Commission Directive 97/43/Euratom (so called MED directive), 30 June 1997. First clinical audits have been made in Finland in March 2002. So far all radiological departments have been audited at least two times, part of them already three times. In Finland clinical audits are guided by the Finnish Advisory Committee for Clinical Audit. The Advisory Committee gives guidelines on what should be assessed in clinical audits. This study will find out about if clinical audits have been effective in Finland.

Methods: In the study, improvement recommendations of clinical audits from the first, second and third audit rounds have been compared by samples. From every round (first, second and third) twenty audit results were collected, ten from smaller routine type radiological departments, and ten from demanding radiological department. Demanding radiological department means that there is either CT, angiography or similar kind of advanced imaging. The audit results have been compared in a matrix.

Results: In the first and second rounds the number of improvement suggestions was at the same level, while in third round there were fewer suggestions. The area of the most common suggestion was changing at every round. Also the dispersion of findings was smaller at every round. In the third round, the most common type of improvement suggestions was given for the quality manual. In the second round the most frequent improvement suggestions concerned the instructions, and in the third round self-assessment and imaging practices. The findings of audit show the impact from the various individual auditing teams, especially in the first round. For the second auditing round Clinical Audits Advisory Committee gave more specific instructions and probably because of that results were somewhat more homogeneous.

Conclusions: It is clear that clinical audits have improved the quality of practice in radiological departments in Finland. However, given the diversity of the reports, no significant conclusion about the content, development or effectiveness can be made. Each auditing team seems to make different kinds of findings. More specific instructions are needed for clinical audits, including more training for auditors to make clinical audit findings comparable. Typically, a quality system follows a plan-do-check-act (PDCA) cycle for continuous improvement. Nowadays for clinical audits there is no system in place to make sure that corrective actions are taken after the audit report. In my opinion we need a systematic approach for check and act to make sure that clinical audits are effective.

8.24. The professional association and the history of the ISRRT

Presenter: David Collier, Australia
Author: David Collier

Introduction: The key values of a Profession are status, shared values, altruism, affiliation, advocacy and representation, social Interaction, information provision and products and services. There is a long history behind today’s professional associations in which special skills and knowledge has always had a unique place in society.

Method: This paper is the outcome of a series of observations and learning gained from the writing of the history of the ISRRT during the previous three years. In the process of the exploration of the archives a number of valuable conclusions can be made which are relevant to the running of any professional association.

Discussion: Specialists belonged to recognisable groups of like-minded professional people and in mediavial times these professional groups were called ‘Guilds’. The guilds set standards for their professions and protected the interests of their members. The Professional Association today provides a range of measurable or tangible benefits as well as intangible benefits which recognise and confirm the status and reputation of that profession. These intangible benefits can extend far beyond that of the membership and reach into the whole profession itself. This extended reach provides both and opportunity and a challenge for all professional associations and the history, the story of the ISRRT since its first meeting with 25 attendees in July 1959 in Munich, held at the same time as the 9th International Congress of Radiologists provides a valuable insight into what a professional association is and what being part of that association means. The relationship between the ISRRT and other bodies has always been at the centre of the success of the international body. A number of the Council members over time have had strong working relationships with a variety of the suppliers of equipment and technology and those companies have shown extraordinary generosity and support. This was most noticeable in the early days of the society and has, in no small measure, contributed to the continued survival particularly during the first twenty years.

Results: The paper then covers the story of the ISRRT with a number of examples and images, and concludes with a brief summary of the challenges of writing such a history.

9. INTERVENTIONAL

9.1. The utilization of ultrasound during interventional procedures in optimization of radiation dose - a case of Uganda, a low income resource country

Presenter: Rogers Kalende, Uganda Radiography Association / Ernest Cook Ultrasound Research And Education Institute (Ecurei) Mengo Hospital
Author: Kalende Rogers

Introduction: The rational for optimization in radiological practice remains keeping radiation exposure and consequent dose as low as reasonably achievable (ALARA) without compromising diagnostic quality. Although various patients derive great benefit from interventional procedures, a serious disadvantage associated with interventional procedures is patient radiation dose. It is therefore, prudent for every radiation technologist to innovate ways of reducing the radiation dose during these procedures. One way is to substitute fluoroscopy guidance for non-ionizing procedures. I present cases of how Uganda has managed to reduce radiation dose in interventional Radiology by using Ultrasound and conventional x-ray in absentia of fluoroscopy to perform guided interventions without compromising diagnostic image quality. This case study sites 3 types of procedures in which this approach to optimization was used: • 33 Ultrasound guided chest biopsies. • 67 Ultrasound guided Percutaneous Trans Hepatic Cholangiography (PTHC) • 16 Ultrasound guided nephrostomy and antegrade pyelography. In all these, ultrasound was substituted for fluoroscopy hence cutting down on the radiation dose the patient would have received.

Methods: This was a retrospective case study. A total of 116 case notes for patients who had undergone interventional procedures using a combination of ultrasound and radiography investigations were studied.

Results: Ultrasound guided intervention remains one of the most practiced time saving, cost effective and dose minimizing alternatives to fluoroscopy guided procedures in optimizing patient dose while maintaining diagnostic quality, in low resource income countries like Uganda.

9.2. How is the correlation between modality given dose parameters (DAP and AK) in cardiac interventional procedures and actual maximum skin doses (MSD) to the patients

Presenter: Tommy Berglund, St. Olovas Hospital, Trondheim Norway
Author: Tommy Berglund

Introduction: The amount of interventional procedures have been increasing rapidly. Technological development in the equipment used together with more complex procedures leads to an increasing risk of potential high doses given both to the working staff and even more, the patients. (Panuccio et al, 2010). The first confirmed case of radiation induced skin damage appeared in 1990. FDA published guidelines and counseling in how to avoid skin damage during fluoroscopic procedures in 1994. (Balter et al, 2010) The ionizing radiation has enough energy to be able to change the molecular structure in the cells of the body, including the DNA. Some of these molecular changes can be so complex that it is difficult for the repair mechanism of the body to correct the damage. (BEIR, 2003). Effects caused by damages on a population of cells are called deterministic effects. Early tissue reactions can be inflammatory, the late effects can be
effects can be necrotic changes in the tissue of the skin. (ICRP, 2011) It has been established threshold values for the skin with possible tissue damages that can appear with the different threshold values. Definition of threshold dose values: The minimum amount of radiation dose where a deterministic effect can appear. The threshold values have an individual variation because of biological differences in each patient. Stecker et al (2009) If we want to reduce the risk of deterministic effects from interventional procedures we need to be able to evaluate MSD for these procedures. The challenge is how to manage this in the daily care at the interventional department. This is what I have tried to do in my project.

Methods: I have measured skin doses in two different cardiac interventional procedures. The measuring of MSD is done with Gafchromic film, and the film is put directly under the patients back during the procedures.

Results: It is a very good correlation between actual measured MSD and both dose values from the apparatus. DAP is found to be the most suited dose value. We have now a good foundation for setting threshold DAP values in the daily care, and perform follow up procedures for patient at risk of getting deterministic skin damages. 1 of 43 patients that had their MSD measured received a dose over 3 Gy. A retrospectively study shows that 1.1 % of our cardiac patients receive over 3 Gy.

9.3. The Image-guided trans arterial chemoembolization and radiofrequency ablation

Presenter: Maria Venäläinen, Päijät-Häme central hospital, Finland
Author: Maria Venäläinen

Introduction: The rates of hepatocellular carcinoma and colorectal carcinoma are increasing worldwide and most patients can only be offered palliative treatment. Interventional radiology offers palliative treatments like image-guided trans arterial chemoembolization (TACE) and radiofrequency ablation (RF ablation). The interventional radiologist makes yearly dozens of these image guided treatments at Päijät-Häme central hospital. In the RF ablation treatment there is utilized heat energy. The interventional radiologist guides a small needle or needles into the tumor during x-ray examination. Radiofrequency energy is transmitted to the tip of the needle where it produces heat in the tumor tissues. TACE is a treatment where the interventional radiologist threads a tiny catheter up the femoral artery in the groin into the artery veins the liver tumor. Then the interventional radiologist administers the chemotherapy drug eluting beads directly into the tumor. The beads keep the chemotherapy drug in the tumor by blocking the flow to other areas of the liver. TACE and RF ablation can cause pain to the patient during the treatment. The patient’s pain is usually treated with epidural anesthesia. TACE and RF ablation involve a stay in hospital for a couple of days. Radiographers are part of the team in TACE and RF ablation. The Radiographer assists the interventional radiologist and take care of the patient trough the treatment.

Methods: The purpose of TACE treatment is to make necrosis in tumor with drug eluting beads. RF ablation system with needles utilizes heat energy that raises the temperature of tissue in order to cause its death. Results: Image-guided treatments trans arterial chemoembolisation (TACE) and radiofrequency ablation (RF ablation) are safe and effective treatments of unresectable liver metastases. TACE and RF ablation have also minimal complications and the acceptable tumor response is good. The benefits of TACE and RF ablation are short hospitalization time and low complication rates. The radiographer functions in both TACE and RF ablation are challenging and interesting.

9.4. Is extra corporeal shockwave lithotripsy more effective when conducted under general anaesthetic compared with conscious sedation? A retrospective review.

Presenter: James Hayes, Christchurch Polytechnic Institute of Technology, New Zealand
Authors: James Hayes, Cindy Grobler, Chris Frampton

Introduction: Extra corporeal shockwave lithotripsy (ESWL) is a non-invasive but painful treatment for urolithiasis. Within New Zealand one lithotripter provides the majority of lithotripsy treatments as it travels the length of the country. The local urologist will decide the treatment pattern and, in conjunction with their anaesthetist, the type of anaesthesia given. This is usually conscious sedation or general anaesthetic. The objective of this study is to compare the efficacy of conscious sedation with that of general anaesthesia in the setting of ESWL.

Methods: Data was collected from 5266 patients with a single primary nonstaghorn calculi who were treated with a Dornier S1 or Dornier S2 lithotripter between June 1995 and May 2011. Success was no remaining fragment greater than 4mm.

Results: Treatment of primary, non stag-horn stones with the Dornier S1 or Dornier S2 lithotripter under general anaesthesia was significantly more successful than treatment under conscious sedation.

9.5. Interventional radiology dose distributions for vascular procedures undertaken at Universitas hospital

Presenter: Henra Muller, Department Clinical Imaging Sciences, Universitas Hospital, Bloemfontein, South Africa
Authors: H Muller, WID Rae, H Friedrich-Nel, CP Herbst,1 Department Clinical Imaging Sciences, Universitas Hospital, Bloemfontein, South Africa, 2 Department of Medical Physics, Universitas Hospital, Bloemfontein, South Africa 3Department of Clinical Sciences, Central University of Technology, Bloemfontein, South Africa

Introduction: Medical exposure contributes more than 95% of the dose that the global population receives from man-made sources. Radiation exposure to patients during interventional radiology delivers the highest skin doses. In some procedures, skin doses to patients approach the lower limit for biological effects (2Gy). It is thus important that referring clinicians, radiologists, radiographers and patients are aware of these potentially high doses and long imaging times. From the early 1990s radiation induced skin injuries associated with interventional procedures have increased. These procedures are complicated and, require longer fluoroscopy times. It is therefore important to identify procedures with a real risk of radiation injury. If a patient is knowledgeable about the radiation dose received and the possibility of radiation injuries the patient would be able to seek help sooner if for example skin changes occurred. If personnel members were informed about the radiation doses associated with interventional procedures, and took note of the potential radiation injuries associated with procedures beyond threshold dose values, they would be able to answer specific questions or concerns raised by the patient. Personnel members would also be more aware of dose optimization by making use of different techniques of radiation protection during these high dose procedures. The aim of this study was to determine dose distribution for specific diagnostic and interventional procedure types, to determine which procedures undertaken at Universitas Hospital contribute the highest radiation dose to individual patients and to the population.

Methods: The study included 3310 patients for diagnostic and interventional procedures, involving fluorescent x-ray exposure from 2006 to 2009. Patient data and doses were entered into a database, which included dose-area products (DAP) and screening times.

Results: The maximum dose was during a renal arteriogram. Four vessel angiograms and transmural outflow delivered highest population doses. Arterial outflows were most performed and embolizations delivered the highest mean dose. Diagnostic procedures deliver higher population doses vs interventional procedures high dose to the individual patient. Procedures identified which may require patient follow-up to monitor skin effects. Dose reduction measures must be taken, especially for the identified procedures.


Presenter: Yang Sheng Chen, Taipei Veterans General Hospital, Taiwan
Authors: Yang-Sheng Chen, Yen-Chun Shen, Chieh-An Liu

Introduction: Breast cancer is one of the most common malignancy affecting women worldwide. In Taiwan, the incidence gradually increases and younger population is affected in the past decade. Surgical resection is a mainstay of treatment. The role of adjuvant chemotherapy is to achieve tumor down staging, to increase the possibility of surgical resection and reduce tumor recurrence and metastasis. Local or regional chemotherapy has been used for local control or palliative treatment of primary or metastatic diseases. Interventional radiology provides minimally invasive treatment for locally advanced breast cancer, such as intraarterial chemotherapy (IAC) and transcatheter arterial chemoembolization (TACE), by means of angiography alone conventionally. Computed tomography.
(CT) demonstrates more accurate tumor extent and supplying territories of the cannulated vessels than digital subtraction angiography (DSA). We demonstrate a case of inoperable recurrent breast cancer receiving four sessions of TACE with drug-eluting microspheres (DEMs) using combination of angiography and intraarterial CT angiogram with angio-CT system.

Methods: A 44-year-old woman with recurrent breast cancer received 4 sessions of DEM-TACE from April 2013 to November 2013. Hepasphere was impregnated with chemagents. TACE was performed with angiogram and corresponding CT angiogram using Angio-CT system.

Results: The tumor bulk was supplied by the branches of internal mammary, thoracoacromial and lateral thoracic arteries. Tumor volume decreased during the first 3 sessions and disease progression occurred after the 3rd TACE. Superselective angiogram and corresponding CT angiogram clearly demonstrated the feeding arteries and their supplying territories. Precise evaluation of supplying territories with CT before delivering the chemoeagents ensures the coverage and reduces the risk of nontarget embolization.

9.7. NIS (Neurointervention system): Developing an image file and database for Neurointervention

Presenter: Ok-Kyun Lim, Asan medical center, South Korea
Authors: OK-Kyun Lim, Ben Joonyeon Park, Eun-Hye Kim, Seon Moon Hwang

Introduction: According to increasing of the interest of general health in the people and improving of the diagnostic instrument, the number of medical examination such as X-ray, CT, MR, Ultrasound and angiography have increased for several decades continuously. Increasing of the number of diagnostic cases naturally has been led to encourage of the amount of the interventional treatment cases. Consequently, we could obtain a deep-seated knowledge of the procedure from the cases. In these circumstances, it is important that how to manage the amount of the data which are derived from a series of the examination and medical treatment. We already realized that complex clinical information in cerebral angiointervention unit requires effective management of statistical analysis for the classification of diagnosis and intervention including follow-up data from the interventional treatment. Since 2002, we’ve used an application of Microsoft Access (Microsoft, WA, USA) program for the management of patients’ data in cerebral angiointervention unit. Microsoft Access program has been effective in the management of patient’s data in cerebral angiointervention unit for nearly ten years. However, our access program hasn’t enough field or storage space to save the images which can be the source of education, presentation, teaching file, or research. It was too difficult to handle the images which stored in the Access program and to search multiple patients as quickly. In 2000, Tran et al. reported that they succeeded in creating an inexpensive electronic database of digital radiographic teaching images using commercially available software.

Methods: In order to develop the new database system linked PACS, firstly we searched our database programs which have been using in our daily work. There were many kinds of database system such as EMR, PACS, OCS, MS Access, Excel.

Results: We developed a new database system, NIS (Neurointervention system). We could easily connect NIS while using the PACS system and we could input the patient’s images as well as information related patient’s diseases. The NIS consisted of two parts. One part performed a database to save text type of data linked schedule of department of neuroangiointervention unit in our hospital. Another part performed a database to save image and text type of data.

9.8. When Radiographers participate in EndoVascular Aneurysm Repair

Presenter: Henrik Mogensen, Odense University Hospital, Denmark
Authors: Radiographer Henrik Mogensen and Radiographer Jette Skjellerup Jensen

Introduction: Department of Radiology, Odense University Hospital (OUH) was first in Denmark to offer endovascular treatment of a ruptured Abdominal Aorta Aneurysm (rAAA). The treatment was introduced in October 2012 and has been available as a round-the-clock service ever since, as the only place in Denmark. The procedure is interdisciplinary and is highly dependent on teamwork between the vascular surgeons, the anesthetic team and the radiologic team in which radiographers are important contributors. The radiographer’s role is to contribute with expertise, knowledge and having total responsibility for handling the x-ray equipment during the entire procedure as well as preparing and handling the stent graft. A cost benefit analysis has shown that this treatment is more expensive than traditional surgery (approx 2.700 EUR), primarily due to the higher price of the stent graft. In this analysis only the cost of the actual treatment is considered. The benefits for the patient such as lower mortality rate, less pain and faster recreation etc. are not valued.

Methods: The procedure is performed in local anaesthesia where the radiologist places the stent graft fluoroscopy guided in the abdominal aorta to exclude the aneurysm thus avoiding general anaesthesia and open surgery.

Results: So far 38 patients have undergone treatment for rAAA using this method, resulting in a better outcome for the patient with a mortality rate of 7% versus 30-35% when traditional open surgery in full anaesthesia is performed. Participating in this procedure requires highly skilled and experienced radiographers. If complications occur during the procedure, it is of utmost importance with an experienced team who has a vast knowledge of materials allowing for other possibilities to be explored.

10. MANAGEMENT

10.1. Optimizing patient care in radiology through team-working: a case study from the United Kingdom

Presenter: Nick Woznitza, Homerton University Hospital & Canterbury Christ Church University, UK
Authors: N Woznitza, K Piper, S Rowe & C West

Introduction: Improving patient care should be the primary focus of all healthcare providers, regardless of country, setting or department; radiology is no exception. Roles within radiology have evolved and professional boundaries blurred; assistant practitioners contribute to image acquisition and advanced and consultant radiographers undertake tasks historically performed by medical professionals. Team working and appropriate use of skill mix has been highlighted as a way of managing ever increasing imaging workloads. In the United Kingdom, trained radiographers have developed their roles to include tasks traditionally performed radiologists, including definitive clinical reporting and interventional procedures. The aim of this study was to demonstrate how a radiology department within an acute district general hospital optimizes imaging services to improve access for patients and support for referrers through a strong emphasis on team-working.

Methods: Data about service delivery was analyzed across three consecutive years and interrogated by modality, referral source and reporting practitioner to determine how workload had evolved. Feedback from referring clinicians was sought.

Conclusions: Overall trend was for increased activity (13%) with significant reductions (p<0.05) of x-ray and ultrasound examinations. Novel services and patient pathways were implemented with high clinician satisfaction. Radiologists and radiographers, working together, can deliver an effective service. Innovation, staff development and redesigned patient pathways have produced significant improvements.

10.2. Patient Classification System in the work of a Radiographer

Presenter: Virva Seiko-Vänttinen, Medical Imaging Centre of South West Finland
Authors: Luotolinna-Lybeck Helena and Seiko-Vänttinen Virva

Introduction: Patient classification is needed to measure and to make visible the workload of radiographers. Nurse leaders and managers need it to plan the radiographer resources properly and flexibly. In today’s economical situation it is very important to have all your resources in most effective use. Patient classification is coming true for all patients and examinations in the medical imaging centre of Southwest Finland. In Turku we have developed a patient classification system which is suitable for patients in the radiological department. This classification system has its roots in the Oulu Patient Classification system. Radiological Patient Classification system is a way to measure how much each patient in a radiological examination in different health condition needs radiographer resources. We evaluate patient’s ability to move, to get dress, need of advice, stage of health, the examination type needed and planning of the examination. Evaluation takes few seconds. All these numbers are
summarized to patient classification points. These points per day with the knowledge of the radiographer resource in the same day gives the information of the workload (caused by patients) of radiographers during that day. By following this information it is possible to show for the administrative persons in the organization when there is a need of more or less radiographers. It helps leader and managers to make right decisions and gives more understanding to the radiographers about why there can be variation in the amount of radiographers in the radiological departments and why the work can be very hard although the number of the patients or examinations might be minor.

Methods: Measurement is made with the scale of six variables and four difficulty grades. Number four means the most demanding case in variables. The points are scared in to the classes which describe the amount of care the patient needs in one examination.

Results: The validity of our classification has been several times evaluated with pair-review and results have been good, unanimity 2012 over 90% and 84% in the year 2007 and the value of agreement by Kappafactor 2012 was 0,88 when the limit of good value is over 0,70. Patient Classification System is needed to measure and to make visible the workload of radiographers. It is needed for many reasons, not least to see the variation in patient needs and to be able to plan radiographer resources properly.

10.3. National registration for medical radiation practitioners in Australia

Presenter: Neil Hicks, Medical Radiation Practice Board of Australia

Author: Neil Hicks

Introduction: Australia’s National Registration and Accreditation Scheme is widely recognised as an internationally significant health reform, bringing together multiple jurisdictions and professions into a single regulatory system. From 1 July 2012 six different registering bodies for medical radiation practice in Australia joined to become one national regulator for the profession. The Medical Radiation Practice Board of Australia is led by members of the profession and is separate and independent of professional associations and unions. The Board’s main purpose is to protect the public by registering suitability qualified, safe and competent practitioners. A unique aspect of the Board’s responsibilities is balancing the protection of the public with other aims of the scheme which includes facilitating workforce mobility across Australia, and enabling the continuous development of a flexible, responsive and sustainable health workforce. The work of the Board includes developing and consulting on registration standards, codes and guidelines for the profession; registering medical radiation practitioners and students; handling notifications, complaints, investigations and disciplinary hearings; keeping the national register of practitioners. Some of the benefits of the National Scheme are: registered once and practice anywhere in Australia; everyone who is registered has to meet the same standards. There are five mandatory registration standards that are common across professions, as well as profession-specific standards, that practitioners must meet to become and remain registered. Professional capabilities statements identify the minimum skills and for registration.

Methods: Further information about the Board can be found at http://www.medicalradiationpracticeboard.gov.au/

Results: Consumers now have access to accurate, up-to-date information about the registration status of more than 590,000 health practitioners across 14 professions. Registered practitioners can use a protected title that consumers recognise and understand. This assures the public that health services are being delivered by qualified practitioners who have met and maintain national standards. For the first time the Board has national data about registered practitioners.

10.4. Better imaging for the patient’s best

Presenter: Virva Kaarina Seiko-Vänttinen, TYKS, Medical Imaging Centre of Southwest Finland

Author: Seiko-Vänttinen Virva

Introduction: “The future is here”, said Olli-Pekka Lehtonen, Chief Executive Officer of hospital District of Southwest Finland. Last spring the biggest hospital building project in Finland ever was completed. New T-hospital started to operate at April the 2nd. The T-hospital is the first new generation’s hospital in Finland, where implementing and solutions are based on process-thinking. The goal is patient-centred care and all the competence is around the patient. That is the reason why emergency medical imaging is in the middle of the Emergency Medical Services.

Medical Imaging Centre of Southwest Finland has four medical imaging departments in the T-hospital. One of these units is the Emergency Radiology unit. The purpose of this presentation is to give an overview of the huge amount of issues that had to be dealt with before the new department could start functioning. Acquisition of devices was started two to three years ago, first planning and then employing of personnel to the new departments took two years and staff training concerning new devices had to be scheduled and executed. Because the department is completely new, we had to buy almost everything – furniture, personal computers, printers, books, medical supplies, phones, radiation protection stuff etc. Luckily the budget was sufficient for us. At the Emergency Radiology unit we have three conventional x-ray devices, Computed Tomography, Ultrasound and Magnetic Resonance imaging devices. The department is open 24/7 and examination numbers are estimated to be around 60 000 examinations / year.

Methods: When everything is new – environment, staff, devices, manager of the department – you can imagine that there is a lot of challenge and takes for a while before everything is settled down.

Results: Although everything had to be done very quickly, we have succeeded in many things. Emergency Medical Services have been satisfied to the quality and availability of our examinations. Still we do have challenges with co-operation in- and outside the department. But without competency, enthusiasm and motivation of the staff this wouldn’t have succeeded! Vision of Medical Imaging Centre of Southwest Finland is “better imaging for the patient’s best” and we are in a good way towards it.

10.5. Patient safety from a leadership perspective

Presenter: Heidi Korin, Turku School of Economics, Finland

Author: Heidi Korin

Introduction: The legislation of healthcare in Finland requires healthcare to be of high quality ensuring patient safety. The Finnish Ministry of Social Affairs and Health published a strategy for patient safety for years 2009-2013. Aim of the strategy was to promote patient safety culture since it is the base of patient safety in health care organizations. Organizations ability to evaluate its own safety is based to safety culture of the organization (Glendon & Stanton 2000). In the safety culture are experiences and attitudes of the healthcare staff combined with the working processes and operational environment. A high safety culture is characterized among others by a genuine commitment to safety as well as proactive evaluation and understanding of safety related risks. (Reiman et al 2008.) Patient safety culture is also closely related to the leadership of the organization. Since legislation sets a clear demand for patient safety work, are healthcare leaders in an important role in implementation of patient safety work. Promotion of patient safety demands commitment and support from leaders. This paper discusses the importance of leadership to the promotion of patient safety.

Methods: A literature review was carried out to explore how patient safety management and leadership practices occur in light of research articles.

Results: Results suggest that patient safety culture and leadership activities are combined together. Important factors in patient safety management are visible commitment of leaders, communication and learning of patient safety incidents, education and strategic patient safety management. Results indicate that there are plenty of tools for leaders for implementation of patient safety management. Patient safety should be a natural part of the total quality management of the organization.

10.6. The Aftermath of Major Trauma - Coping with Critical Incidents in a Radiology Department

Presenter: Kathy Colgan, Rotorura Hospital, New Zealand

Author: Kathy Colgan

Introduction: Introduction Radiographers, due to the nature of their work are frequently involved with trauma cases where patients have suffered severe life threatening injuries. In some cases, the traumatic event will have involved fatalities at the accident scene and in others the patients that reach hospital, despite exemplary care, do not survive. Modern media – internet, social networking telecommunications along with conventional television and newspaper reporting means that these traumatic incidents become highly publicised events. The practitioner meanwhile becomes isolated from their community due to the confidential nature of their role
in the traumatic event. Post incident debriefing sessions may provide the staff member the only opportunity to speak openly and safely about the traumatic event. The purpose of this paper is to review the workplace mechanisms in place to support staff following critical incidents in our own workplace, in relation to some of the published literature regarding critical incident stress management. A holistic approach to community resilience through a well-planned and implemented critical incident stress management programme has been shown in the literature to promote self-help and self-efficacy of individuals and organisations’ (Guenther, 2012, p1). “Critical incident stress is defined as the emotional stress experienced by individuals secondary to their exposure to a specific incident or number of Incidents” (Blacklock,2012, p3).

Methods: Radiographers and Emergency Department nursing staff were surveyed to gauge the level of incidents encountered, debriefing sessions offered, and the perceived impact of the support mechanisms.

Results: Determining whether practices offered in the workplace make a difference to managing stress of a traumatic incident for the current staff complement should be identifiable from the survey results. Literature suggests that while CSD success hasn’t been "conclusively supported by research findings” (Mitchell et al, 2003, p49), there is clinical evidence within employment groups that support following significant trauma events does have a positive impact on staff wellbeing and morale.

10.7. Implementation of a Radiological Department as an integral part of an Emergency Department for faster and better care to patients

Presenter: Kristian Blessing, Odense University Hospital, Denmark
Author: Kristian Blessing

Introduction: To optimize care for all incoming patients through the Emergency Department (ED), at Odense University Hospital, a new ED was built and taken into use in 2012. The most important issue for the new ED, was to diagnose the patient as fast as possible. One of the key factors for optimizing patient flow, and thereby getting a faster diagnosis, was the integration of a complete (4 X-ray, 1 CT and 1 US) small Radiological Department (RD) in the ED. The idea was to fully integrate the Radiological Department as an integral part of the ED. To do this, an experienced radiographer was hired 6 month prior to the opening. The radiographer was tasked with identifying the new goals of the ED and implements these to the RD in the ED. One of the most important factors was to create the mind-set of a large group of radiographers from the old workflow, to a completely new one. The ED and RD wanted to perform all radiological exams within one hour after receiving the referral and all patients should have a tentative diagnosis within 4 hours.

Methods: An experienced radiographer, who used lead the way management, facilitated the new and efficient workflow. The entire workforce helped the process along and made the big step from an old workflow to a completely new one.

Results: Due to several factors; the effectiveness of the radiographers has been considerably improved. The overall flow through the RD in the ED is much more efficient now than before the integration. Two key factors, the proximity of the RD to the ED and that there are no ambulatory patients in the RD (ED,) are the most prominent.

10.8. Hong Kong Medical Imaging Service in China

Presenter: Edward Chan, The University of Hong Kong Shenzhen Hospital
Author: Edward Chan

Introduction: The accessibility of Healthcare service is a serious problem in China. The public of China has complained it for many years. Health Care Reform become high priority in the agenda of Chinese government officials in the last decade but it is not a easy task to find a sustainable solution to satisfy the need of 1.3 billion people. As the other developing countries, China have to import method and system from the well developed area and start pilot studies to tackle their own problem. Hong Kong is the window city of China, having independent and international standard of medical service system by the concept of "one country two systems". So the central government of China would like to introduce HK’s system as a pilot study of Health Care Reform. The Faculty of Medicine of the University of Hong Kong was identified to be the partner of this project since 2010. A new hospital was transferred to the University of Hong Kong at the Futian Distant of Shenzhen and named "The University of Hong Kong Shenzhen Hospital" (HKU-SZ). Hong Kong Healthcare professionals are the backbone of management and clinical services. The first HK radiographer reported duty about 3 months before the opening as the Department Manager (DM). The second HK radiographer arrived in November 2012. The third and fourth resumed their duties in August and September of 2013 respectively. They all are experts of different specialities. They also do the administrative work of the ultrasound service. This presentation will share our experience and strategies of setting up a new radiography service model within difference culture and healthcare system.

Methods: Currently, 4 HK Radiographers are managing 19 local radiographers provide services of general, DSA, CT, MRI, NM, DEXA, ESWL, Mammography and Fluoroscopy. They expected to have 52 radiographers to operate the department at the end of 2014.

Results: They had too many differences of both systems. The cultural different of work was a major problem of operation. Although they faced many obstacles, the operation become seamless and combined all the advantages of Hong Kong high healthcare standard and the local high output practice by the courage of local and HK staff. The transparent policies, good strategy and communication are the keys of success. This format of healthcare service may be a good model for the Health Care Reform in China.

10.9. Tampere Cancer Center, TAMCAN

Presenter: Anne Kahliluoto, Pirkanmaa Hospital District/ Tampere University Hospital, Finland
Author: Anne Kahliluoto

Introduction: Cancer diseases are a major public health problem. About 30 000 new cancers are diagnosed yearly and One third of Finns are diagnosed with cancer, and cancer causes one in five deaths in Finland. Cancer treatment is a multi-professional teamwork from primary care to specialized medical care, and back. The treatment consists of today an increasing number of different treatment modalities are combined; options put together: surgery, chemo-pharmaceutical and hormone therapy, radiation therapy, and targeted therapies. Various molecular biological drug therapies. The choice of cancer treatment is based on molecular, biological and clinical factors. Evaluation of the effectiveness of treatments requires constant research. Patient care must have clear links and interfaces with research, as well as population level research to guarantee a wide availability of the new therapies. To improve cancer treatment and research opportunities, many countries have established national cancer center networks. Now, the same model is being applied in Finland. The developmental project of Tampere Cancer Center, TAMCAN, aims to examine fully the specific responsibilities of the cancer center, establishing conditions - as well as the opportunities and modelling tasks. TAMCAN will be one part of the Finnish cancer center (FINCAN) network. Evaluation of the treatment effectiveness requires constant research. Patient care must have clear links and interfaces, as well as research in the development of treatments that guarantee the availability of new therapies. To improve cancer treatment and research opportunities, many countries have established national cancer center networks

Methods: The Chairman is involved in the National Cancer Center’s planning at the national level. The project group has visited cancer centers in Europe and discussed with the regional hospital leaders about their preferences and expectations as to TAMCAN.

Results: The project group proposes that TAMCAN will be established. Its mission is to contribute to cancer research, treatment and education. TAMCAN will be one part of the FINCAN -network. TAMCAN’s primary focus is going to be a wide-ranging prostate and breast cancer research, including basic, translational, clinical, and health care and scientific research. TAMCAN will also support other types of cancer research and a high level of care. A Phase I-III anti-cancer drug research center will be an important part of TAMCAN, linking translational research done at the Institute of Biomedical Technology to patient care, and providing funding of research through cooperation with the pharmaceutical industry.

10.10. Is it economically justifiable to let sonographers perform diagnostic ultrasound examinations in the upper abdomen?

Presenter: Kari Gerhardsen Vikestad, Oslo Kommune, Norway
Author: Kari Gerhardsen Vikestad

Introduction: A scientific study from Norway concluded in 2011 that sonographers are qualified to perform ultrasound examinations of upper abdomen equal to radiologists. This is a cost/benefit analyze to explore
whether it’s justifiable to use sonographers to perform diagnostic ultrasound in the upper abdomen.

Methods: A cost/benefit analyze included salary, time spent performing reports, time radiologists spent to assist or take over examinations because the lack of sonographers competence, new tasks that the radiologists find time consuming.

Results: The radiologists’ saved 36 or 17 hours per week for other tasks as a consequence of using the sonographers to perform all ultrasound examinations in upper abdomen independently. The waiting time is reduced and the radiologists have saved time to perform more examinations with advanced diagnostic, CT, MRI and conventional x-ray examinations. The study concludes that a society perspective the benefits are documented, depending on that the society will invest in the sonographer’s education.

10.11. “The Young and The Restless” - How to Harness the Synergy of a Multigenerational Radiation Therapy Team

Presenter: Marcia Smoke, Juravinski Cancer Centre, Hamilton, Ontario, Canada
Authors: Marcia Smoke, Courtney Patterson, Tom Farrell

Introduction: Radiation therapy currently has a mixture of generations in the workplace: Baby Boomers, Generation X and Millennials. Each generation has different attitudes, styles, work ethics, preferences and goals that are shaped by varying life experiences. These variations can have a significantly positive influence on productivity if managed appropriately, or the variations can create conflict and negatively impact the cohesion in the workplace environment. Managing a workplace with generational diversity presents unique challenges. Intergenerational workplace differences have been studied in nursing, but not in radiation therapy. Understanding how the intergenerational workforce impacts radiation therapists at a large, Canadian, academic Cancer Centre could help create a work environment to meet each generation’s needs and expectations. The work expectations, work ethics, job preferences, career goals, values and attitudes were investigated in the three main generations in the radiation therapy workforce, that is, the Baby Boomers (1946-1964), Generation X (1965-1979) and Millennials (1980-2000).

Radiation therapy is a unique area of study in that the job requires exceptional teamwork abilities to ensure patient safety and quality assurance. As a result, it will be interesting to see how this unique factor will influence the survey results compared to the literature. The study also investigates innovation that could be considered for radiation therapy practice that addresses Generation X and Millennials’ desire for flexibility, creativity, autonomy and an unstructured work environment.

Methods: A literature review was performed on the work expectations, work ethics, job preferences, career goals, values and attitudes of the three generations. A quantitative survey was developed. Data were analyzed using the Sign and Kruskal-Wallis test.

Results: Radiation therapists from all generations scored positively for working with therapists from other generations. No intergenerational conflict was noted. Generational differences may not manifest in the workplace as much as postulated by the literature. It is possible that radiation therapists develop similar work attitudes and preferences through the process of ‘normalization’. The study highlights areas of innovative radiation therapy practice to address each generation’s expectations.


Presenter: François Couillard, CAMRT, Canada
Author: François Couillard

Introduction: Many healthcare organizations are struggling to make ends meet as they aim to fulfill the needs of those they serve with dwindling means. At the same time, their stakeholders are asking for more accountability for the way they spend their money. Governments faced with growing deficits are disengaging from some of their social commitments, focusing more effort on reducing their deficits and stimulating the economy. Businesses, on the other hand, are under growing burden to behave in a socially responsible way. Social innovation is emerging as a promising new way to connect these various actors and foster collaboration across sectors. In this presentation we will explore the concepts of social innovation and social enterprise. The author will share examples of how the social enterprise model is helping improve health outcomes in various parts of the world, highlighting best practices and pitfalls. Examples will range from a multinational corporation promoting portable ultrasound devices in India to help diagnose life threatening conditions, to small a social enterprise providing solutions to bridge the eHealth knowledge divide in Medical Imaging Informatics. This topic will be of interest to health professionals who are looking for alternative models of delivering care in regions with weak or inefficient healthcare public funding. It will appeal equally to those responsible for the management or good governance of professional associations as they seek ways to better serve their members in a financially sustainable way. Finally, it will be of interest to industry representatives as they respond to public pressure to “give back” and behave in a socially responsible way.

Methods: The author will discuss numerous case studies. He will make reference to the available literature on the emerging field of social enterprises and his own experience as a business and non-profit executive and a consultant.

Results: The polarization between business and non-profits is blurring. New organizational models are emerging that combine the best of the non-profit and business worlds: social enterprises. This is still a new field, but thought-provoking new models to organize and deliver health care and improve population health are being developed all over the world and show promising results.

10.13. Perspectives of medical radiation technologists regarding involvement in planning and execution of work-related organizational changes

Presenter: Greg Toffner, Athabasca University, Canada
Author: Greg Toffner

Introduction: How organizational changes are managed in the workplace and how they are perceived by front-line Medical Radiation Technologists (MRTs) may have a direct or indirect effect on a number of underlying factors such as intrinsic motivation, trust, attitudes, stress levels, staff morale and job satisfaction. In turn, job performance, patient care, staff retention and attainment of strategic planning initiatives can be influenced. Influences based on changes being implemented by organizational leaders can affect fundamental internal dynamics within organizations that can negatively or positively affect employees and subsequently outcomes for the organization. This study explored the perspectives of front-line MRTs concerning their involvement in planning and execution of work-related organizational changes. The aim of the study was to obtain a better understanding about if, and where, influential change in the MRT professional environment is occurring, how MRTs perceive that change and how their perceptions of the implemented change affected the practice environment. As healthcare organizations anticipate future trends, the concept of ‘change’ will become an increasingly important influence on the maintenance of quality health services in times of limited resources. How change is managed will have an impact on quality, accessibility and efficiency of health services and sustainability of the healthcare system.

Methods: - Qualitative descriptive study - Data collection was comprised of personal interviews and a focus group - Rigor in the research design was maintained by following established standards in qualitative research practices.

Results: This study was remarkably consistent with the conceptual framework presented for the study. The theories presented by Lewin, Bridges, and Senge change confirmed in this study why some change initiatives are successful and others are not. The concepts of intrinsic motivation and participant engagement had a profound impact on the change transition.

10.14. Aged Care Mobile X Ray Service- an ED Avoidance Project

Presenter: Ingrid Klobasa-Egan, Northern Beaches Medical Imaging Departments, Sydney, Australia
Authors: Ingrid Klobasa-Egan, Ken Cassar et al

Introduction: Australian Hospitals have been seeking to identify affordable emergency admissions due to ever-increasing presentations and an aging population. Aged/disabled patients from nursing homes often experience lengthy waiting times in Emergency for simple x-ray examinations and often experience difficulties in obtaining ambulance transport to and from hospital. These patients face extended periods of discomfort on ambulance beds, and in some cases disorientation, whilst waiting for an x-
11. MRI

11.1. A Study on the Electrical Axis of Heart in Cardiac Magnetic Resonance Imaging

**Presenter:** Ho Nam Koong, Seoul National University Hospital, South Korea  
**Authors:** Ho Nam Koong, Dong-Jin Choi, Dong-Sung Kim

**Purpose:** The signal of electrocardiogram from patients can be changed and distorted by the position of electrodes on the chest that is necessary for high quality of Cardiac Magnetic Resonance Imaging (CMR). It is essential for the electrodes to align with the electrical axis of the heart that is variable in the patients. We investigated the angle of the electrical axis on the heart on CMR clinically.

**Materials and Methods:** We investigated the angles from 335 patients (male 237, female 99, mean age 63.2 ± 2.5 years old) for 5 years (January 2008 – December 2012) on 1.5T (Sonata, Siemens) or 3.0T (Trio, Siemens). The electrical axis is the direction from left atrium through mitral valve to apex of heart and has been divided into two angles on the CMR scout images to know how much it changed. The two angles were measured from medial sagittal line to the electrical axis on axial and coronal images respectively. The correlation between angles, sex, and diseases were evaluated by Pearson Correlation Value (IPSS v22.0). We compared the electrode position according to electrical axis from the patients with that of the manufacturer recommended.

**Results:** The angles of electrical axis on axial and coronal images were 112.26 ± 6.05°, 42.43 ± 8.77° respectively. It showed significant correlation between the angles (p<0.006). However, it was not correlation between angles and sex (p=0.133). Most cardiac diseases of the patients were myocardial infarction (40%), angina pectoris (9%), cardiomyopathy (9%), aortic stenosis (8%), congenital heart (6%) and etc. (28%). The electrode attached locations were different between in aligned with electrical axis and manufacturer recommended.

**Conclusion:** Cardiac electrical axis varies and changes toward inferior and lateral in various patient conditions clinically. The positioning of the electrodes needs to be adjusted to the electrical axis to get the high quality ECG signal and it should be considered clinically comparing the manufacturer recommended methods.

11.2. MRI with cardiac pacing devices – Safety in clinical practice

**Presenter:** Touko Kaasalainen, HUS Medical Imaging Center, Finland  
**Authors:** Touko Kaasalainen, Sami Pakarinen, Sari Kivistö, Outi Sipilä

**Introduction:** Until recently, cardiac pacing device manufacturers have strictly restricted the magnetic resonance imaging (MRI) examinations of patients with cardiac pacing systems. However, with the high incidence of clinical indications for MRI, pacemaker (PM) manufacturers have recently developed MR-conditional PMs and implantable cardiac defibrillators (ICD) that can be scanned in MRI under certain imaging conditions. Additionally, many centres have recently performed MRI scans also for patients with MR-unsafe pacing systems. Our aim is to introduce our safety protocol, which was developed in close co-operation between the Departments of Cardiology and Radiology, of performing MRI scans in patients with cardiac pacing systems and to summarize our experiences of these studies. The step-by-step protocol doesn’t have any restrictions in a scanned body region, and includes methodologies for both MR-conditional and MR-unsafe pacing systems as well as for both PM-dependent and non-dependent patients.

**Methods:** So far, 140 patients with cardiac pacing devices have been scanned with a 1.5T MRI scanner using a dedicated safety protocol. The function of pacing devices has been checked prior to, immediately after and approximately one month after the MRI.

**Results:** All MRI examinations have been completed safely. We haven’t observed any significant changes in the programmed parameters of the devices. Neither we have found differences in the variable changes between MR-conditional and MR-unsafe pacing systems nor between scans of thorax area and other areas. We conclude, MRI in PM patients can be performed safely under certain condition with a proper patient monitoring and device programming, when there are no alternative imaging modalities for diagnosis.
11.3. Magnetic Resonance Imaging in Francophone West Africa

Presenter: Aziagba Dogbèvi, Polyclinique Saint Joseph Lome Togo
Author: Aziagba Dogbèvi

Introduction: The magnetic resonance imaging (MRI) is one of the very few still available radiological modern methods in poor countries. The high cost of installation could justify the rarity of this technology. Many countries especially in sub-Saharan Africa do not have MRI, and schools radiology training in these countries confound their training technologies available on site. In the West African region which consists of 16 countries, including eight French countries, only 3 of its 8 francophone countries have at least an MRI machine. In order to evaluate the practice of this new technology of our discipline in Francophone Africa, we initiated a study that aims to: - Determine the profile of radiographers working on an MRI - Identify their difficulties - Exposing their wishes and recommendations for improvement of MRI practices in Africa The study was conducted during the months of November and December 2013 through the three Francophone countries of West Africa has at least an MRI namely Cote d’ivoire, Senegal and Togo, and involved a total of 13 centers of Radiology with MRI machine. An opinion survey was sent to radiographers or radiological technologist working in MRI in these centers.

Methods: The survey focused on 7 themes: MRI Radiographers; initial training of radiographers; special training in MRI and continuing education; MRI centers; protocol, configuration and MRI images realization; Great difficulties; Best wishes of radiographers.

Results: 13 MRI centers. MRI radiographers: 8 answer our questions (5 Togoises, 2 Ivorians and 1 Senegalese). 62.5% have never worked in MRI before. Initial training of radiographers: 3 years for all. For 75% this training didn’t include MRI. Special training in MRI: 75% hadn’t received training. The MRI centers: 84 % are low magnetic field machine (0.23T to 0.35 T). Protocol and MRI images realization: 37.5% arrived to modify exam’s protocol; 62.7% not succeeds. Wishes: Practical training in MRI.

11.4. MRI of the liver - the imaging protocols of the Central Hospital of Central Finland

Presenter: Tiina Nousiainen, Central Hospital of Central Finland
Author: Tiina Nousiainen

Introduction: The Central Hospital of Central Finland performs the second highest number of liver resections in Finland. Over 30 liver resections and over 170 hepatic MRI scans were being done in 2013. Metastases are the most common malignant lesions in the liver and also the most common reason for liver imaging. Two thirds of the liver resections executed in our hospital are being done to patients with liver metastasis colorectal cancer liver metastases. Magnetic Resonance Imaging (MRI) of the liver has improved significantly due to the progress in technology. Stronger magnetic fields, better coils and advanced sequences have made MRI play a bigger role in hepatic imaging. It is used for detecting, locating, quantifying and characterizing hepatic lesions. At our hospital MRI is not routinely used for pre-operative imaging but rather for characterization of undefined lesions seen in other cross sectional imaging like computed tomography. Our hepatic MRI protocols are based on unenhanced T1-, T2- and diffusion weighted sequences and dynamic multiphase fluoro-triggered contrast-enhanced T1W imaging.

Methods: The usage of contrast agent is necessary when doing a hepatic MRI as the enhancement properties form a basis for the characterization of the lesions. The contrast agents can be divided into gadolinium based chelated agents (GBCA) and non-GBCA.

Results: The non-GBCAs include hepatobiliary agents and reticuloendothelial agents. The classification is based on their chemical properties, biological distribution and mechanism of action. Liver specific contrast agents give greater liver-to-lesion contrast compared to gadolinium chelates. The most used contrast agent in liver MRI imaging in our hospital is GBCA but also a hepatocyte specific gadolinium based contrast agent is being used in selected cases.

12. NUCLEAR MEDICINE

12.1. Sterile and septic inflammation: imaging properties of 67 Ga-citrate versus in-house manufactured 99mTc-ECDG

Presenter: Je’nine Horn-Lodewyk, Department of Nuclear Medicine, Universitas Academic Hospital, Bloemfontein, South-Africa
Authors: J. Horn-Lodewyk, A.C. Otto, J.M. Wagener, J.R. Zeevaart and G. Joubert

Introduction: The imaging properties of the newly synthesized in-house manufactured (IHM) technetium-ethylencysteine-deoxyglucose (99mTc-ECDG) and the established 67Ga-citrate were compared in sterile (zymosan) and septic (Escherichia coli) inflammation models. The aim of this study was to determine whether there is a difference in the degree of inflammation detection for IHM 99mTc-ECDG (99mTc-ECDG) and 67Ga-citrate in rabbits with induced septic and sterile inflammation.

Methods: IHM 99mTc-ECDG static imaging at 0-6 hour (h) and SPECT/CT at 2- and 4 h. 67Ga-citrate statics at 24- and 48 h and SPECT/CT at 24- and 48 h. Regions of interest on the infected right, versus uninjected left area and expressed as mean percentages.

Results: The mean % uptake for the static images of the IHM 99mTc-ECDG group one from 0-6 h was 66.57% and for the IHM 99mTc-ECDG group two from 0-6 h was 66.10%. These did not differ significantly, p=0.78. The mean % uptake for static images of the 67Ga-citrate group one 24-48 h was 82.10% and the mean % uptake for 67Ga-citrate group two 24-48 h was 78.25%. 67Ga-citrate gave better results than IHM 99mTc-ECDG yet the latter compared favourable in both the sterile and septic inflammation model.

12.2. Accuracy of Nuclear Medicine Technologist Reporting on Bone Scintigraphy: A case Study from Sudan

Presenter: Suliman Salih, 1 Faculty of Applied Science, Taibah University., Al-madinah Al-munawarah, KSA, 2 National Cancer Institute - University of Gezira, Sudan
Authors: Suliman Salih

Introduction: Development in radiologic technologist (radiographer) reporting role over the past four decades has been necessary to deliver and expand clinical imaging services. In developing countries, radiologic technologist reporting is become a requirement, where there is shortage in medical staff. The objective of this study is to assess the accuracy of nuclear medicine technologist reporting on bone scintigraphy, in comparing with nuclear medicine physician as reference standard.

Methods: The study statistical assessed the nuclear medicine technologist (NMT) reporting on 100 bone scans in comparing with nuclear medicine physician report as reference standard. The study was carried out at National Cancer Institute, University of Gezir.

Results: This study revealed the accuracy, specificity and sensitivity of nuclear medicine technologist reporting were 97.4%, 95.8% and 97 respectively, in comparing to of nuclear medicine physician.

Conclusion: This study provide evidence that nuclear medicine technologists can reporting on bone scintigraphy accurately, if they exposed to a formal training in nuclear medicine imaging report.

12.3. One year imaging of cancer patients at the dept. of nuclear medicine University College Hospital, Ibadan, Oyo State, Nigeria

Presenter: Musa Dambele, Department of Nuclear Medicine, University College Hospital, Ibadan, Oyo State, Nigeria
Authors: Dambele Musa

Introduction: Cancer imaging in University College Hospital (UCH), Ibadan with Gamma Camera started in April, 2006 to cater for staging, treatment and assessment of metastases. This presentation is aimed at analysing the number of patients, age group, treatment progress report, cancer preponderance among cases like cancers of the cervix, prostate, breast and most common scan performed as well as the challenges and contribution of radiographers in nuclear medicine.

Methods: * A total of 637 Radionuclide bone scan patients during the period were presented . The diagnosis, biodata and results were analyzed using descriptive means. Patients for other scans were excluded. * Tc-99m
12.4. Multimodality imaging in the medical radiation sciences

** Presenter: Robert Miner, The Michener Institute CE  
** Author: Robert Miner  

** Introduction:** New multimodality imaging technologies are significantly impacting diagnostic imaging and the current practice of medical radiation professionals. All imaging modalities have their own strengths and weaknesses: radiography, CT and MRI are excellent at imaging anatomy while nuclear medicine (PET and SPECT) image physiology and molecular response. Hybridized complementary modalities allow increased diagnostic accuracy and improved workflow.  

** Methods:** Conventional and future imaging technologies and topics relevant to the medical radiation sciences are compared and contrasted: Image fusion, SPECT/CT, PET/CT, PET/MRI, optical, Compton and neutron activated SPECT (nSPECT) imaging.  

** Results:** The merging of anatomical and physiological modalities has marked a shift in diagnostic imaging. The integration of different modalities is now the norm. Possible future clinical imaging modalities such as optical, Compton and nSPECT are either in pre-clinical use or in development offer unique advantages.

13. PEDIATRIC IMAGING

13.1. Guidelines for skeletal surveys in Suspected Child Abuse

** Presenter:** Bo Mussmann, Department of Radiology, Odense University Hospital, Odense, Denmark  
** Author:** Bo Mussmann

** Introduction:** Child abuse imaging differs from general musculoskeletal imaging in the demands for low noise. The consequences of misdiagnosis are serious. The images are directly involved in legal processes and the child and the family faces major consequences if the images are not adequate. If head trauma or fractures are overlooked, or if the radiological diagnosis is uncertain, abused children may be sent home with violent parents or caregivers. If no abuse has taken place, and the certainty of the diagnosis is questionable, it may result in prolonged hospitalization of an innocent family. In Southern Denmark approximately 40 children pr. year are examined in four different radiology departments. Until the autumn of 2012 different projections and imaging techniques were used for the skeletal surveys. This proposed difficulties, because all images are subject to second opinion statements. In many cases supplement images or a complete reexamination of the child were needed in order to state a second opinion, resulting in unnecessary excess radiation dose.  

** Methods:** A literature review was performed and the results were discussed at an initial meeting at Odense University Hospital. A follow-up meeting was arranged in Sept. 2013. The meeting focused on follow-up skeletal surveys in children < 2 years of age  

** Results:** Images are acquired at low noise levels. Speed class 100 against normally 200 - 400 is sufficient, demanding higher radiation dose compared to common pediatric examinations. For children < 2 years, images are acquired systematically and consequently, if a follow-up skeletal survey is needed, images of the spine, head and pelvis are not repeated. No cases of unnecessary supplement images or reexaminations have occurred since autumn 2012 indicating successful implementation of the guidelines.

13.2. Improving neonatal chest radiography: an evaluation of image acquisition techniques, dose and technical quality

** Presenter:** Maryann Hardy, University of Bradford, UK  
** Authors:** Maryann Hardy, Beverly Snuth

** Introduction:** Neonatal radiography is unique in terms of vulnerability of patient group to radiation exposure and distinctive anatomical appearances. While internationally agreed standards for neonatal chest radiography dose and image quality assessment criteria exist, these are not readily transferable to radiographic image acquisition practice and variation in recommended practice is evident within internationally acclaimed radiographic technique textbooks. While previous studies have considered dose and collimation within neonatal radiography, no published research has considered the technical quality of neonatal chest radiographs (i.e. lordosis, rotation, inspiration) or the prevalence of suboptimal image acquisition approaches, radiographer knowledge of neonatal anatomical proportions or their anxieties re: working with this patient group in specialized neonatal ward environments. This study forms the initial phase of a progressive programme of research that will explore these issues. The findings of this phase of the study will provide a baseline evaluation of practice quality from which the learning needs of radiographers can be determined and intervention developed. The outcome of the programme of work, of which this proposed study forms the fundamental phase, will be international standards on neonatal chest radiographic image acquisition technique and technical quality assessment and promotion of the professional knowledge and responsibility of radiographers for image acquisition quality in this vulnerable patient group.

** Methods:** Phase 1: A retrospective evaluation of neonatal chest radiography quality and dose  

** Results:** Analysis of results is ongoing. A descriptive analysis of image acquisition quality will be undertaken to identify differences and commonalities in radiographic practice. Dose range at each Trust will be statistically summarised and compared with national and local DRLs where available. The findings of this study will provide baseline data to support revision of national and international neonatal radiography standards.

13.3. Every Picture Tells a Story

** Presenter:** Anne Connell, Mater Children’s Hospital, Brisbane Qld, Australia  
** Author:** Anne Connell

** Introduction:** This story began with a single AP view of a knee which demonstrated Harris Lines (or Growth Arrest Lines). These lines result from a temporary slowdown of normal longitudinal growth rates during a period of injury or illness. Research into the cause of these lines made a very interesting case study which I would like to share with you, and discuss how after multiple surgical examinations the resultant outcome was amazing. The history included SUFE (Slipped Upper Femoral Epiphysis), AVN (A vascular necrosis) osteotomy and long leg imaging.  

** Methods:** This is a case study based presentation therefore the examinations discussed will be briefly mentioned.  

** Results:** This is a case study presentation which will explain the treatment and will conclude with an excellent outcome.

13.4. The importance of verbal interaction between child and radiographer during radiographic procedure

** Presenter:** Berit Björkman, School of Health Sciences, Jönköping University, Sweden  
** Authors:** Björkman, B., Golsäter, M., Simeonsson, R., Enskär, K.

** Introduction:** The verbal interaction between the child and radiographer during a radiographic examination is an unexplored, but important area of clinical practice. The aim of this study was to investigate the nature and distribution of that interaction between child and radiographer and the extent to which it varied as a function of the child’s age.

** Methods:** The study had a quantitative approach. The verbal interaction between child and radiographer during 32 examinations was analyzed using the Roter Interaction Analysis System (RIAS).  

** Results:** The results revealed that 80% of the verbal interaction was carried out by the radiographer either to the child or to an escorting parent, while 17% was carried out by the child and 3% by the parent. More utterances containing social emotional exchange were used to involve
13.5. Immobilization of children in pediatric radiography

Presenter: Heli Heikkilä, Finland
Authors: Anja Henner, Mira Uusitalo, Heli Heikkilä

Introduction: Radiographers have to utilize good communication skills especially in pediatric imaging. It is difficult to reach child’s confidence in a very short time and radiographers face many challenges every day when undertaking pediatric examinations. One of the most testing of these is that of a strong-willed uncooperative child who refuses to keep still for an examination. A successful, diagnostic examination could be described as one which achieves diagnostic quality images, without image degradation due to patient movement but should also exclude mental or physical detriment to the patient. The first and most important way to calm the child is good communication with the child and family. Radiographer must be aware of the typical features of child’s development. Child may have previous unpleasant experiences or she/he might be afraid of pain, loss etc. When imaging newborns, radiographer needs always ancillaries to keep to baby in position although it is sad that only as a last resort should restraining techniques be used.

Methods: Different tools and the use of them for immobilization of small children are introduced. Tools like small metallic beads inside a fabric bag, line, ribbons and strings, tape and supporting pillows of foam rubber are used for immobilization. Examples are given.

Results: Different size of fabric bags which are filled only partly with metallic beads. The weight of the metallic beads is lying on the table, not on the child. With lines the hands are easy to keep motionless and the metallic bead bags can be used as press. Supporting pillows of foam rubber are useful e.g. to keep the child’s head motionless. Wide tape is useful in hand and foot examinations. Lead aprons are useful to keep small children in position and same time they protect the child from radiation.

References

13.6. Advanced Paediatric Imaging: A View of the Past Ten Years

Presenter: Michelle O’Connor, University College Dublin, Ireland
Authors: Michelle O’Connor, John Ryan, Shane Foley

Introduction: The use of advanced diagnostic imaging has increased considerably over the past two decades. Advanced imaging modalities used in paediatric radiology include; ultrasound (US), computed tomography (CT), magnetic resonance imaging (MRI), and nuclear medicine (NM). Technological advances in imaging have led to a higher quality of care and reduced patient morbidity and mortality. While there are many benefits to diagnostic imaging, there are also some risks worth considering. Modality such as CT and nuclear medicine involve ionising radiation and radioactive material. Children are at higher risk of developing radiation-induced cancers than adults because their developing tissues are more sensitive to radiation. Their likelihood of repeat examinations and longer life expectancy allow additional time for the emergence of detrimental effects. To date, initiatives such as the Image Gently campaign by the Alliance for Radiation Safety in Paediatric Imaging have been established to increase awareness of the opportunities to promote radiation protection when imaging children. In order to successfully develop further initiatives and monitor the success of existing initiatives, it is necessary to analyse the trends in diagnostic imaging over time. Longitudinal studies on the use of paediatric imaging involving radiation have been examined in Australia and the United States. Such literature in Europe is sparse and out-dated. This research investigated; 1) population-based trends in the use of advanced medical imaging in children in Ireland from 2003-2012; 2) its use across age groups and gender; and 3) the most commonly performed procedures within each specialist modality.

Methods: A retrospective cohort analysis study was carried out in paediatric hospitals within Ireland (N=3). CT, MRI, NM and US annual examination data and demographic patient data from 2003-2012 was obtained from the Radiology Information Systems (RIS).

Results: 224,173 imaging procedures were carried out on 84,511 patients, 68% of which were ultrasound, 15% MRI, 7% CT and 6% NM. MRI (+280%) and CT (+80%) saw the largest increases in use, followed by US (+70%) and NM (+100%). Most examinations were performed on children aged 0-3 years, with no tendency towards either sex. Imaging rates increased with age in CT and MRI. Regions most frequently imaged included the abdomen (ultrasound), head (MRI and CT), and kidneys (NM).

13.7. Doses to newborns in chest x-ray examination in PICU

Presenter: Anja Henner, Oulu University of Applied Sciences, Finland
Authors: Minna Tikkanen, Kirsti Matila, Anja Henner

Introduction: Digital imaging gives new possibilities to post process an exposed x-ray and decrease the need for retakes or extra exposures: e.g., edge enhancement to copies of neonatal chest radiographs helps to identify small pneumothoraxes and vascular catheters and gives increased contrast and the possibility to transfer images quickly via telediagnosis to a specialized pediatric radiologist. Routine daily chest radiographs may give new information to the pediatricians in 50% of the cases of very low birth weight infants. The most common examinations are chest or chest and abdomen. The risk from one neonatal radiograph is low. However, the benefit versus risk of each radiograph is important and must be checked carefully. Radiation effects are cumulative and some children may have dozens of x-rays (even more than one hundred) and they may have also CT and nuclear medicine examinations. The smaller the newborn is the more x-rays are usually taken in follow up purposes. That is why the doses to newborns have to be followed up regularly.

Materials: Doses in pediatric intensive care unit were collected and compared to doses collected in the beginning of this century. This current data was performed by Shimadzu Mobile Art Evolution system installed in 2011. Focal spot is 0.7 mm, filtration 2.5 mmAl, focus to detector distance 100 cm and babies are lying in incubator in intensive care unit.

Results: Weight of the babies varied from 1.7 kg to 4.37 kg (mean 2.65 kg). Mean DAP, used with CR, was 3,30 mGycm² using 0,75 cm (range 0,63 mAs to 1 mAs). Mean DAP was 438,6 (range 247-1240). DAP varied from 1 mGycm² to 5 mGycm², mean 2,769 mGycm². In the former data with CR system mean DAP was 3,5 mGycm² (range 1,8 mGycm²-6,3 mGycm²). This data shows that the doses in PICU can be optimized and it is possible to decrease doses with CR compared to CR system. The radiation field size was not documented in this latter data but it seems that the DAP is lightly correlating on patient’s size. The scale of S-value is varying widely. Pediatric radiologists have reported images and the image quality is good enough for diagnosis in all cases. More important is the image quality according the indication can looking only the given recommendation of exposure index (in chest in x-ray examination S-value from 200 to 600). The children may receive many x-ray examinations already as newborns, which is why dose optimization must be performed every time when using radiation. The total radiation dose should be followed up and recorded but that is not yet in use.

13.8. Agreement In Neonatal X-ray Interpretation: A Comparison Between Consultant Paediatric Radiologists And A Reporting Radiographer

Presenter: Nick Woznita, Homerton University Hospital & Canterbury Christ Church University, UK
Authors: N Woznita, K Piper, N Aladangady, K Iliadis, R Prakash & R Santos

Introduction: X-rays are frequently used by clinicians to aid in patient diagnosis and management; infants which require specialised neonatal care are no exception. Accurate and prompt x-ray interpretation is of fundamental importance; however significant observer variation is reported in the literature. Increasing workloads in developed nations and limited specialized radiology resources in the developing world can act as barriers to the availability of a radiology report. In the United Kingdom, radiographer reporting is often used as a solution to manage radiology workload while maintaining a patient focused service. In order to influence practice there is a need to aid the clinician in arriving at an accurate diagnosis. A paucity of recent evidence exists in the literature related to this aspect of x-ray interpretation, particularly for radiographer produced x-ray reports. The paediatric literature reveals a small evidence base; the majority of studies examine agreement between radiologists and paediatricians in the interpretation and diagnosis of pneumonia in children. There is little research evidence which examines agreement in neonatal x-ray interpretation. Previous studies have examined pathology scoring systems rather than clinical reports produced in routine practice. A Royal College of Radiologists and College of Radiographers guidance states that radiographers who interpret images must perform at a level comparable to radiologists; this hypothesis will be tested. If radiographers are trained to interpret neonatal x-rays and do so to a standard comparable to radiologists, they could provide additional reporting resource across healthcare settings worldwide.
Introduction: Medical imaging is an essential part of the diagnosis of many diseases and plays an important role in the improvement of public health among all populations. Optimal diagnostic image quality (radiograph) is a fundamental element of x-ray image interpretation. It is also known that poor image quality is a major source of diagnostic error and can lead to misdiagnosis. Therefore, the implementation of quality assurance and management is a key pathway to accurate diagnosis. It is for that reason that the quality management mechanism was emphasized within the imaging department before integrating a systematic film reporting process. Problem Statement: Poor equipment and infrastructure made it impossible to respond to an increase in patients exhibiting clinical signs that required precise musculoskeletal and chest x-rays in order to ensure accurate diagnosis. It was therefore determined that not only will some abnormalities be misdiagnosed but many early pathologic features such as hairline fractures, any mild periosteal reaction, sclerotic changes, loss of smoothness of any hema diaphragm, and small pulmonary nodules will be invisible on radiographs leading to misdiagnosis and patient mismanagement. In addition, it has generally been believed that diagnostic accuracy which corresponds to the outcome of radiologic examinations is related to image quality and other supporting factors which were not sufficiently in place. A number of medical imaging service challenges related to clinical problems for accurate diagnosis have been reported:...... Improved Department infrastructures for radiation protection facilities Accessibility of equipment Technical Aspects Methods: • Used critical observations (CPBPFD) • Developed tools for analyzing challenges identified and documented daily • Retrospective study(2001-2011), analyzed image quality based on theories learned in school prior to giving image to patient Results: Medical imaging service challenges related to clinical problems for optimizing patient care through accurate diagnosis based on medical imaging were reported. These included administrative issues and infrastructure. Ultimately, all basic facilities for patient-centered care were upgraded in a sustainable way. Cl: Accurate diagnosis results from high image quality.

14.2. How can the nonverbal communication help our relationship with the patient?

Presenter: Benoit Billebaut, Institut für klinische Radiologie, Universität Klinikum Münster (Germany)
Authors: Benoit Billebaut & François Alric, Centre Hospitalier de Troyes (France)

Introduction: There are many ways to communicate but it is always challenging in our jobs to establish a trusting relationship with a patient, particularly in the relatively short time that we have at our disposition. This relationship is of a primary importance, first so that the patient does not live the examination like a trauma and second to make sure that he/she will be as cooperative as possible. Time is short in today radiology and we seldom have the opportunity to take a lot of time to simply speak with our patients, to help them trust us. Words take too much of that valuable time, that is why it is important to master the other aspect of communication, one that doesn’t require this verbal component. It has been demonstrated that in trust matters, the nonverbal communication is as much as 80% more important the verbal aspects. Simply put: it matters more how we say something as what we say.

Methods: First, we will introduce the basics of nonverbal communication and secondly we will demonstrate how a radiographer can use those to enhance his/her patient care. Our rules: it has to be easy, quick, universal and reliable.

Results: With this presentation (20-30min), we aim to show how simple it can be to ease the patient examination stress and to help him/her see us as trusted professionals, if one is aware of the importance of nonverbal communication. Because this communication does not rely on words, it is by its very nature international and be used in every radiology services in the world.

14.3. Simple measures to improve correct chest and abdomen imaging in NICU portable x-ray

Presenter: Janni Jensen, Odense University Hospital, Denmark
Author: Janni Jensen

Introduction: For the infant in the neonatal intensive care unit (NICU) all medical procedures are of utmost and at times vital importance. Characteristic for bedside chest and abdomen imaging is that it must be performed fast, cause no or little stress to the infant and produce radiographs suitable for correct diagnosis. A radiograph may alter patient management and mistakes that could potentially affect the diagnostic accuracy must be kept at a minimum. Such a mistake could be, choice of beam orientation, positioning of the infant or how many images to take. When confirming correct positioning of a central venous catheter an AP supine chest radiograph is sufficient whereas both AP and lateral radiographs are essential when determining correct positioning of an umbilical venous catheter. At Odense University Hospital (OUH), the radiographers had access to a large detailed protocol containing guidelines, image criteria, images and in depth description on all relevant pathology. The protocol was meant to help the radiographers decide which images to obtain in the NICU. At OUH approximately 900 radiographic bedside examinations with numerous different pathologies are performed yearly on children between the ages of zero and three years. With more than 90 radiographers performing these examinations, a short readily available protocol with easy to understand guidelines was desired. The aims and objectives of this project was to raise the number of correct images by introducing a simplified one-page schematic protocol, derived directly from existing department protocol, leaving out all explanatory information, containing only essential knowledge.

Methods: The effect of the new simplified guidelines was assessed by auditing the number of incorrect NICU images before and after introduction of the guidelines. 80 consecutive examinations were included in both audits.

Results: The result of the first audit, already existing department protocol, was that 30% of the examinations differed from department protocol. The second audit was made three months after introduction of the simplified guidelines and the number of incorrect images had fallen to 13%, p<0.001 (Fisher’s Exact Test). Minimal intervention, such as simplifying already existing guidelines and making them available at all mobile x-ray units was enough to improve the number of correct examinations.

14.4. A Snapshot of a Week in Radiology

Presenter: Adam Steward, Western Health, Australia
Authors: Adam Steward, Stephanie Broeren, Michal Schneider-Kolsky, Louise Bentley

Introduction: Radiology plays a vital role within the modern healthcare system; it involves communication between medical imaging staff, referrers and other hospital staff whereby clinical information is exchanged with the set goal of providing relevant, accurate and useful information in the diagnosis and treatment of a patient. There are worldwide studies that suggest communication problems in hospitals, between radiology and other departments, particularly with the ability to transfer and exchange important patient information. This leads to the question of ‘Are Radiology request forms being adequately filled out with all necessary information?’ and ‘Are radiologists providing useful information back to referrers?’ With this research project we hope to identify common inadequacies in communication with regards to the
completeness of the request form while also identifying any deficiencies in the subsequent radiology reports. We have retrospectively reviewed all request forms and radiology reports in a period of one week at a three campus major hospital in Melbourne. This includes all medical imaging modalities (CT, Plain film X-ray, US and MRI). Our goal is to provide a snapshot of radiology in Australia. We hope this research will provide useful data that can be beneficial to future research and to promote the importance of communication between medical professionals.

**Methods:** This study was a retrospective analysis of all request forms and radiology reports tendered to our department over a one-week period. The extensive data collected was analysed with SPSS version 21 statistical software.

**Results:** More than 1,700 request forms and subsequent radiology reports were reviewed. Clinical questions were not provided in over 17% of cases and other information deemed relevant omitted in more than 30% of cases. This implies significant inadequacies in the completion of radiology request forms. Improvement in the effectiveness of communication between referrer and radiology is needed to utilize radiology to its full potential.

14.5. Plain radiography image evaluation – development at HUS Medical Imaging Center

**Presenter:** Merja Wirtanen, HUS Medical Imaging Center, Finland

**Authors:** M Wirtanen

**Introduction:** HUS Medical Imaging Center (HUS MIC) (Helsinki and Uusimaa, Finland) offers imaging services for special and primary health care providers. HUS MIC made nearly 1 million examinations in the year 2013. This is almost 1/3 of all examinations made in Finland. HUS MIC has 31 x-ray departments and 51 CR/OR x-ray rooms. Patients with a referral can almost freely choose the plain x-ray department where they want to be examined. This is possible only by having equal imaging protocols and guidelines. In the year 2007 HUS MIC (named HUS-Röntgen) began a project to develop a common direction for plain radiography. The first common guidelines were published in the year 2008. Today we have directions for each plain radiographic examination, altogether 50. For example, views are listed by indication. In the year 2011 the first versions of good image criteria defined by HUS MIC were published in Finnish. Every view mentioned in direction had its own criteria. The first documented “common” image quality evaluations at HUS MIC were made in the year 2008 as a part of an internal audit. At that time we had no common good image criteria. Radiologists fulfilled a Word document and calculation of “criteria fulfilled” was made. First Excel-based evaluation form was ready in the year 2012 for lumbar spine. Radiologists made self-assessments of department’s examinations using Excel. When making a summary of HUS MIC, I noticed some need for further develop and suggested a change from “criteria fulfill or not” to 3-step evaluation. As a result, in the year 2013 radiologists evaluated some 460+460 thorax x-rays using 3-step scale. This evaluation included referrals and reports as well.

**Methods:** I will present development of our evaluation form from Word-document to Excel we use now. I will explain how I selected criteria, calculations and graphics. I will describe how radiographers and radiologist were informed about the results.

**Results:** Word-type form is simple and easy to begin with. Word-like form and simple calculations can be made even without a computer. When having more data, well planned Excel-form may be more informative. After evaluation each x-ray department makes their own improvement plans, if necessary. A good evaluation form supports this by giving limits and visualizing results.

14.6. Physical image quality in digital radiography: Comparison of three types of flat-panel detectors within the same imaging system

**Presenter:** Ell-Noora Salo, Oulu University of Applied Sciences, Oulu, Finland

**Authors:** Salo E-N, Wahlberg J, Väisänen P, Henner A

**Introduction:** The three main types of digital flat-panel detectors in use today, namely amorphous selenium (a-Se), cesium iodide (CsI) and gadolinium oxyxulfide (GOS) –based detectors, exhibit markedly different image quality characteristics depending on dose level and tube voltage used. Furthermore, the comparison of the image quality between detectors is often hindered by factors related to the imaging system itself. This study aims to evaluate the physical image quality of three different flat-panel detectors (a-Se, CsI and GOS) within the same imaging system using two image quality phantom (DIGRAD and CDRAD). The knowledge of the differences in image quality between the detector types could lead to better optimization of imaging protocols.

**Methods:** High- and low-contrast visibility, resolution and contrast-detail performance were evaluated on three detectors. Imaging was performed with three dose levels and three tube voltages. The images were graded by three independent observers manually.

**Results:** The preliminary results demonstrate significant differences in low-contrast visibility, resolution and contrast-detail performance between the detectors. Low-contrast visibility was best with a-Se detector, followed by CsI and GOS detectors. The performance of the CsI detector, however, was close to the a-Se detector. Similar trend was observed with resolution. Contrast-detail performance was markedly lower in a-Se detector, whereas the CsI detector exhibited the best contrast-detail visibility.

14.7. Closed Loop System for the Communication of Critical Radiology Results

**Presenter:** Michael Ong, Department of Diagnostic Imaging, National University Hospital, Singapore

**Authors:** Ong, M.I, Tan, F.L, Lim, R.F.Z, Lim, J.I, Kok, M.C.J, Lee, K.Y.J, Chong, F.H.1

1 Department of Diagnostic Imaging, National University Hospital 2 Integrated Health Information Systems Pte Ltd (I HIS)

**Background:** The Radiology Information System (RIS) and Picture Archiving and Communication System (PACS) manage and share Radiology images and results. The communication of critical results to the requesting clinician is necessary so that timely and appropriate patient management can be promptly initiated. However, the communication of critical results is often met with challenges and proper loop closure may not be achieved.

**Purpose:** The Department of Diagnostic Imaging (DDI) at the National University Hospital (NUH) implemented an automated closed loop system for the communication of critical Radiology results. This study was to determine if the automated communication system was reliable and if loop closure was achieved within the target timeframe of 1 hour from the report generation.

**Method:** A web-based SMS application which is interfaced to the Radiology Information System (RIS) automatically triggers a text message via short message system (SMS) to the requesting clinician’s mobile phone when a critical result is reported. The clinician needs to acknowledge the receipt of the notification by replying to the SMS. Failing to do so will trigger an escalation protocol until the communication loop is closed. Data from the system logs is interrogated to determine the percentage of successful SMS triggers and loop closure within 1 hour.

**Results:** The results from 2010–2013 revealed that critical results were successfully triggered within 10 minutes for more than 99% of the time and more than 99% of the results are acknowledged within 1 hour.

**Conclusion:** The automated closed loop system for communicating critical Radiology results proved to be reliable and effective in communicating critical Radiology results to the requesting clinician and achieving loop closure within 1 hour of the report generation.

15. RADIOTHERAPY

15.1. Multienergetic verification of dynamic wedge angles in medical accelerators using multichannel Linear array

**Presenter:** Anna Kowalki, Greater Poland Cancer Centre, Poland

**Authors:** Anna Kowalki, Marcin Litoborski

**Introduction:** The aim of the modern radiotherapy is to get the homogeneous dose distribution in PTV, which is obtained using for example of physical or dynamic wedges. The using of physical wedge have provided such isodose distributions but their use resulted in detrimental dosimetric consequences for example beam hardening effects and the practical consequences of filter handling or possible misalignment. The linear accelerators are now equipped with collimator jaws system and controlled by modern computer and it is possible to generate wedge shaped isodose distributions dynamically. Because of more comfortable using of dynamic wedge there are alternative to the standard physical wedge. During the
treatment different segments of the treatment field can be exposed to the primary beam for different intervals of time. This process of shrinking the field while modulating the collimator jaw velocity and dose rate creates the desired wedge-shaped iodose gradient across the treatment field. Dynamic wedges can replace physical wedges but their need more precise dosimetry and quality control procedures. The dynamic wedges are realized by continuous movement of one collimator jaw. The field size is gradually reducing until the collimator is almost completely closed or the field is increasing, while the beam is on. The measurements were divided in two steps: in the first step there were verified the dynamic wedges with the recommended values and in the second step there were compared the planned and measured angles of dynamic wedges. Measurements were made by means of LA48 linear array of ionization chambers (PTW).

Methods: The measurements were performed for Clinac 2300C/D accelerators (Varian) by using LA48 linear array of ionization chambers (PTW) for 6MV and 15MV photon beams. There were verified the dynamic wedges with the recommended values and compared the planner

Results: For energies 6MV and 15MV almost all percentage difference between measured and calculated profile was smaller than 5%. The biggest difference were observed in the first step of measurements when the angle of Dynamic Wedge was verified. The comparison between the planned and measured angle value of Dynamic Wedge showed the difference between 0.1% - 4.5%. It is necessary to provide comprehensive quality control procedure for enhanced dynamic wedges.

15.2. Brachytherapy Treatment of cervical Cancer: A Comparison of two centres in Africa

Presenter: Longino Mucheusi, Kenyatta National Hospital & Kenya Medical Training College, Kenya

Author: Longino Mucheusi, OGW

Introduction: Brachytherapy treatment of cervical cancer: A comparison of two centres in Africa. By Longino Mucheusi, RTT Training Coordinator Kenyatta National Hospital & Kenya Medical Training College, Nairobi, Kenya Abstract Background and Purpose Brachytherapy plays an essential role in the management of patients with cervical cancer. This study analysed treatment outcomes of two brachytherapy modalities, high dose rate (HDR) and low dose rate (LDR) intracavitary treatment for patients with cervical cancer at two Centres in Africa. The aim was to determine how well HDR compared with LDR intracavitary brachytherapy (ICBT), given the problems and challenges that exist on the African continent.

Methods: Materials and Methods Treatment outcomes of one site treating with HDR and the other LDR ICBT were retrospectively analysed for 193 patients in the HDR group and 49 patients in the LDR group. All patients were treated with external beam radiation therapy

Results: Results The findings showed several issues in regard to clinical outcomes between patients treated with HDR and LDR at the two centres. The median follow-up for patients treated in the two groups (HDR and LDR) was 42.2 and 12.4 months, respectively. The actuarial 5-year pelvic relapse free survival in the HDR and LDR group was 65.8% and 53.9% (p = 0.84), respectively. The 5-year bladder and rectal (grade 3 and 4) complication rates for patients treated with HDR were 3.4% and 3.0%

15.3. Gantry Speed of Cone Beam CT (CBCT) and Patient's Breathing Rates for Three-Dimensional Setup of Lung Tumor Motion in Radiotherapy

Presenter: Utumporn Duanganan, (Radiation Technology), Mahidol University, Chulabhorn Hospital, Bangkok, Thailand

Authors: Utumporn Duanganan, Chirapa Tannanonta, Sangutid Thongsawad, Chirask Khambhongkrua, Rattanapon Siricha

Introduction: Radiation treatment of lung cancer is complicated because of tumor moving with patient respiration. Four-dimensional CT (4D-CT) imaging is needed for accurately tumor contouring and reducing motion. For accurate patient setup, onboard cone-beam computed tomography (CBCT) imaging is currently used. The image reconstruction of the 4D-CT with average intensity projection (AVG) is preferable for using as the reference in registration with CBCT images comparing with the other methods, maximum intensity projection (MIP), Mid Position (MidP), and free breath. Since 4D-CBCT is not available with our machine, free breath CBCT (FB-CBCT) is used for registration. From our data, the patient breathing rate ranged from 10 - 21 bpm (breaths per minute). The gantry speed of our machine can be varied with 3 steps, 3'/s, 4'/s and 6'/s. The purpose of the research was to determine the appropriate gantry speed of FB-CBCT for each breathing rate.

Methods: The 4DCT of a Respiratory Motion Phantom with RPM was done. The reference AVG image was matched with CBCT's. From the matching of the images, the targeting accuracies were analyzed by using both shifting distance and matching Index, MI methods.

Results: The shifting distance method for every breathing rate with each gantry speed from every observer shows the same errors for all directions with the values of 0.1, 0, and -0.1 cm for AP, SI, and LR respectively. The value of MI for every breathing rate with each gantry speed was close to 1 so that the gantry speed does not effect the targeting accuracy of CBCT. For decreasing the scanning time and radiation dose to the patient, the high gantry speed is preferred.

15.4. To contribute to human resource capacity building in comprehensive cancer control in the African Region by establishing a Virtual University for Cancer Control (VUCC) supported by a Regional African Cancer Training network (RACT network), collectively called VUCNCT

Presenter: Susan Morgan, International Atomic Energy Agency

Author: Susan Morgan

There is a drastic shortage of accessible knowledge and quality training programmes in Africa for comprehensive cancer control. In particular, local capacity to train and mentor practitioners within the region is not sufficient to ensure sustainable cancer control and to counter the effects of brain drain. Combined with a lack of financial resources, this scarcity of training opportunities has resulted in a great shortage of trained professionals in health care, particularly in cancer control and treatment.

PACT Programme Office, in cooperation with its international partners in cancer control and experts in radiation medicine within the IAEA, has developed a project to address this shortage. This initiative, collectively referred to as VUCNet, is intended to support and enhance Member States’ programmes to build human resource capacity in cancer control. The VUCNet initiative will help establish training and mentorship networks within and amongst low and middle income (LMl) countries, while building a web-based platform to make educational materials more easily accessible to and affordable for trainees.

Through the VUCNet, it is anticipated that trainees will have access to learning materials that can be used at their own pace, either alongside other course work, or as a means for practicing health care professionals to refine or update their knowledge base. The VUCNet model also aims to allow for more trainees to partake in cancer control training, directly affecting the number of health care professionals available in participating Member States.

15.5. Implementing new clinical procedures in an overburdened healthcare system, at Ho Chi Minh City Oncology Hospital, Vietnam

Presenter: Vu Huynh, HCMC Oncology Hospital, Vietnam

Author: Vu Huynh

Introduction: Ho Chi Minh City (HCMC) Oncology Hospital is the largest Radiation Oncology Centre in Vietnam, treating many patients from all around the region. For Vietnam, cancer is a leading cause of mortality. Radiation Therapy continues to play an essential role in cancer control, in both treatment and palliation. Over the last decade, Vietnam has come a long way in terms of Radiation Therapy services. In 2000, the country installed its first linear accelerator. Previous to this, Vietnam was using a small number of Cobalt 60 units which derived from the Soviet Union in the 1970s, followed by World Vision Australia and the French Government in the 1990s. Within recent years Vietnam has seen a rapid growth in the number of linear accelerators installed due to government and private sector initiatives. But this is still not enough to cope with the overwhelmingly large patient loads, as the majority of cancer treatment resources lay in developed countries, even though the majority of sufferers live in developing countries. To cope, some treatment machines are only given a small break daily, working in shifts to provide radiation treatment 20-23 hours a day. Hospitals are severely overloaded serving four to five times more patients than intended capacities. And to add pressure, these statistics are set to worsen at a much faster rate compared to developed countries. Current plans to expand oncology along with the Vietnamese government’s aim to raise technical skills will mean a major
need to also address human resources. Focusing on human resources and essentially developing people can be the key to establishing accurate, safe and effective Radiation Treatments.

Methods: New radiotherapy simulation procedures were implemented at HCMC Oncology Hospital following a comprehensive review of current practices. Template documents were produced and new clinical patient positioning were adopted.

Results: New implemented procedures are now standard practice. Treatment is now more accurate and consistent which means more consistent and predictable outcomes. Due to many challenges, successful implementation was not easy, requiring emphasis on concepts of multidisciplinary teamwork, effective communication and leadership. By setting patient outcomes as the ultimate focus, & through careful planning, we have shown that development can be possible even with limited resources and huge patient loads.

15.6. Stories at Work: Writing to Learn, Care, and Collaborate in Radiation Therapy

Presenter: Gail Williams, Odette Cancer Centre, Sunnybrook Health Science Centre, Canada
Authors: Kari Osnar, Sarah Whyte, Ariella Damelin and Marnie Peacock

Introduction: Learning in the radiation therapy workplace tends to focus on hard clinical skills such as the use and mastery of electronic applications, image matching and treatment delivery. At the undergraduate level, training programs have begun to teach health professionals how to write and read stories. Narrative training has been advocated for practicing health professionals. Education in narrative writing has been shown to improve empathy, communication and well-being. Experiential narrative writing workshops in a large urban cancer centre were offered in two phases. First phase, a 90-minute introductory workshop was offered to four separate groups: practicing radiation therapists (2 groups), radiation therapists and oncology nurses together, and radiation therapy students. Second phase, participants were invited to continue with a narrative writing course consisting of four 60-minute sessions. Workshops were led by an experienced narrative facilitator and researcher. A second experienced researcher observed the sessions and conducted follow-up interviews to document the process and effects of the workshops on learning and practice.

Methods: This qualitative research study was completed using descriptive and exploratory methods. The facilitator and observer wrote field notes for Phase 1 and Phase 2. Research observer completed, transcribed and coded interviews for Phase 1 and Phase 2.

Results: Thematic analysis revealed both elements and effects. Elements included that these are stories at work not stories about work, the challenge, the quality and the continuity. Effects included pleasure, presence, community and craft. These effects do not come through imparting information or close analysis of professional experience, but rather through the opportunity to engage with oneself, colleagues and patients in meaningful and challenging ways outside of professional identities.

15.7. The quality of student tutoring in radiation therapy unit

Presenter: Aino-Liisa Jussila, Oulu University of Applied Sciences, Oulu, Finland
Authors: Aino-Liisa Jussila, Anna-Tuulia Tero, Katarina Kamsula and Annukka Tuomikoski

Introduction: The supervised tutorial periods are essential parts in the development of professional skills of radiographer students. Students’ feedback about their learning environment and supervision gives the base for developing their studying circumstances further and enabling their professional growth. To describe how radiographer students experienced their clinical learning environment and supervision given by supervising radiographers in radiation therapy unit through four aspects which are department atmosphere, premises of the art of radiation therapy on the department, premises of learning on the department, and supervisory relationship.

Methods: Data was collected among radiographer students (n=82) by the validated CLES © evaluation scale of Clinical Learning Environment and Supervision (Saarikoski 2002) in 2011, 2012 and 2013. The electric CLES © questionnaire consists of 27 items

Results: The students evaluated the clinical learning environment and radiographers’ clinical supervision as very good. “Atmosphere in the department” was supporting their learning positively. “The premises of the art of radiation therapy on the department” and “the premises of learning on the department” indicated that students were relating the learning environment with the quality on the art of radiation therapy and patient relationships. “Supervisory relationship” between tutoring radiographers and students

15.8. Potential workflow improvement in radiotherapy by means of patient positioning and transfer system

Presenter: George Chiu, Department of Radiotherapy, Hong Kong Sanatorium and Hospital
Authors: George Chiu1, Ka-Fai Cheng1, Wing Lun Mu2 and Ben Yu2
1Department of Radiotherapy, Hong Kong Sanatorium and Hospital,
2Medical Physics and Research Department, Hong Kong Sanatorium and Hospital

Introduction: This study investigated the potential workflow improvement of patient logistics in radiotherapy by means of a patient positioning and transfer system (PPTS). Feasibility studies of PPTS were carried out in three major categories including dosimetric compatibility, positioning reproducibility and workflow improvement. In dosimetric compatibility, studies were conducted to investigate the physical properties in beam attenuation, induced skin dose and plan dosimetry in various treatment plans of 6MV photons. In positioning reproducibility, geometric accuracy was tested by means of repeated transfer and repositioning of the transfer slice in the provided docking system without and with 10 subjects to simulate patients receiving thoracic treatments. Relative displacements of isocentre were recorded and random errors were calculated. In workflow improvement, studies were conducted to compare the machine occupancy in 10 patients without and with the implementation of the PPTS.

Methods: Transmission factors at different locations and skin doses at 20x20cm² and 4x4cm² were measured. Dosimetric differences in 8 different treatment plans were studied. Geometric accuracy, relative displacements of isocentre and random errors were recorded.

Results: Transmission factors ranged 0.91-1.00. Skin doses increased 8.6%-24.9%. Dosimetric difference was < 2%. Random error was <1.1mm in all directions. Average machine occupancies in current and new PPTS were found 17.4 min and 12.5 min respectively.

Conclusion: The dosimetric difference induced by the PPTS is clinically insignificant. The positioning reproducibility governed by the fixation system of the PPTS is highly reliable. Implementation of PPTS with laser guided setup rooms nearby the treatment machine can significantly reduce the machine occupancy of patients in radiotherapy procedures. It is a feasible solution for busy radiotherapy departments which requiring high patient throughputs without scarifying setup accuracy for patients.

15.9. A Comparison of Two Systems of Patient Immobilization for Prostate Radiotherapy

Presenter: Peter White, The Hong Kong Polytechnic University
Authors: White P, Chui KY, Lee CS, Lee WC, Ng HM & Yik SC

Introduction: Background Reproducibility of different immobilization systems, which may affect set-up errors, remains uncertain. Immobilization systems and their corresponding set-up errors influence the clinical target volume to planning target volume (CTV-PTV) margins and thus may result in undesirable treatment outcomes. This study compared the reproducibility of patient positioning with Hipfix system and whole body alpha cradle with respect to localized prostate cancer and investigated the existing CTV-PTV margins in the clinical oncology departments of two hospitals in Hong Kong. Aims and objectives The aims of this study were to improve the potency of VMAT by achieving more precise patient positioning and to study the corresponding CTV-PTV margins. The ultimate goal was to benefit both staff and patients directly through easier reproducibility of the treatment position as well as reducing treatment times, improving local control and reducing radiation side-effects respectively. With reference to RapidArc treatment for prostate cancer, the objectives of this project were to: 1. Compare the set-up reproducibility of patient positioning with Hipfix and alpha cradle for T1-T3 prostate cancer patients. 2. Investigate the existing CTV-PTV margins in the clinical oncology departments of two regional hospitals.

Methods: 7 sets of AP, cranial-caudal and medial-lateral deviations were collected from each patient. Reproducibility of positioning in hospitals was compared using a total vector error (TVE) parameter. CTV-PTV margins were computed using van Herk’s formula.

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Results: TVE values were 5.1 and 2.8 mm for Hipfix and alpha cradle systems respectively. TVE associated with alpha cradle was significantly less than Hipfix system. The CC axis in Hipfix attained greatest large (23.6%) and serious (7.9%) set-up errors. The calculated CTV to PTV margin was 8.3, 1.9 and 2.32 mm for Hipfix, and 2.1, 3.4 and 1.8 mm for alpha cradle in CC, ML, and AP axes respectively. Alpha cradle was significantly better than Hipfix in terms of reproducibility, especially in the CC axis.

15.10. Information System empowerment in Radiotherapy

Presenter: Wing Yiu Joseph Lee, Hong Kong Sanatorium & Hospital
Author: Lee Wing Yiu, Joseph

Introduction: In the development of modern radiotherapy, it is highly dependent on computers to control sophisticated electronic equipment for advance treatment deliveries. We now come to an age of computerized radiotherapy. This computerization trend not only limited to machine controls but covers whole department. Nowadays radiotherapy centers would normally ‘equip’ with a hospital information system, a billing system, a scheduling system, and one or a few treatment delivery systems. We put our eyes on the development trend to perform an integration power of those systems with the help of streamlining and simplifying procedures so as to increase efficiency and most importantly: to improve patient safety. There are areas which can fulfill patient’s satisfaction during their journey in the radiotherapy department such as improving the clinical service quality, productivity and safety in planning and treatment of patients. From this vision, we got a comprehensive view in radiotherapy departments in order to develop a better understanding of the clinical demand and service development by utilizing our huge patient data volume in radiotherapy centers through identifying and improving the clinical process for integration with the good support of Information Technology (IT).

Methods: This paper intends to grasp the insight of the clinical workflow management and re-engineering clinical process in radiation therapy department through illustrating different IT integrations, which are available through related journals and personal.

Results: The clinical workflow and multi-system integration in radiotherapy service has been improved with the help of IT technology. Clinical systems integration will be commenced in order to provide good quality service and beneficial to clinical working environment of radiation therapists together with the multi-disciplinary teams.

15.11. A Clinical Pathway of a Patient with Breast Cancer

Presenter: Annila Inkinen, The Central Hospital of Central Finland
Author: Annila Inkinen

Introduction: This is a report on a clinical pathway of a breast cancer patient in the radiation therapy ward. The report was done as a school assignment during a practical training period in the spring 2013. The practical training was completed in the Radiation Therapy Ward in The Central Hospital of Central Finland. During 2013 there were 797 cancer patients given radiation therapy and 174 (22%) of them were breast cancer patients. The cancer patient followed in this report is a 56-year-old earlier healthy woman. At the end of the year 2012 a 9mm ductal carcinoma with a lymphatic vessel invasion was found in a routine mammogram screening. The tumor was grade 2. Lumpectomy was an option because the cancer was in a relatively small part of one breast. Surgery was a success and the scars healed well. Hormonal therapy and radiation therapy were offered as adjuvant therapy. The 8 week long radiation therapy period included the first appointment with an oncologist, virtual simulation using a specialized CT scanner and an interview held by a radiographer charting patient’s mental, social and physical condition. Also two appointments with a psychiatric nurse, one meeting with a social welfare supervisor and two more visits to the oncologist were needed. The total radiation dose of 50 Gy was divided into 25 fractions. FIMRT technique was used and one fraction was given in two fields.

Methods: The breast cancer patients clinical pathway was observed by author.

Results: The biggest problems during the radiation therapy treatments were mental. The patient suffered from depression and sleeping problems and could not work during the treatment period even though she wanted to. Physically the radiation therapy was endured well.
chest, 1.7-3.6mm for abdomen and 1.6-3.8mm for pelvis. Rotation systematic and random errors that ranged from 0.5-0.8° were comparable among the 5 body sites. Calculated 3D vector means were ranged from 4.3-8.3mm. The magnitudes of systematic and random errors in radiotherapy treatment were regions depended and the calculated result can be a reference in deciding optimal PTV margin.


Presenter: Man Man Fan, Hong Kong Sanatorium & Hospital
Authors: K. C. Chan, R. W. M. Luo, H. Y. Yip, G. Chiu

Introduction: Radiosurgery (RS) is to deliver single, very high-dose fraction in a small volume with sub-millimeter accuracy. The effectiveness of radiosurgery is partially related to the use of high radiation dose to control tumor repopulation. Thus the treatment aims to achieve a sharp dose gradient between lesions and normal tissues, sparing adjacent radiosensitive tissues, and thereby minimizing the risk of radiation-induced toxicity. Radiosurgery can be delivered using various equipment and techniques including Gamma Knife, linacs, Cyberknife and helical Tomotherapy (TOMO). Volumetric-modulated arc therapy (VMAT) delivered by the linacs could be an alternative to TOMO. Data comparing the dosimetry of TOMO and other equipments/techniques for intracranial radiosurgery are limited. The aim of this study was to compare the dosimetric characteristics and treatment time between TOMO and VMAT for radiosurgery of single and multiple intracranial lesions. Twenty-two patients with either single and multiple intracranial lesions who were previously treated with TOMO RS were replanned for VMAT and evaluated in this study.

Methods: Conformation number (CN) was used to assess the target conformity and homogeneity index (HI, D5%-D95%) to assess dose homogeneity. The percentage volumes of non-target brain tissue receiving 12Gy (V12) were also recorded.

Results: VMAT plans showed comparable dose conformity in PTVs for single brain lesions. For multiple brain lesions, VMAT plans achieved better dose conformity. For target dose homogeneity, TOMO plans were superior for both single and multiple intracranial lesions. VMAT plans yielded lower V12 to the normal brain tissues for multiple lesions. It might imply that the possibility of late complications of the brain would be lower in VMAT plans. VMAT would be a preference for RS of multiple intracranial lesions.

15.15. Evaluation of in-house manufactured 99mTc-ECDG tumour detection in nude mice

Presenter: Je’hine Hor-Lodewyk, Department of Nuclear Medicine, Universitas Hospital, Bloemfontein, South Africa
Authors: J. Hor-Lodewyk, A.C. Otto, J.M. Wagener, J.R. Zeevaart and G. Joubert

Introduction: In-house manufactured (IHM) Technetium-99m-metastable-pertechnetate-Ethylenedicycisteine-deoxyglucose (99mTc-ECDG) was developed with a new synthesis route and radiobelling procedure for possible tumour detection. The aim of the study was to evaluate the tumour-to-muscle-, tumour-to-brain- and tumour-to-lung ratio of the IHM 99mTc-ECDG compared and Fluorine-18-fluorodeoxyglucose (18F-FDG).

Methods: Xenografts (n=18) injected with IHM 99mTc-ECDG or 18F-FDG were sacrificed at time points. In vivo percentage of injected dose per gram of wet tissue weight and tumour-to-non-tumour tissue ratios are presented as means ± standard errors of the means.

Results: The IHM 99mTc-ECDG showed better tumour-to-muscle ratio and tumour-to-lung ratio than the 99mTc-ECDG found in the literature (tumour-to-brain ratio for 99mTc-ECDG was not reported in literature). The IHM 99mTc-ECDG showed better tumour-to-muscle ratio, tumour-to-brain and tumour-to-lung ratio than 18F-FDG. IHM 99mTc-ECDG may be utilised as a possible low dose and low cost glucose metabolism imaging agent for the detection of muscle, brain and lung tumours.

15.16. Mepilex Lite dressing for the prevention of radiotherapy-related skin reactions - a case study

Presenter: Mervi Rytilahti, Department of Radiotherapy/Oulu University Hospital, Finland
Authors: Mervi Rytilahti, A. Suomela, U. Viinikka

Introduction: A large amount of patients still experience side effects from radiation treatment despite new improvements in irradiation techniques. The severity of radiotherapy-associated skin reactions varies according to treatments- and patient-related factors (e.g. total radiation dose, volume of tissue irradiated, chemotherapy). To date there is no consensus or universal skin care guidelines to prevent or treat radiation-induced skin reactions. These reactions are typically managed with a variety of topical agents such as water-based moisturizing creams or lotions, topical steroids, anti-inflammatory medications and wound dressings. Previous case studies have shown that Mepilex Lite dressings decrease the severity of skin reactions. However, the preventative effect of Mepilex Lite was not investigated in these studies. The aim of this study was to compare the effectiveness of Mepilex Lite dressings as a preventative aid with our department’s standard skin care guidelines for breast cancer patients receiving electron beam therapy. 98 women participated in this study but ten patients were withdrawn. The study was conducted during February 2013 and February 2014. The Mepilex Lite dressing was positioned on half of the electron field area before the first fraction at the first treatment appointment; the other half of the treatment field was treated with the standard departmental care guidelines (e.g. base moisturizing lotion, hydrocortisone cream (3%)). Mepilex Lite dressings (15x15 cm) were donated by Molnlycke Health Care.

Methods: The material was collected by using observation and questionnaires. The patients filled out the questionnaires with baseline demographic during the first treatment appointment. Since the Mepilex Lite dressing was positioned before the first fraction, it was to be used throughout the whole radiotherapy. However, the Mepilex Lite dressing was replaced if it was not performed if needed. After the treatment session was completed patients filled out the rest of the questionnaire assessing their own symptoms. Digital photographs of the skin reactions were taken after the last fraction and a group of three radiation therapist evaluated the skin reactions upon photos.

Results: Preliminary results show that Mepilex Lite dressing reduces effectively the severity of skin reactions compared to our standard departmental skin care guidelines. No significant results were observed in minor skin reactions. The analysis of the study is not completed yet; the final results will be ready in spring 2014. According to the results of this study Mepilex Lite can be recommended to be used during radiotherapy for breast cancer patients as a preventative method for acute skin reactions.

15.17. Validation of implanted fiducial gold markers for set up verification of breast cancer patients during radiotherapy

Presenter: R. Steenberg, Netherlands
Authors: R. Kattevilder, R. Steenberg, V. Althof, D. Koopman, T. Eiland, M. Kramer

Introduction: Introduction To investigate if fiducial gold markers, implanted during breast conserving surgery, accurately represent the position of the lumpectomy cavity and whether they improve accuracy of patient setup in an EPID protocol during treatment. Fiducial gold markers represent the position of the lumpectomy cavity. CT analysis of the lumpectomy volumes supported a decrease in inter-marker distance between the CT studies suggesting a shrinkage of the volume of the lumpectomy cavity during radiotherapy treatment. 3D COM displacement results were consistent with 2D EPID analysis. Using EPID: patient set up in the cranial/caudal direction based on fiducial markers is preferred above set up based on bony anatomy.

Methods: 25 patients enrolled in a prospective study protocol. Three fiducial gold markers were placed in the lumpectomy cavity during surgery, following study protocol. For each patient, 3 CT-studies (before, halfway and directly after radiotherapy) and 6 orthogonal MV control images (anterior/posterior and lateral; EPID Theraview NT) were acquired during radiotherapy. Variations in lump volume in the CT studies were assessed. Variations in inter-marker distances and the position of the Centre of Mass (COM) were assessed by an application written in Matlab.

Results: Results are presented as mean ± 1SD in mm. EPID set up results for 3 different marker sets were compared, using external fiducials placed on the patient skin, internal gold fiducials and bony anatomy. Until now 17 patients completed the study protocol. The inter-marker distance, measured in the CT studies, decreased in 16 out of 17 patients (94%) with an average of 4.0 mm, suggesting lumpectomy cavity shrinkage during radiotherapy. The largest change in inter-marker distances was found between the first and second CT study. A decrease in lumpectomy volume between CT1 and CT2 of 51% was found for lumpectomy volumes over 11
Introduction: Conventional supine radiotherapy for large-breast patients often faces difficulties in dosimetry as the breast is enfolding around heart and ipsilateral lung, resulting in worse dose homogeneities. The underlying skin folds also give worse skin reactions. Other concerning factors e.g. the necessarily large target area due to large breast size, daily setup variabilities and respiratory motion also lead to a larger planning target volume (PTV), hence increasing doses to contralateral breast, lungs and heart. Positioning improvement can be done by alternative immobilization method, i.e. patient to lie prone on a dedicated prone setup device. Since the breast target is hanging down away from the chest, lung doses can be reduced with improved dose homogeneity within the breast tissues. Also, adverse skin reactions can be reduced by minimizing skin folds. However in prone position, heart gets closer to the chest wall, thus becoming disadvantageous in cases which PTV involves deep-lying breast tissues. Setup accuracy may also be lowered due to patient discomfort. In helical tomotherapy, the highly conformal intensity modulation allows optimal dose escalation in PTV and better sparing to organs at risk (OARs). Position verification using a single computed tomographic (MVCT) scan allows position verification and with the accurate CT number obtained, recalculation of actual delivered dose becomes feasible. In order to investigate the effect of setup errors on actual delivered dose in prone breast treatments using helical tomotherapy, this study was conducted to determine the daily deviations between the planned and actual doses to the PTV and OARs in large-breast patients.

Methods: Data from 249 out of 250 fractions in 10 patients, prescribed 50Gy to 95%PTV, were used. With daily MVCT, actual dose per fraction was recalculated. Daily actual and planned doses to specific DVH points were recorded and compared by paired t-test.

Results: The mean 95%PTV actual dose was less than planned. Concerned OARs DVH points showed decreased mean actual doses except heart. PTV and OARs DVH points showed small absolute dose or volume differences (<0.2Gy and <1%) yet statistically significant (P<0.05). Statistically different daily planned and actual doses implied suboptimal primal dose setup accuracy. Higher mean actual dose to heart implied less-favored sparing. Yet, results might not do clinical significance as absolute dose differences were small.

15.18. Daily dose variation during prone breast helical tomotherapy for large-breast patients: planned dose verses actual delivered dose

Presenter: Wai Man Lee, Department of Radiotherapy, Hong Kong Sanatorium and Hospital
Authors: Wai Man LEE, George CHIU, Winky Wing Ki FUNG

Introduction: Conventional supine radiotherapy for large-breast patients has been studied and was reported to be from 5 to 50 mm depending on the location of the tumor in relation to the diaphragm. Other than geometrical variation, the liver tumor can also be deformed as a result from the breathing motion intra and inter-fractionally. Furthermore, for the tumors in liver, the extent of motion depends on individual position within liver, degree of disease, size of tumor, and surgical history. Therefore, accurate target localization is one of the largest challenges in radiotherapy in liver. The GE MR-simulator (Optima MR450w 1.5T) is a clinical MR system featured by its wide bore and larger field of view, a detachable flat top couch enable transporting patient without repositioning. All these features allow the use of actual treatment setup during MR imaging, which is the same as CT-sim, thus it is called MR-simulator. MR has superior spatial resolution and is excellent in soft tissue imaging. Liver is a soft tissue structure in which its tumor can be difficult to delineate in traditional planning CT scan. With the use of the MR simulator, patients can be reproduced in the same treatment position for optimal image registration and tumor motion tracking during the course of radiotherapy. As it does not involve radiation, repeated MR scan inter-fractionally can be performed to manage the motion of the liver tumor throughout the entire treatment duration. This study aims to investigate the motion of the liver tumor can be managed by the use of rapid MR cine scan in MR simulator.

Methods: Two patients with liver tumors at RT centre. They were instructed to maintain regular free breathing during the whole scan in the same treatment position. Rapid 2D sagittal and coronal cine MRI through the centre of the tumor were acquired.

Results: This initial result on liver tumor motion has demonstrated the tumor moves in 3 dimensional in relation to time. With the use of rapid MR scan, the motion of the liver tumor can be tracked in continuous breathing cycle. This is more favourable when compared with 4DCT which only captured the motion in several breathing cycle. The use of MR in motion management of liver does not involve radiation and are safe to use in repeated motion management monitoring especially in liver tumor cases.

15.19. Investigating the potential use of MR-simulator in motion management of liver radiotherapy

Presenter: Jacky Tsz Lung Wong, Hong Kong Sanatorium Hospital
Authors: Jacky Wong, George Chiu & Imen Ku

Introduction: Liver is located directly inferior to the diaphragm and its position is strongly influenced by breathing. The motion of liver tumor has been studied and was reported to be from 5 to 50 mm depending on the location of the tumor in relation to the diaphragm. Other than geometrical variation, the liver tumor can also be deformed as a result from the breathing motion intra and inter-fractionally. Furthermore, for the tumors in liver, the extent of motion depends on individual position within liver, degree of disease, size of tumor, and surgical history. Therefore, accurate target localization is one of the largest challenges in radiotherapy in liver. The GE MR-simulator (Optima MR450w 1.5T) is a clinical MR system featured by its wide bore and larger field of view, a detachable flat top couch enable transporting patient without repositioning. All these features allow the use of actual treatment setup during MR imaging, which is the same as CT-sim, thus it is called MR-simulator. MR has superior spatial resolution and is excellent in soft tissue imaging. Liver is a soft tissue structure in which its tumor can be difficult to delineate in traditional planning CT scan. With the use of the MR simulator, patients can be reproduced in the same treatment position for optimal image registration and tumor motion tracking during the course of radiotherapy. As it does not involve radiation, repeated MR scan inter-fractionally can be performed to manage the motion of the liver tumor throughout the entire treatment duration. This study aims to investigate the motion of the liver tumor can be managed by the use of rapid MR cine scan in MR simulator.

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15.20. Randomized controlled trial of the effects of the e-feedback on breast cancer patients knowledge of radiotherapy (RT)

Presenter: Mervi Siekkinen, University of Turku, Finland
Authors: Mervi Siekkinen, S Pyrhönen, H Leino-Kilpi

Introduction: The patient education providing knowledge of radiotherapy (RT) during RT is equally important at RT centre. However, breast cancer (BC) patients have reported to unmet knowledge expectations. Due to their interest in health information seeking through internet there is a challenge to develop effective electronic (e-) patient education. An evaluation was done to measure the effect of the e-feedback knowledge of RT intervention (e-Re-Know) on knowledge of RT process, possible side effects, side effect self-care and lifestyles and RT patients. The e-Re-Know delivered pre RT via e-mail was aim to improve knowledge of RT and support patients to be empowered.

Methods: A randomized controlled study was used. BC patients (n=126) in RT were assigned into intervention (e-Re-Know and standard education) and control (standard education) group. The outcome was knowledge level measured before and 3 months after RT period.

Results: The increase in knowledge level was significantly higher in the intervention than in the control group after adjustment for baseline knowledge level. The e-Re-Know delivered pre RT was effective on knowledge for breast cancer patients; and consequently on quality of care in RT. Patients benefited mainly of the knowledge of side effects self-care. In the future, the women with breast cancer should use the e-Re-Know for adjusting in their everyday life not only during but also after treatments.

15.21. How can the radiation therapist support cancer patients undergoing head and neck radiotherapy?

Presenter: Helen Egestad, UiT, The Artic University of Norway
Author: Helen Egestad

Introduction: Head and neck cancer patients experience a high level of emotional distress in the radiation treatment period. They are already in a vulnerable situation when they enter the radiation therapy department, and therapy can induce further fears, including concerns about the efficacy of treatment, about side-effects, dysfunction and accuracy. Several studies have shown that patients undergoing radiation therapy have fears, anxieties, and stress related to the therapy, but few studies have investigated living with and neck cancer during radiotherapy from the patients’ perspective. Studies have rarely focused on the whole experience of radiation treatment. Head and neck cancer patients’ radiation treatment is complex. The illness and the treatment have an enormous impact on the patients’ daily living. It is important to gain more knowledge about patients’ experiences when they undergo radiotherapy treatment. Head and neck cancer patients have daily visits in 5-7 weeks in the radiation department. Qualitative studies have shown that the radiating patient can reduce patients’ distress when they give information and express understanding. But there is a lack of research that describes what the radiation therapists exactly do when they meet the patients leading to the patient’s stress decreases. The aim of this study was to describe what radiation therapists do and say in order to help patients through the radiation treatment period.
Methods: This study was conducted via qualitative interviews and took on a phenomenological, hermeneutic approach involving semi-structured interviews. Eleven head and neck cancer patients were interviewed one month post radiation.

Results: This study showed that radiation therapists have a significant influence on head and neck cancer patients’ distress. Many patients felt claustrophobia associated with treatment. They felt that the treatment was easier to undergo when the same radiation therapist gave treatment every day, when they reassured them by putting a hand on their shoulder or arm, and when they completed the treatment quickly. In addition, patients appreciate that radiation therapists reassured them with words.

15.22. A Review of 10 Years of Advanced Practice ... An Evidence-Based Approach to Revolutionize Practice

Presenter: Marcia Smoke, Juravinski Cancer Centre, Hamilton, Ontario, Canada
Authors: Marcia Smoke (Juravinski Cancer Centre, Hamilton, Ontario, Canada) and Donna Lewis (Odette Cancer Centre, Toronto, Ontario, Canada)

Introduction: In Ontario, Canada, a mandate was established to create advanced practice roles for radiation therapists. Over the last 10 years, this initiative has revolutionized the profession of radiation therapy. A 2003 Symposium, entitled Improving the Present — Embracing the Future, featured experts on advanced practice from the UK, professional associations, education and legislation. This Symposium was the beginning of a literature review which focused the initiative to potential roles. A further comprehensive literature review was performed. The project initiated with government funding for 5 roles and has expanded to 17 advanced practice positions. The evidenced-based approach to developing, implementing and evaluating advanced practice roles will be presented. The quality framework "Plan, Do, Study, Act" (PDSA) provided the basis for the implementation, assessment and evolution of the advanced positions. Since suitable Master’s level candidates were not available, a Prior Learning and Assessment Recognition (PLAR) process was developed to determine candidate selection. The metrics used to validate the roles included competency assessment, consensus/concordance studies, safety data, stakeholder satisfaction, burnout, and wait time data. At the national level, the professional association performed a validation survey to determine the competency profile for advanced practitioners. The formalized national “validation process” formed a consensus document describing advanced practice in radiation therapy. Also, at the national level a certification and credentialing process for advanced practitioners was developed.

Methods: The Quality Framework "Plan, Do, Study, Act" was used to develop, implement and assess advanced positions. Validation metrics included competency assessment, consensus/concordance studies, patient/stakeholder satisfaction, burnout and wait time data.

Results: This revolutionizing evidence-based initiative demonstrated that advanced practitioners can improve quality, effectiveness and access to existing systems and processes and can add new services to patients in those systems. Patients are highly satisfied with the care they received and advanced practitioners are valued members of the teams, facilitating improved workflow and enhanced team functioning. Government funding has been secured for additional advanced practice positions.

15.23. Multimodality Imaging In Radiotherapy At Rsig& Rc India

Presenter: Gurvinder Singh Wadhawan, Rajiv Gandhi Cancer Institute & Research Centre, India
Author: Gurvinder Wadhawan

Introduction: Accurate image guided radiotherapy (IGRT) using MVCBCT is essential prerequisite to practice IMRT or 3DCRT and forms an important factor in the quality of actual radiation delivery. The capability of generating an entire volumetric MV-CBCT data set in a single-gantry rotation, allows 3D visualization of the tumor prior to the delivery of treatment and correlation with reference plan CT data. This permits corrections of shifts beyond an acceptable limit.

Methods: Prior to treatment, 2D and/or CBCT (on ARTISTE Siemens and Varian i) was acquired and setup errors with reference to X, Y, Z were corrected online in 20 patients of breast, head & neck (H&N) and prostate. A second CBCT was acquired after the correction process and coordinates for daily set-up and images were obtained.

Results: A total number of 211 CBCT/ or 2D images were performed in 20 patients. The sites included – breast (n=10), H&N (n=6) and prostate (n=4). Images were evaluated for 95, 58 and 58 fractions respectively. The shifts observed in X, Y and Z axes are summarized below: In addition, rotational errors were observed in 7% (15/211 images). These include breast (2%), H&N (1%) and prostate (4%), which were also corrected by IGRT. Despite immobilization devices, shifts beyond the acceptable limits of 2mm were observed during online CBCT or 2D imaging with IGRT in breast (79.9%), H&N (49.2%) and prostate (96.6%). IGRT permits detection and online corrections of these shifts which would have been otherwise gone unnoticed leading to dosimetric errors during radiation therapy.

16. RESEARCH

16.1. Interdisciplinary practice within the MRS profession

Presenter: Madeleine Shanahan, RMIT University, Australia
Author: Madeleine Shanahan

Introduction: Interprofessional practice (IPP) or terms used interchangeably such as interdisciplinary practice to describe the delivery of health care by a diverse team of health professionals (HPs) is of increasing interest to health educators, practitioners and policy makers around the globe. IPP and multidisciplinary teams (MDT) operating within healthcare are said to optimise the skills of their members and provide better health-services to patients and the community. However, little is currently known about IPP applications in the Medical Radiation Science (MRS) profession. Ultimately we need information about where IPP is used within and across the MRS profession and identify issues that may currently limit IPP within the MRS profession.

Methods: This study used online survey method to collect data on IPP within the MRS profession. Participation in the survey was N=332.

Results: MRS professionals work collaboratively with medical practitioners (91%), their own area of specialisation (AoS) (89%), other HPs (73%), other MRS within MRS (79%) and participate in MDT meetings (43%) to support high quality health care. However as MRS professionals have a lower level of confidence working with those outside their own AoS, and some have limited or no access to other HPs, additional access and support is needed so MRS can more fully participate in IPP.

16.2. Decision making in diagnostic imaging investigations: a case study of processes and interactions between patients and health care professionals

Presenter: Chandra Rekha, University of Pretoria, South Africa
Author: CR Makanjee

Introduction: The use of diagnostic medical imaging can be defined as “timely access to and delivery of inte-grated and appropriate radiological studies and interventions in a safe and responsive facility and a prompt delivery of accurately interpreted reports by capable personnel in an efficient, effective, and sustainable manner” (Pitman et al., 2009: 457). According to Ber–nardy et al. (2009: 844), the quality of medical care brings value to both patient and provider when medical imaging is justified and is performed correctly. Despite the acknowledgement in the current literature that health professional-patient interactions are central to decision-making processes regarding referral, diagnostic imaging investigations, interpretation and communication of outcomes are complex phenomena, research in diagnostic investigations in general has been fragmented (Geneau et al., 2008: 10). These fragmented studies focus on test ordering (Geneau et al., 2008: 8; Whiting et al., 2007), cost (Olivier et al., 2005: 583; Hof–mann and Lydsdahl, 2008: 446; Hendee et al., 2010: 240), and over-utilisation of diagnostic services (e.g. as a result of new technology, office-based imaging, physician self-referral, increasing patient demands, altered reimbursement systems, commercial liability, and fear of lawsuits). This study was an attempt to bridge the gap of fragmentation and to embrace the shift from a technology-centred approach to an integrated patient-centred approach (Ugwu et al., 2009: 1; Halkett, 2011: 55). The main aim of this study was to get an understanding of the various decision-making processes involved in referral for and the choice of the most appropriate diagnostic imaging investigation.
Methods: A social constructivist conceptual framework informed the inductive, emerging qualitative research design adopted for this study. An instrumental case study of one district hospital and its referral links was selected as methodological point of departure. The study consisted of two main phases, the one following on the other. In the first phase, real-life, individual mini-case studies were conducted by “shadowing” 24 patients, from the point of reporting to the hospital up to their discharge from hospital or admission for in-hospital treatment. Data collection methods in this phase included entry and exit interviews with patients, observations at various points of care, and interviews with different health care providers involved with the care of each patient.

Results: Provider-patient interactions are explored in terms of patterns of interaction during the consultation and the diagnostic imaging investigation, as well as in terms of issues of communication, continuity and fragmentation. Patient expectations and experiences are explored from the viewpoint of health providers and of the patients themselves. The findings in this report are structured around the following themes: (a) services and administrative processes and referral pathways for diagnostic imaging investigations, with an overview of the health-facility complex in which the district hospital was situated and the various referral pathways for diagnostic imaging investigation that could be followed. (b) This exposition is followed by an exploration of structural and organisational interactions between health care providers from referral for diagnostic imaging, to investigation, interpretation and integration.; (c) Interprofessional interactions between and experiences of health care providers; (d) provider-patient interactions with regard to diagnostic imaging investigation, with a special focus on the role of the radiographer, as trainer, mediator, gatekeeper and gap filler and the differences in interactions inside a radiology department and outside of it.

16.3. Imaging the body and coping with patients, radiographers and radiological technologists’ practices: an ethnographic perspective

Presenter: José Jorge, Haute École de Santé Vaud, HES-SO, Switzerland
Authors: Jorge, J., Rey S., Schnegg C.

Introduction: Most of the social sciences studies on medical radiology, the world of the transparent body, are focused on radiologists’ activity, imaging technologies and clinical procedures suggesting that medical imaging on patients would be performed exclusively by physicians and high-technology machines. Only a few studies are focused on radiographers and radiologic technologists’ activity. Nevertheless, patients undergoing to clinical procedures in radiology services either into radio diagnostic, radiotherapy or nuclear medicine have always to deal with radiographers or radiologic technologists. Often radiographers and radiologic technologists are the unique health professional patients meet. This communication presents some results of a study designed to understand the technical mediation operating within the radiographers and radiologic technologists’ practices and the process of producing virtual medical images from and with real patients. We considered technology as a full actor that mediate and structure the interactions established between patients and radiographers when medical radiology clinical procedures are realize. In other words, this study intended to contribute to a better understanding of care radiographers and radiologic technologists’ practices acting when radiologic clinical procedures are performed. This is what can be called the invisible side of their professional action, as these professionals are mainly identified from the only visible point of view of technical performance linked to the cure paradigm of modern scientific biomedicine.

Methods: We conducted an ethnographic study combining direct observations in radio diagnostic, radiotherapy and nuclear medicine departments and interviews with radiographers. Data were obtained by qualitative content analyses of the observations and interviews.

Results: The study documents the complexity of radiographers’ practices. If the performance is directly visible on handling imaging technologies, radiographers and radiologic technologists’ action is supported by care activities. The production of virtual images of patients’ body needs simultaneously to cope with pain and fears of real patients. Nevertheless, specific scanners can be characterized by difference respectively to radio diagnostic, radiotherapy or nuclear medicine practices.

16.4. Evaluation of in-house manufactured 99mTc-ECDG in baboons: normal biodistribution of radioactivity

Presenter: Je’nine Horn-Lodewyk, Universitas hospital, Department of Nuclear Medicine, Bloemfontein South-Africa
Authors: J. Horn-Lodewyk, A.C. Otto, J.M. Wagener, I.R. Zeeyeart and M. Janse van Vuuren

Introduction: The Universitas Academic Hospital together with the South African Nuclear Energy Corporation (Necsa) developed an in-house manufactured (IHM) technetium-ethylenedicycsteine-deoxyglucose (99mTc-ECDG) as an effective tumour and infection glucose metabolism imaging agent. The aim of the study was to determine the normal biodistribution of the newly synthesised IHM 99mTc-ECDG in baboons.

Methods: Imaging was performed on six baboons at 0-, 1- and 2 hours (h). Single Photon Emission Computed Tomography was performed on one baboon at 2 h. Regions of interest were drawn around the organs to determine the biodistribution of the IHM 99mTc-ECDG.

Results: The normal biodistribution of the IHM 99mTc-ECDG was effectively demonstrated in all six baboons with significant uptake to the brain, heart, liver, gallbladder, joints and kidneys. IHM 99mTc-ECDG was excreted from the kidneys to the bladder. The in-house manufactured 99mTc-ECDG visually demonstrated lower biodistribution to the brain as observed with 18F-FDG (gold standard). This may need to be evaluated further.

16.5. A Norwegian Radiography Research group, how to establish and operate an research group in a small country – the journey to our first radiographic study

Presenter: Kari Gerhardsen Vikestad, Norwegian Radiography Research group
Authors: Kari Gerhardsen Vikestad, Linda Hafskjold, Mona Vestbostad

Introduction: Need for research in the radiography field, theory development and also identity clarification should be taken seriously. It is therefore recommended that radiographers should commit research in order to bring the profession forward. Radiography is a fast evolving profession which demand rapidly change in education, research and practice. Research in this field is therefore a requirement. 35 years after graduating the first radiographer in Norway and two years after the first radiographer achieved the PhD, a group of radiographers constituted a research group. A wintry day in December 2006 was a proud moment for establishing the group Norwegian Radiography research group (RadForum). Radiographers starting or post-graduate education for Master of Science and PhD were invited to participate. The main objective of RadForum was to promote research in the radiographic field in Norway and to raise awareness for research among radiographers. The research group declared a vision, containing of three statements: to be a knowledge resource, to be a source of motivation and to be a promoter of radiographic research. Contact and agreements with the Norwegian society of radiography was created and members of the research group started to teaching evidence-based knowledge among radiographers in various courses that Norwegian society of radiography arranged and thus promote the research group to search for members. The first three years RadForum spent time establishing, make statutes and finding our position in the radiologic environmental in Norway. Five years after establishing we conduct a study, aiming to make a baseline for radiographers beliefs to research.

Methods: A quantitative study aiming to describe the Norwegian radiographer’s attitude of research. Who are responsible for radiographic research? How many radiographers are involved in research? How many radiographers have published in scientific journals

Results: RadForum is now a part of The Norwegian society of radiography in Norway and have collected data for the first study. All radiographer in Norway was included in the study and hopefully we get a useful baseline point to further research. Number of members has been doubled and the research group are currently a natural co-partner in the established radiographic and radiologic environment in Norway.
16.6. Survey of plain film image interpretation provision in curricula offered by accredited Australian Medical Radiation programs of study

Presenter: Imelda Williams, Monash University, Australia
Authors: Imelda Williams; Cynthia Cowling

Introduction: It is expected that the Medical Radiation Practice Board of Australia (MRPBA) and the Australian Health Practitioner Regulation Agency (AHPRA) will include specific requirements related to image interpretation as a core skill for radiographers. Courses offering Medical Radiations programs of study need to demonstrate that their graduates meet these core skills on completion of their study. In addition, postgraduate education and training undertaken need to ensure that practitioners can demonstrate advanced plain film image interpretation competencies of the musculoskeletal system, the chest and abdomen within the trauma and outpatient setting. This research was undertaken by Monash University contracted by the Department of Health (DoH) Queensland to define core plain film image interpretation competencies for both entry level and advanced level diagnostic radiography.

Methods: Two surveys were distributed to universities offering accredited Australian radiography programs of study to review current training standards relating to plain film image interpretation for both entry level and advanced level diagnostic radiography.

Conclusions / Results: 77.8% Response rate revealed 5 themes; clinical history, image quality, human and radiographic anatomy, radiographic pathology and communication. Delivery of themes varied across radiography programs. 2 Definitions of image interpretation competencies were proposed for both entry and advanced levels. Image interpretation content and assessment were mapped. Recommendations should serve as guidance for assessing accredited Australian Medical Radiation programs of study to meet proposed definitions

16.7. The influence of an undergraduate image interpretation course on the accuracy of radiographers’ interpreting trauma images of the appendicular skeleton: A pilot study

Presenter: Kriteshni Kaushal, Fiji National University
Authors: Kriteshni Kaushal

Introduction: Radiographers are able to interpret trauma images of the appendicular skeleton comparable to radiologists. This study assessed the accuracy of radiographers’ interpretation of trauma images of the appendicular skeleton, relative to an image interpretation course, at a teaching hospital in Fiji. Upon relevant Ethical Approval, 2 groups of 5 radiographers each and 1 Consultant Radiologist, whose reports were used as the Gold Standard, participated in this study participated in this study. Group A had access to the course while Group B did not. A test bank of 20 trauma radiographs of the appendicular skeleton was used, pooling a total of 200 cases.

Methods: Group A had an accuracy estimate of 90% compared to 81% of Group B. Sensitivity for both groups was 97%. Specificity for Group A and Group B was 84% and 67%, respectively. The PPV for both groups was 97%. The NPV for Group A and B was 83% and 71%.

Results: Group A had an higher accuracy rate, indicating that the image interpretation course had a positive effect on the ability of radiographers to interpret radiographs of the appendicular skeleton. Radiographers’ demonstrated higher level of accuracy interpreting lower limb trauma images. The vocabulary used by radiographers to describe their findings needs improvement. A larger scale study could be done to further validate the findings of this pilot study.

16.8. Comparison of dual energy subtraction radiography and tomosynthesis in the evaluation of pulmonary nodules - a preliminary study

Presenter: Subhash Chand Bansal, PostGraduate Institute of Medical education & research Chandigarh, India
Authors: Bali Ritu, Bansal S C, Garg Mandeep, Khandelwal N

Introduction: A pulmonary nodule is defined as an oval to round opacity, 2-30 mm in diameter seen on a chest radiograph or Computed Tomography. The current standard for detection and characterization of most pulmonary lesions is volumetric Multi-Detector Computed Tomography (MDCT). The diagnostic performance of Dual-Energy Subtraction Digital Radiography (DES-DR) and Digital Tomosynthesis (DT), which are advancements of Digital Radiography (DR) technique, in detecting pulmonary nodules was assessed. DUAL SHOT ENERGY SUBTRACTION RADIOGRAPHY In the dual shot technique, the high and low energy radiographs are generated by two exposures. The system uses a flat panel detector with superior detectable quantum efficiency (DQE), as compared to the phosphor plates. TOMOSYNTHESIS Digital tomosynthesis is a radiographic technique that produces a number of low-dose projection images of a patient over a limited angular range from a single pass of X-rays. These projection images are then used to create section images of the examined object, using modern reconstruction algorithms.

Methods: Twenty five patients (15 males, 10 females) which included 17 patients from Radiotherapy department and eight patients from other OPDs of Nehru Hospital PGIMER Chandigarh who were either diagnosed with cancer or pulmonary nodules on previous

Results: In this study, thoracic DES imaging and DT imaging demonstrated superior performance over digital chest radiograph for the detection of lung nodules. These observations are clinically significant, as small lung nodules are challenging to detect. DES imaging and DT imaging have also demonstrated a clinically significant advantage (i.e. a correct change in the diagnostic trajectory of disease cases) as well as more definitive diagnosis of both disease and normal cases.

16.9. The good, bad and ugly of an abstract

Presenter: Hesta Friedrich-Nel, Central University of Technology, Free State, South Africa
Authors: H Friedrich-Nel

Introduction: The abstract of an article or research project assists the reader to obtain an overall picture of the content and creates an interest in reading the full article. For this reason an abstract needs to be comprehensive but informative. The word or character limit of an abstract often makes it hard to provide the necessary information in a concise manner. Writing the perfect abstract is thus an art that all researchers need to develop. One of the outcomes in the Bachelor degree in Radiography is that each student has to complete a research project. Each student thus need to prepare a proposal, obtain ethical clearance for the project, write a report, an abstract and do a presentation to attain the outcome. The students receive guidance during the process. They also receive a template to prepare their abstracts. Considering the limited exposure of the undergraduate students to the research process, what can we learn from the abstracts that the students prepared? How can this information assist us in appropriately guiding the student so as to address possible shortcomings?

Methods: The abstracts of 14 research projects completed in November 2013 were retrospectively reviewed according to specific criteria. A column (yes/no) on a one page checklist was completed to determine the completeness of information of each abstract.

Conclusions: The majority of the abstracts had the following shortcomings: no problem statements, an incomplete methodology and no recommendations. Experience shows that students may leave the preparation of the abstracts for the last minute. The supervisor may thus not have the opportunity to provide feedback. Structured guidance and timely completion may assist to prevent the above scenario.

16.10. Development and psychometric evaluation of the radiographers’ competence scale

Presenter: Bodil T. Andersson, Department of Health Sciences, Sweden
Authors: Bodil T. Andersson, Lennart Christenson, Bengt Fridlund, Anders Broström

Introduction: Assessing the competence of registered radiographers’ clinical work is of great importance because of the recent change in nursing focus and rapid technological development. Self-assessment assists radiographers to validate and improve clinical practice by identifying their strengths as well as areas that may need to be developed. The aim of the study was to develop and psychometrically test a specially designed instrument, the Radiographers Competence Scale (RCS).

Methods: A cross sectional survey was conducted comprising 406 randomly selected radiographers all over Sweden. The study consisted of two phases; the development of the instrument and evaluation of its psychometric properties.

Results: The analysis reduced the initial 54 items to 28 items. A logical two-factor solution was identified; “Nurse initiated care” and “Technical and radiographic processes”. The scale had good internal consistency
reliability, with a Cronbach's alpha of 0.87. The RCS is a short, easy to administer scale for capturing radiographers' competence levels and the frequency of using their competence. The scale was found to be valid and reliable.

16.11. Lesion detection performance in an anthropomorphic chest phantom: comparative analysis of low-dose CT data on two hybrid imaging systems.

**Presenter:** Maryam Jessop, Brighton Sussex County Hospital, UK  
**Authors:** Jessop M, Thompson JD, Sil J, Sanderud A, Jorge J, Groot M de, Lança L, Hogg P.

**Introduction:** Incidental findings, in low-dose CT images obtained during hybrid imaging, are an increasing phenomenon. Understanding technical limitations is important when reporting these images and recommending follow-up which could lead to increased radiation burden and anxiety for the patient. Using an anthropomorphic chest phantom, this study assessed lesion detection in low-dose CT images obtained during attenuation correction acquisitions for myocardial perfusion imaging (MPI), on two hybrid SPECT/CT systems (GE Infinia Hawkeye 4 and Siemens Symbia T6). Comparative analysis was facilitated by the jackknife alternative free-response receiver operating characteristic (JAFROC) method. This phantom based study gives an indication of lesion detection on the imaging systems used and inferred reliability in the clinical context.

**Methods:** Simulated lesions within the phantom were imaged with low-dose CT settings used in MPI. Image evaluations were carried out by 22 observers assessing 46 images (15 normal, 31 abnormal containing 41 lesions) from each SPECT/CT system. 

**Results:** JAFROC analysis showed a significant difference (p<0.0001) in lesion detection performance with figures of merit 0.599 (95% CI 0.568, 0.631) for Infinia Hawkeye 4 and 0.810 (95% CI 0.781, 0.839) for Siemens Symbia T6. Lesion detection on the Infinia Hawkeye 4 was limited to larger, higher density lesions. The Siemens Symbia T6 detected mid-sized and some lower density lesions. Lesion detection is more reliable in low-dose CT images from the Symbia T6 than those from the Infinia Hawkeye 4.


**Presenter:** José Jorge, Haute École de Santé Vaud, HES-SO, Switzerland  
**Author:** Scheller L.

**Introduction:** This communication is based on an exploratory study focused in the understanding of radiographers communicative and reflective competencies required besides the technical mastery of radiological tools. More precisely, the study explores the complexity of their relational posture, the opposition between technical rigour and patient’s comfort and the taking of risks motivated by a preoccupation with a beautiful product above the pressure for efficacy. The participants were 7 volunteers' radiographers which 3 of them work in nuclear medicine, 2 in radiotherapy and 3 in radiology departments of a Swiss hospital.

**Methods:** The study implemented the method of simple and crossed self-confrontation to the video record of the tasks performs by the volunteers' radiographers in order to realize a co-analysis of the profession in the medical radiology departments.

**Results:** The true contribution of this study is to have shown the utility of professional discussions for better adaptation to professional changes, dilemmas imposed by the activity, and difficulties related to the evolution of technological tools. Also, it constitutes an incentive for the development of linguistic exchanges with patients, imposed on radiographers by the evolution of radiological performance, as testified in real-time by the first results obtained with these tools.

17. SONOGRAPHY

17.1. Abdominal ultrasound referred by the Emergency department – Can sonographer findings help guide effective patient management?

**Presenter:** Michal Schneider, Monash University Australia  
**Authors:** Michal E Schneider, Justin Bloesch, Paul Lombardo

**Introduction:** In Australia, ultrasound scans are carried out by sonographers who provide preliminary findings to the radiologist. The radiologist then confirms these findings and creates the final report. However, timely reporting of radiology exams at regional or remote clinical centres can be problematic due to the lack of radiologists available for reporting. The aim of this study was to explore if sonographers can provide accurate preliminary ultrasound reports in selected emergency cases and thus reduce the time and risks associated with delays in the provision of a final report.

**Methods:** Abdominal ultrasound examinations referred by the Emergency department at a large regional hospital were retrospectively reviewed and sonographer findings compared to the final radiologists’ reports in a blinded fashion.

**Results:** Eighty-six cases were identified and 73 (84.9%) reached a complete agreement between the sonographer and the radiologists. In 12 cases (14%), a minor discrepancy was reported and only one case (1.1%) was scored as moderately discrepant. There were no significant differences in the use of hedging vocabulary, ability to answer the clinical question or requests for further imaging. Sonographer findings are useful when radiologists are unavailable for the reporting of urgent abdominal scans.

17.2. Sonography Education program in HUS Medical Imaging Center

**Presenter:** Heli Patanen, HUS Medical Imaging Center, Finland  
**Authors:** Heli Patanen

**Introduction:** In my presentation I will tell about the sonography educational program which is organized by HUS Medical Imaging Centre. The demand for diagnostic ultrasound examinations has been growing but the resource of radiologist is limited. One solution for this problem has been a transfer of certain ultrasound examinations to sonographers. The current educational program is organized by HUS Medical Imaging Centre in collaboration with the University of Helsinki and Metropolia University of Applied Science. The extent of the program is 30 credit units of which 80 per cent consists of clinical learning and hands-on-sessions and 20 per cent is theory (lectures, selfconducted studying). Duration of the studies is approximately 1,5 years but is depending on examinations one has to perform to qualify. Four radiographers and one medical laboratory technologist were selected for the program. Traditionally we have had radiographers as sonographers but with this program a medical laboratory technologist started the education and is pioneering in HUS area in clinical physiology. Educational program consists of five modules.

**Results:** The major part of the education is clinical learning which is taking place on one’s own department as hands-on-learning. Students have to perform certain amount of ultrasound examinations and they must have a certain amount of findings. The activity and medical specialities of the hospital determine the content of the educational program and therefore the examinations of the sonographers vary.

17.3. The role of ultrasound in the management of patients with cervical cancer at Kenyatta national hospital

**Presenter:** Evelyn Khakasa Wasike, Kenyatta National Hospital, Kenya  
**Authors:** Evelyn Khakasa Wasike

**Objective:** The study was conducted to determine the socio demographic features of cervical cancer patients attending Kenyatta national hospital and the role of ultrasound in the diagnosis, staging and follow-up of cervical cancer patients.

**Methods:** The retrospective study was carried out at cancer treatment centre in Kenyatta National Hospital. Three hundred and eighty five files were used. Predisposing factors such as multiple partners, alcohol, smoking and marital status as well as social demographics were correlated.
with the stage of the disease. Data was analyzed using Pearson chi square test.

**Results:** Of the 385 subjects, 272 were married and living with spouse. 40 subjects had multiple sexual partners, 7 were cigarette smokers and 39 took alcohol.

**Conclusion:** It was found that majority of patients were peasant farmers with high prevalence of poverty among them. Living with spouse, multiple sexual partners and alcohol intake increases the possibility of cervical cancer.

### 17.4. Sonographic Findings Among Patients with Knee Joints Disease Symptoms at Mengo Hospital

**Presenter:** Gerald Mrema, Baradi Hospital, Simiyu, Tanzania  
**Authors:** Gerald Mrema, Zeridah Muyinda, Emmanuel Okello

**Introduction:** Knee joint impairments has been reported as the most common and disabling musculoskeletal medical conditions. The disorders impose an increasing burden in health care costs and lost life quality. According to World Health Organization (WHO) approximately 600 million people over 60 years old are affected by osteoarthritis. The figure will double by 2025. A significant proportion of this burden is in the developing countries and this is likely to increase rapidly with the increasing longevity of this population. The burden is slightly higher in females than males. According to the study done in Uganda at Mulago national referral hospital, of the 107 patients with knee complaints, ninety one patients had unilateral knee pathology while 18 had pathology in both knees. In evaluating and treating joint injuries, there is a need to establish a clear and precise working diagnosis Two competing non-invasive imaging techniques, ultrasonic and magnetic resonance imaging (MRI) are taking over the role of arthrography. The benefits of sonography compared to MRI and other cross-sectional imaging modalities are that it is easily accessible, well accepted by patient, relatively cheap, and dynamic evaluation. The important roles of musculoskeletal ultrasound in the diagnosis and management of joint disorders include but are not limited to detection of joint effusion, guidance of joint aspiration or synovial biopsy, demonstration of muscle, ligament, or tendon tear, assessment of the degree of synovial hypertrophy. The study is expected to highlight the sonographic appearances among patients with knee joint symptoms, which is hoped can improve patient management.

**Methods:** A descriptive cross – sectional study was done at Mengo hospital located in Kampala, Uganda for a period of six months from July to December 2012. 76 patients with knee joint disease symptoms were scanned. A structured questionnaire was used.

**Results:** The study has demonstrated that ultrasound can easily demonstrate and assess the disease conditions of muscles, ligaments, tendons, recess and bursae, cortical bone, hyaline and fibro cartilage and popliteal vessels of most patients with knee complaints. Hence, ultrasound should be used as a primary investigative tool in soft tissue pathology of the knee joint. There is need to do more research of knee joint ultrasound to improve on the management of knee joint disease.

### 17.5. A New Model for Assessing Clinical Competence

**Presenter:** Vivien Gibbs, University of the West of England, UK  
**Authors:** V Gibbs

**Introduction:** Current financial pressures in higher education institutions (HEIs) are driving new ways of delivering education and assessment. New technological developments are facilitating opportunities to rethink traditional methods and explore more innovative, effective approaches.

**Discussion:** Within ultrasound education, assessment of clinical competence has long been a contentious area. All programmes accredited by the Consortium for the Accreditation of Sonographic Education (CASE) in the UK require a robust and transparent process for monitoring and assessing students, with the aim being to produce students who are clinically competent. However, the method for establishing this is not prescribed and, as a result, different HEIs have adopted a variety of methods for establishing students’ competence. Many in the field consider that a university assessor should perform a final summative assessment in the student’s clinical workplace. This however is an expensive, resource intensive process, which is potentially unsustainable for the majority of institutions in the current economic climate. In addition, critics of the process claim that not only is it impossible to entirely exclude subjectivity from the process, but also is difficult to ensure equity across all assessments when a variety of different assessors and patients are used in the assessments. A new framework is therefore proposed, which has recently been accredited by CASE, and has been piloted at a HEI in 2013. One of the components of this approach is the incorporation of an ultrasound simulator, which will help to standardise assessments and ensure students are assessed over a range of pathologies, rather than only those randomly presenting on the day of assessment.

**Conclusion:** This presentation discusses details of a newly accredited assessment framework which has been piloted at a UK HEI. The role of an ultrasound simulator within this process is discussed.

### 17.6. The role of simulation for the acquisition of clinical skillwithin postgraduate ultrasound education

**Presenter:** Viven Gibbs, University of the West of England, UK  
**Author:** V Gibbs

**Introduction:** Simulation is recognised as an innovative pedagogical approach which is gaining popularity in many areas of education. Its capacity to offer learners exposure to real-life scenarios in a safe environment, enables learners to practice skills whilst receiving feedback from a facilitator. Experiential learning, where students are actively engaged in the learning process, is generally recognised as offering the most effective learning environment. However, busy clinical ultrasound departments often struggle to allow students sufficient supervised clinical practice time. Patients are often reluctant to tolerate inexperienced operators and this is likely to increase rapidly with the increasing longevity of this population. There is need to do more research of knee joint ultrasound to improve on the management of knee joint disease.

**Methodology:** In order to explore students’ experiences of interacting with an ultrasound simulator, a study was undertaken at a HEI in 2013. A qualitative design was used for this study, employing semi-structured interviews. Data were analysed using thematic analysis. Several themes emerged relating to positive/ negative aspects of working with the simulator, and the transference of this experience into the clinical environment.

**Conclusion:** The theory-practice gap is a recurring narrative in healthcare literature, and the findings from this study demonstrate the opportunities that ultrasound simulators can offer in the education environment.

### 17.7. Musculoskeletal impact of electronic device usage by university students in Hong Kong: An evaluation by means of ultrasound examination and self-reported questionnaire

**Presenter:** Eugenia H.C. Woo, The Hong Kong Polytechnic University  
**Authors:** Woo E.H.C., White P & Lai W.K.

**Introduction:** Following current trends towards the promotion of electronic learning (e-learning) and mobile learning (m-learning) in schools, the extensive use of computers and mobile devices, in particular portable electronic devices, hold a special fascination among young people nowadays. In addition, young people may also be attracted to handheld game consoles as these devices can be played anywhere and the games are often designed specifically for their specific age groups. As children and adolescents are at the age of physical and behavioural development, this rapid growth in the use of electronic devices by students both at home and in school has raised concerns among parents, educators and health care professionals with respect to the possible adverse physical effects associated with the excessive use of these devices. This study aims to explore the impact of cumulative exposure to various types of electronic devices on the physical health of university students. The key issue addressed is that prolonged use of various electronic devices is associated with increased prevalence of upper limb disorders like carpal tunnel syndrome (CTS). It is important to gain a deeper understanding of contributing risk factors: awkward posture, repetitive motion and forceful exertion, so as to prevent early manifestation of CTS. These problems must be fixed at the most critical stages of development as it is very likely they may extend into adult life. This study, therefore, will be the first attempt to examine this issue in great depth and strive to develop novel solutions for such problems.

**Methods:** A cross-sectional research design was used: questionnaire survey, physical examination (Phalen’s and Durkan’s tests) and...
ultrasonographic assessment (median nerve cross-sectional area, flattening ratio, transverse carpal ligament thickness and bulge)

**Results:** Mean median nerve cross-sectional area was smaller than those for European studies due to personal factors such as race, body mass index and wrist circumference. Mean flattening ratio was greater than optimal threshold value at tunnel inlet and outlet. No significant difference between dependent and non-dependent hands was found. This study therefore provides insights into risk factors associated with development of adverse health effects related to various electronic devices used by students.

17.8. Phantom-based ultrasound quality assurance measurements in HUS Medical Imaging Centre

**Presenter:** Mervi Jauhiainen, HUS Helsinki Medical Imaging Centre, Finland

**Author:** Mervi Jauhiainen

**Introduction:** The purpose of this lecture is to describe how phantom-based ultrasound quality assurance measurements are arranged in HUS Medical Imaging Centre, Finland. Phantom-based measurements are part of the quality control protocol which has been used since 2010 at HUS Medical Imaging Centre. Measurements are useful both in evaluating technical quality of examinations and in optimizing the use of large amount of ultrasound scanners.

**Methods:** Sonographers perform once a year phantom-based quality measurements to all ultrasound scanners. More limited condition inspection is also done quarterly. HUS Medical Imaging Centre has several locations with ultrasound scanners.

**Results:** This coherent way of executing phantom-based ultrasound quality measurements has proved to be sufficient. Measurements are coordinated by ultrasound physicist and sonographers perform them. At this moment there are twelve sonographers working in HUS Medical Imaging Centre. Phantom-based quality assurance measurements have become part of sonographer’s know-how and the measurements are more reliable and easier to perform, when they are done by experienced sonographers.

17.9. 3D Elastography Measurement of Neck Node Volume: System Development, In Vitro and In Vivo studies

**Presenter:** Micahel Ying, Department of Health Technology and Informatics, The Hong Kong Polytechnic University

**Authors:** M Ying, YP Zheng, BCW Kot, JCW Cheung, SCH Cheng

**Introduction:** Assessment of neck lymph nodes is crucial for patients with head and neck cancer as it helps treatment planning and predicting prognosis. Ultrasound is a useful imaging tool for assessing neck nodes because of its high sensitivity and specificity when combined with fine-needle aspiration cytology. Measurement of nodal size is important in ultrasound assessment of neck nodes. In patients with head and neck cancers, increase in size of neck nodes in serial ultrasound examinations suggests metastases. With the availability of three-dimensional (3D) ultrasound, it allows measurement of lymph node volume which is accurate in nodal size assessment. However, lymph nodes with extracapsular spread demonstrate ill-defined borders on grey scale ultrasound which makes identification of nodal borders difficult and thus affects the accuracy and reliability of nodal size assessment. Elastography has been shown to have an advantage of better delineation of ill-defined lesions’ borders. Therefore, this study aimed to integrate 3D ultrasound and elastography to develop a novel 3D elastography system, and to apply it in measuring the volume of ill-defined lymph nodes.

**Methods:** Porcine lymph node volume was measured with 3D grey scale ultrasound and 3D elastography. Measurement accuracy and reliability of the techniques were compared. Patients with enlarged neck nodes were included to evaluate the measurement reliability.

**Conclusions:** We developed a novel 3D elastography system for volume measurement of soft tissues. Lymph nodes that appeared ill-defined on grey scale ultrasound demonstrated well-defined borders on elastography. 3D elastography (84% and 91-99% respectively) has higher accuracy and reliability than 3D grey scale ultrasound (62% and 78-91% respectively) in volume measurement of ill-defined lymph nodes.
18. POSTERS

18.1. MEDICAL IMAGING

1. THE POTENTIAL HAZARDS OF MAMMOGRAPHY RADIOLOGISTS IN PERFORMING MLO VIEW WITH SIT POSITION AND COMPARE WITH STANDING POSITION - Authors: Liu Shiu-chen; Sun Chin-chih

2. WEIGHT ENHANCEMENT EFFECT ON CT - Authors: Liu Guangyue, Chen Xingpei, ChuYang

3. DETECTION OF PULMONARY EMBOLISM WITH ADJUSTED CONTRAST MEDIA AMOUNT - Authors: Marianne Hansen

4. STRATEGIES TO MINIMIZE THE RADIATION DOSE DURING A CT EXAMINATION - Authors: Raiano, R. Fusco*, F. Mazio, V. Montanino ,G. De Simone , I. Rossi ,C. Raiano, V. Raiano ,A. Petrillo

5. A STUDY ON IMAGE QUALITY AND RADIATION DOSE OF ITERATIVE RECONSTRUCTION ALGORITHM ON ABDOMINAL CT USING PH-S PHANTOM - Author: Seong Ju Lee

6. NEW ECG-GATED CTA TECHNIQUE COUPLED WITH COMPUTATIONAL FLOW ANALYSIS IN ASCENDING THORACIC AORTIC ANEURYSM - Authors: Armando Pasta, Carmelo Parisi, Simona Maggio and Angelo Luca

7. OPTIMIZING FOR BETTER CARE RUBINSTEIN TAYBI –RARITY INTO REALITY - Author: Diane Campbell

8. GOOD PRACTICE IN PAEDIATRIC TRAUMA-CT IMAGING - Authors: J. Mannila, K. Huhtala

9. QUALITY ASSURANCE IN BRAIN CTAS: JUGULAR REFUX PHENOMENON - Authors: Catherine Therrien B Tech, Hosam Al-Jehani

10. EVALUATION OF CT UROGRAPHY WITH LOW IODINE CONTENT CONTRAST MEDIA AND 80KVP TUBE VOLTAGE - Authors: Inpyeong Hwang, Jeong Yeon Cho, Sang Yun Kim, Seoung Hyup Kim

11. EVALUATION OF IMAGE QUALITY AND RADIATION DOSE WITH CHANGE OF ECG SYNCHRONIZATION METHOD AND TUBE VOLTAGE BY HEART RATE AND BODY MASS INDEX IN CORONARY CT ANGIOGRAPHY - Author: Shinho Park

12. THE USEFULNESS OF EXTRAVASATION DETECTION ACCESSORY FOR EARLY EXTRAVASATION DETECTION THROUGH UNDERSTANDING PHYSICAL MECHANISMS AND PROPOSE THE PROPER CLINICAL INSTRUCTION GUIDE - Authors: Sungjae Ahn, Yunsung Shin, Taehyun Nam, Changmin Dae, Kwanhong Min

13. PAEDIATRIC HEAD CT -DIFFERENT INDICATION, DIFFERENT PROCEDURE, DIFFERENT DOSE - Authors: J. Mannila, K. Huhtala

14. RADIOGRAPHER’S COMPETENCE CRITERIA IN COMPUTED TOMOGRAPHY AFTER PRECEPTORSHIP PERIOD – DEVELOPING SELF-ASSESSMENT INSTRUMENT FOR HUS MEDICAL IMAGING CENTER CT-UNITS - Author: Marjut Pawsey

15. RADIOLOGY TECHNICIANS AND DOCTORS LEVEL OF KNOWLEDGE ABOUT RADIATION EXPOSURE DIAGNOSTIC IMAGING PROCEDURES -Authors: Nezaket Özgür, Müge Günalp, Behnan Gülünay

16. DOSES OF ENTRY ON DENTAL RADIOLOGY SALIVARY GLANDS: EXPERIENCE IN THE MUNICIPALITY OF SALVADOR, BAHIA – BRAZIL - Authors: López, Guillermo; Muller, Juliana; Flores Paulo

17. RADIATION DOSES AND SCATTERING IN FACIAL AREA CONE BEAM COMPUTED TOMOGRAPHY EXAMINATIONS - Authors: Minna Väänänen, Anja Henner, Anna-Leena Manninen

18. LOWERING RADIATION DOSE USING THE NOISE-REDUCTION ALGORITHM IN PERCUTANEOUS CORONARY INTERVENTION FOR PATIENTS WITH CHRONIC TOTAL OCCLUSION - Authors: Masayuki Kumasiro, Shinobu Yokota, Atsushi Kawabe, and Kyonori Yamaoka

19. EVALUATION OF RADIATION DOSE TO PATIENTS UNDERGOING INTERVENTIONAL PROCEDURES AT SEOUL NATIONAL UNIVERSITY BUNDANG HOSPITAL - Author: Sunwoo Kim

20. THE OPTIMIZATION OF THE DEFECOGRAPHY EXAMINATION - Authors: Leila Kannala, Maari Korhonen, Anna-Leena Manninen, Anne Vaarala

21. EVIDENCE BASED CLINICAL PRACTICE IN COOPERATION WITH THE STAFF AND RADIOGRAPHER STUDENTS - Authors: Sanna Roppola, , Henner Anja, Virpi Kansanoja, Vesa Repo, , Reponen Jarmo

22. THE CONCEPT FOR THE MENTAL RADIOACTIVITY STUDY FOR RADIATION MEDICAL TREATMENT - Authors: Hiroki Ohtani, Yukari Yamaguchi, Mayuko Kishita, Kei Tsumura

23. TIME FOR CHANGE: NEW OPTIONS FOR PLACEMENT PROVISION - Author: Alexandra Partner

24. USE OF SIMULATOR ANTHROPOMORPHIC (PHANTOM) FOR TEACHING TECHNIQUES OF RADIOLOGY: EXPERIENCE REPORT ON FEDERAL INSTITUTE OF BAHIA-BRAZIL - Authors: Juliana dos Santos Müller and Guillermo Alberto López

25. CONTRAST-AGENT EDUCATION IN HUS MEDICAL IMAGING CENTER - Authors: Heli Patanen and Merja Wirtanen

26. A CASE STUDY OF THE FIRST COHORT OF STUDENTS ON THE MSC DIAGNOSTIC RADIOGRAPHY PRE-REGISTRATION (FAST-TRACK) PROGRAMME AT QUEEN MARGARET UNIVERSITY, EDINBURGH - Author: Alanah Kirby
56. THE BENEFITS OF CLINICAL AUDITS - Author: Mirja Hirvonen-Kari

57. THE PURPOSE OF THIS WORK WAS TO STUDY HOW RELIABLY RECOMMENDED QA PARAMETERS COULD BE REPRODUCED BY SEVERAL SONOGRAPHERS IN REALISTIC SETTINGS - Authors: M. Jauhiainen, P. Blomqvist, T. Kilpeläinen, P. Malaska, T. Vinnurva-Jussila

58. OPTIMISING NEONATAL X-RAY QUALITY: RESULTS OF AN AUDIT - Authors: N Woznitza, N Hayes, N Malisheva, D McGuinness

59. RADIOGRAPHERS’ PERCEPTION OF IMAGE QUALITY AND THEIR COMPETENCE WITH DIGITAL X-RAYS - Author: Astrid Bernsten

60. STATISTICAL ANALYSIS : CT COLONOGRAPHY AND BARIUM ENEMA - Authors: Miss Siew Teng Boon, Co-Author: Mr Jia Jun Ng.; Co-Author: Dr Narayan Lath

61. CHECKLIST FOR IDENTIFICATION OF THE PATIENT IN RADIOLOGICAL EXAMINATION - Authors: Merja Paasio, Heidi Korin

62. IMAGE QUALITY AND OPTIMIZATION DOSE FOR CHEST EXAMINATION IN COMPUTED RADIOGRAPHY AND DIGITAL RADIOGRAPHY - Authors: Puntharika Buasang, B.Sc.(RT), Phadorn Chumpia, B.Sc.(RT), Trongtum Tongdee, M.D.

63. CHEST X-RAY SELF-ASSESSMENT, A PILOT STUDY - Authors: Tolonen M., Hakso-Terävä A., Takalo R.

64. INFLUENCE OF INDOOR AIR QUALITY ON SICK BUILDING SYNDROME RELATED SYMPTOMS AMONG RADIOLOGICAL TECHNOLOGISTS - Authors: Yan-Chi Chang, Chia-Yu Keng

65. IMPROVEMENT ACTIVITIES OF EXPOSURE MANAGEMENT SERVICE THAT IS BASED ON USE OF PDMS (PERSONAL DOSE MEASURING SYSTEM) AND RADIATION-RELATED MANUAL - Authors: Jaeyeong Cho, Yoonjoo Lee, Yeonhee Kim, Mihyang Eun, Hyeongchul Kim

66. IN A UNIVERSITY HOSPITAL HEALTH PROFESSIONALS WORKING WITH IONIZING RADIATION SOURCES IN THE EVALUATION OF OCCUPATIONAL HEALTH AND SAFETY SITUATION - Authors: Seyhan Erdem, Assoc.Prof.Dr. M. Necmi İlhan

67. A PRELIMINARY STUDY OF BACTERIAL CULTURES OBTAINED - Authors: James B. Temme; K. Honeycutt; S. Vas

68. NUTRITIONAL AND LIFE STYLE DETERMINANTS OF RADIATION-INDUCED OXIDATIVE STRESS IN OCCUPATIONALLY EXPOSED WORKERS - Authors: Iman M. Ahmad; James B. Temme

69. DETECTABILITY OF MICROCALCIFICATION IN DIGITAL MAMMOGRAPHY SYSTEMS: EFFECT OF LOCATION AND DEPTH - Authors: A Brindhaban, Shareif H, Failakawi D

70. COMPARISON OF IMAGE QUALITY BETWEEN DIGITAL AND COMPUTED RADIOGRAPHY - Authors: K. Alkhalifah, A. Brindabhan

71. GAUGING PERSONAL EXPOSURE DOSES OF RESIDENTS FOLLOWING THE ACCIDENT AT FUKUSHIMA NUCLEAR POWER STATION - Author: Kunihiko Morozumi

72. TACIT KNOWLEDGE AND WORKPLACE LEARNING – CREATING PRECONDITIONS FOR TACIT KNOWLEDGE UTILIZATION IN RADIOGRAPHER WORK COMMUNITIES - Author: Juha Kurtti

73. OPTIMIZING PATIENT CARE WITH CT/MRI PERFUSION IN STROKE MANAGEMENT: A REVIEW OF PAST EXPERIENCES IN SINGAPORE GENERAL HOSPITAL - Authors: Low Wei Ying Cheryl, Kumar, K., Tan, T. M., Rumpel, H., Chan, L. L.

74. EVALUATION OF CAROTID ARTERY BY DOPPLER ULTRASOUND IN PATIENTS AFTER RADIOTHERAPY OF THE HEAD AND NECK REGION - Authors: Jolanta Tomczak, Bartosz Bąk, Grzegorz Oszkinis

75. THE VALUE OF SPATIAL COMPOUND IMAGING IN 2D AND 3D ULTRASOUND ASSESSMENT OF CAROTID PLAQUES - Authors: Michael Ying, Yongping Zheng

76. COMPARISONS BETWEEN PATHOLOGICAL AND SONOGRAPHIC SIZE OF BREAST CANCER - Authors: Yan-Chi Chang, Chia-Yu Keng

77. SONOGRAPHY OF NONALCOHOLIC FATTY LIVER DISEASE AND LIPID PROFILE OF THE METABOLIC SYNDROME - Authors: Yan-Chi Chang, Chia-Yu Keng

78. ELASTOGRAPHY STRAIN RATIO MEASUREMENTS FOR THYROID NODULE DIFFERENTIATION: A SYSTEMATIC REVIEW - Author: Holly J Elliott

79. CARPAL TUNNEL AREA AS A RISK FACTOR FOR CARPAL TUNNEL SYNDROME: ULTRASONOGRAPHIC MEASUREMENTS OF MEDIAN NERVE AND TRANSVERSE CARPAL LIGAMENT - Authors: Woo, H.C., White, P & Lai, W.K.

80. EVALUATION OF CAROTID ARTERY BY DOPPLER ULTRASOUND IN PATIENTS AFTER RADIOTHERAPY OF THE HEAD AND NECK REGION - Jolanta Tomczak

18.2 NUCLEAR MEDICINE

81. DOES TO THE STAFF IN NUCLEAR MEDICINE: TWO EXAMPLES - Authors: Torvinen Marita, Torniainen Pentti, Manninen Anna-Leena, Vimpari Pirjo Henner Anja
18.2. RADIOTHERAPY

82. COMPARISON OF THE MORPHOLOGY OF TEMPORO-MANDIBULAR JOINT BETWEEN POST-RADIOTHERAPY NASOPHARYNGEAL CANCER PATIENTS AND NORMAL SUBJECTS - Authors: Vincent WC Wu, Michael TC Ying, Dora LW Kwong

83. EXPERIENCED BENEFITS OF CYBERKNIFE® ROBOTIC RADIOSURGERY SYSTEM IN KUOPIO, FINLAND - Authors: Kati Tolonen, Aija Juutilainen, Heidi Niskanen

84. IMPROVING ACCURACY IN ADJUVANT RADIOTHERAPY OF LEFT-SIDED BREAST CANCER ACCOMPLISHED WITH VOLUNTARY DEEP INSPIRATION BREATH HOLD TECHNIQUE - Authors: Marko Laaksomaa, Mikko Haltamo, Mika Kapanen, Seppo Peltola, Eeva Boman, Tanja Skyttä, Piriko-Liisa Kellokumpu-Lehtinen, Simo Hyödynmaa

85. IMPLEMENTATION OF BREATHING ADAPTED STEREOTACTIC BODY RADIOTHERAPY FOR TREATMENT OF LIVER CANCER - Authors: Ineta Nemiro, Olga Utehina, Silvija Preinberga, Galina Boka, Viesturs Boka

86. A SEARCH FOR OPTIMAL RADIATION THERAPY TECHNIQUE FOR LUNG TUMOURS STEREOTACTIC BODY RADIATION THERAPY (SBRT): DOSIMETRIC COMPARISON OF 3D CONFORMAL RADIOTHERAPY, STATIC GANTRY INTENSITY MODULATED RADIOTHERAPY (IMRT) AND VOLUMETRIC-MODULATED ARC THERAPY (VMAT) WITH FLATTENING FILTER (FF) OR FLATTENING FILTER-FREE (FFF) BEAMS - Authors: Murphy S.H. Chiu, Dora L.W. Kwong