Saturday 30 March, 09:00–10:30
MI Techniques

'Thinking aloud' about mammographic image quality: radiographers' cognitive processes for evaluating the craniocaudal view

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Objective: To provide insight into radiographers cognitive processes[1] during the task of evaluating craniocaudal CC views for positioning image quality. Provision of new knowledge is expected to contribute to more consistent application of image quality criteria[2] with the possibility of a reduction in missed breast cancers.[3]
Methods: A 'think aloud' study was developed to provide verbal reports as data.[4] Radiographers working in mammography from Australia and New Zealand attended individual face-to-face sessions (n = 17). The participants' mammographic practice included diagnostic, private screening and/or population-based breast screening.
During the first stage of the session, the participant reviewed a set of mammograms and verbalised their image quality decisions ('concurrent verbalisation'). During the second stage, explanation of the evaluation and thought processes was explored ('retrospective verbalisation'). Both stages were audio-recorded for encoding and protocol analysis.[4]
Result: Protocol analysis is currently being undertaken, with full results due November 2018. Preliminary findings suggest that radiographers' image evaluation is related to the woman's body habitus and ability to undergo mammography. Decisions to repeat imaging are linked to radiation dose considerations.
Discussion and Conclusion: With the advent of digital mammography, image quality decision making often occurs with the woman present within the mammographic room, creating changes from previous methods of assessment. 'Think aloud' is a useful methodology to evaluate clinical decisions through rich qualitative analysis.

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What to do when you can't get the textbook view

Peter Elliott[1]
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Radiographers come across many limitations that include patient mobility, co-operation, obvious injury and technical problems. Thinking outside the square and knowing the capabilities of your equipment are needed to get adequate views that (a) confirm a diagnosis and (b) assist the clinician in the most appropriate treatment plan. Often there is no surprise to find a fracture but important issues are site, angulation and displacement.
This presentation shows recent orthopaedic cases from the presenter's general radiography workplace and how problems were overcome. The outcomes should benefit the new graduate that is still gaining experience.

A small mark with a big impact: a multi-method study on anatomical side marker use at a paediatric medical imaging department

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Background: The presence of a radiopaque or digital anatomical side marker (ASM) is an important diagnostic feature on X-rays and should be a routine feature on all X-rays. Despite its importance, research has indicated numerous instances where ASMs were absent, potentially leading to adverse events. To date, few studies have systematically examined the use of ASMs in clinical practice and explored medical imaging professionals' perspectives on ASM use. This research aimed to address this knowledge gap.
Methods: This research was conducted in two stages underpinned by multi-methods. A retrospective clinical audit was conducted for 421 randomly selected X-rays within 12-month at a paediatric medical imaging department. The data was analysed for overall presence and type of marker use. Semi-structured interviews were conducted with 11 radiographers to garner their perspectives on ASMs, and any barriers and enablers to their use in clinical practice. The interviews were transcribed verbatim and thematically analysed.
Results: The overall presence of ASMs (radiopaque and digital) was observed on 98% of X-rays. There was a noticeable shift towards the use of digital (77%) compared to lead ASMs (20.4%), highlighting the growing trend towards using ASMs in post-processing. A handful of images ($n = 4$) did not include any ASMs. Semi-structured interviews revealed multifaceted barriers (patient and environmental factors) and few enablers (medico-legal requirements and professionalism) for radiopaque ASM use.
Conclusion: While missing ASMs on X-rays was a small feature, it does highlight opportunities for improvement. The increasing use of digital ASMs potentially highlights a shift in clinical practice standards.

Is bowel preparation required for abdominal ultrasound examinations?

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Background: In abdominal ultrasound imaging, the type of bowel preparation used and the time period over which such preparations are performed vary according to expert opinion.[1] There is no recognised international standard for abdominal ultrasound bowel preparation.
Objectives: The aim of this literature review was to assess bowel preparations for abdominal ultrasound, such as dietary restriction (nil by mouth, fluids only, low-gas forming/low-calorie and low-fat diets) and medication regimens (involving anti-flatulents and laxatives) to determine which is the most effective, and to establish if there is a relationship between fasting time and image quality.
Key findings: In general, the use of bowel preparation and the length of fasting time did not significantly improve overall image quality in paediatric or adult patients as determined by the visibility of abdominal organs.[1-4] The routine use of anti-flatulent and laxative medications in bowel preparation for abdominal ultrasound was not supported by the literature.[5-8] However, fasting and medication regimens could improve organ visualisation after an initial failed examination, in patients with excessive abdominal obesity and/or those with known pathologies that cause intestinal bacterial overgrowth which subsequently results in excessive gastrointestinal gas.[9]
Conclusion: Bowel preparation is not routinely required for abdominal ultrasound examinations. A light meal, 2–4 h before the examination, is sufficient to provide adequate organ visualisation. Clinical practices should review their departmental protocols regarding bowel preparation in abdominal ultrasound examinations and embrace the possibility of an evidence-based approach that is appropriately targeted to the patient.

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Chest radiology

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Background: In Bangladesh, the condition people from low socioeconomic groups suffer most from is lung disease. With the help of modern equipment, we can diagnosis disease early and treat early, thereby reducing the consequences.
Methods: This study was conducted on 300 lung disease patients in the Gazipur area of Bangladesh. Samples were collected from one-on-one interviews. Most of the patients were in the low socioeconomic group and within an age range of 30–60 years (both male and female). Record the patient's history and clinical examination and get some relevant investigation. Scanning was carried using digital X-ray.
Results: 300 patients (most patients were aged 30–60 years) both male and female were included. They suffered from various types of lung diseases: tuberculosis more than 30%; COPD 10–20%; asthma 10–15%; lung infection 3–5%; pneumonia in adults 5–10%, consolidation of lung 1–5%, lung cancer 1–5%; pneumoconiosis 2–5%; and plural effusion 3–5%.
Conclusion: We used digital X-ray and advanced equipment. With an early diagnosis, proper treatment can reduce the rate of adverse effects and consequences and ultimately, the mortality rate.

Developing a protocol of best practice for imaging of the shoulder

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Objectives: Despite the availability of different imaging modalities, general radiography remains the primary imaging tool in diagnosing a vast majority of shoulder disorders.[1] However, protocols for shoulder imaging differ greatly from site-to-site, and many radiographers disagree about the most appropriate projections for specific pathologies. This project was a review of Western Health imaging protocols to co-ordinate and facilitate the most appropriate imaging routine of the shoulder to meet the expectations of those with the most invested in the outcome.
Methods: Radiographers, radiologists and orthopaedic surgeons were provided an online survey to determine which protocols were considered most appropriate for eight different clinical presentations.
Results: Preliminary results suggest that, among all professions, there is division around the use of the AP general survey and the glenohumeral AP (GHAP). There also appears to be discrepancies on the appropriate imaging across the differing clinical presentations. Radiologists tended to favour the GHAP over the AP general survey for most pathologies, while radiographers tended to favour the general survey for all presentations except impingement and rotator cuff tear, and arthritic change.
Discussion and Conclusion: These results indicate the disagreement between professions about the most appropriate protocols for imaging the shoulder girdle. The GHAP is more often considered crucial by radiologists. Despite this, radiographers tended to favour the AP general survey. It is possible to conclude that the GHAP may replace the AP general survey in the investigation of specific pathologies, particularly arthritic change and impingement.

Reference

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Saturday 30 March, 09:00–10:30
MRI – An International Perspective

The IVIM MRI of lateral pterygoid muscle: a quantitative analysis in patients with TMDs

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Objectives: To compare and quantitatively evaluate diffusion and perfusion status of lateral pterygoid muscle (LPM) between normal and abnormal patients with temporomandibular joint disorder (TMDs) by intravoxel incoherent motion (IVIM) imaging.
Materials and Methods: 50 patients were divided into two groups. All patients suspected of having TMD were diagnosed in the department of oral surgery or orthodontics; post-operative patients were excluded. B-values were selected from 0 to 1000 sec/mm^2 and divided into 12 values in IVIM sequence. The regions of interest of the superior and inferior bellies of LPM (SLP and ILP, respectively) were measured. Then, IVIM parameters, diffusion (D) and perfusion (f) were calculated by using bi-exponential fittings.
Results: For SLP, the 'f parameter' in TMJs with anterior disk displacement without reduction was significantly higher than those of the normal ($P < 0.05$). It was also significantly higher in TMJs with the joint effusion than those of without the joint effusion ($P < 0.05$). For both SLP and ILP, the 'D parameter' was more significantly increased in TMJs with osteoarthritis than those without osteoarthritis ($P < 0.05$).
Conclusion: Pathological changes of LPM in TMD patients may be quantitatively evaluated by using IVIM sequence of MRI.

Voxel based mophometric analysis of brain structural changes in Alzheimer's disease with clinical and cognitive data: a longitudinal study

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[1]General Sir John Kotelawela Defence University, Western Province, Sri Lanka [2]University of Colombo, Sri Lanka [3]National Hospital of Sri Lanka, Sri Lanka

Aim: To examine the volume and morphometry changes of brain in Alzheimer's disease (AD).

Methods: A group of 40 AD patients and 20 healthy controls. 3D T1 MRI images were collected in different time intervals at 0 (baseline), 26 and 52 weeks thereafter. Images were processed by Voxel Based Morphometry (VBM) through SPM 12. The global and normalised volume of grey matter (nGM) and white matter (nWM) and brain morphometry were evaluated.

Results: The average age of the patients was 69.70 (±7.24) years and 68.36 (±6.33) years in the control and AD group, respectively. The group comparison showed significant changes of volumes in the following ($P < 0.05$); nGM and nWM between the baseline and 52 weeks; nGM between 26 and 52 weeks, and nWM between baseline and 52 weeks. There were no significant differences of volume changes ($P > 0.05$) in nGM between baseline and 26 weeks, and between 26 and 52 weeks in nWM. Multivariate analysis showed statistical differences of brain morphometry based on age and gender. A strong positive significant ($r = 0.744$, $P < 0.05$) correlation was found between the Mini-mental State Examination (MMSE) value and nGM; and a moderate positive significant ($r = 0.496$, $P < 0.05$) correlation found between the MMSE value and nWM.

Conclusion: Cognitive and clinical decline depended on age, gender and time and is correlated with GM and WM volumes of brain, as well as with brain morphometric changes in AD.

A pitfall in free breathing diffusion-weighted imaging of the liver using a different number of excitations for each b-value

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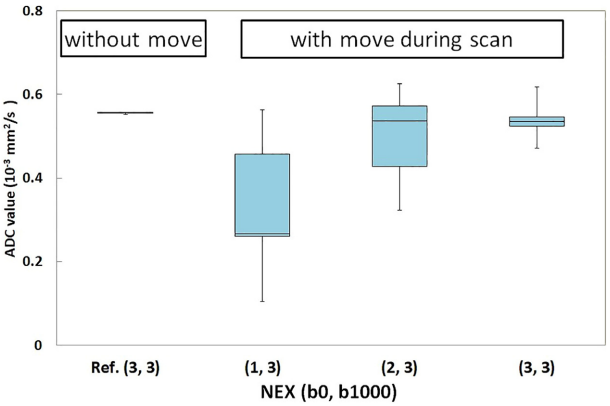
Objectives: Because there is no standardised protocol, diffusion-weighted imaging (DWI) of the liver can be performed with three approaches: breath-hold, respiratory-triggered, and free breathing (FB). Many reports show the usefulness of FB-DWI in terms of high SNR or time efficiency.[1-3] On the other hand, previous reports suggest that FB-DWI might result in misregistration due to unstable slice position by respiratory motion.[4,5] It is now possible to set a different number of excitations (NEX) for each b-value to shorten scan time. Our aim was to evaluate how ADC values are affected by different NEX for each b-value.

Methods: We made an agarose phantom centered on a bottle filled with diluted neutral detergent. DWI with two b-values (0 and 1000 sec/mm^2) were obtained 10 times by varying the NEX for each b-value (b0, b1000 = 1, 3; 2, 3; 3, 3). To simulate breathing motion, the phantom was moved during scanning. A reference value was obtained without moving. The mean ADC values were compared.

Results: The mean ADC values ± standard deviation are shown in the Figure.

Discussion: FB-DWI generally set multiple NEXs for high SNR. Hence, respiratory motion is averaged by more than two NEX. However, it is now possible to set NEX individually for each b-value. Although the one NEX is sufficient for SNR of b0, that might lead to misregistration and scattering of ADC values. This is a pitfall in FB-DWI brought about by the latest techniques.

Conclusion: The one NEX of low b-values should not be set on the FB-DWI of the liver.



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Comparison of conventional and synthetic MRI for quantitative cartilage T2 mapping of the patella

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Introduction: Conventional multi-slice multi-echo T2 mapping has been established as the gold standard for non-invasive quantitative assessment of collagen content and ultrastructure in cartilage.[1,2] Synthetic MRI (SynMRI) is a recent pulse sequence that provides dynamic tissue and inversion recovery contrasts from a single scan.[3] We aim to compare cartilage T2 values from conventional and SynMRI techniques, potentially delivering quantitative information with greater time efficiency.

Methods: The local institutional review board granted study approval. Scans were done on a 3.0T MRI scanner with a 16-channel phased array knee coil. Conventional T2 mapping and SynMRI sequences were performed in addition to outpatient routine knee examinations. The acquired imaging data from both conventional T2 mapping and SynMRI were processed to yield quantitative cartilage T2 maps (Figure 1). The data of 70 knees in 70 subjects (48 men, 22 women; mean age 29 years) were analysed.

Results: Mean full-thickness cartilage T2 relaxation time was significantly higher for SyMRI compared to conventional T2 mapping (45.1 vs 38.0 msec, $P < 0.001$); similar findings were found for superficial (48.2 vs 43.9 msec, $P < 0.001$) and deep (42.0 vs 32.0 msec, $P < 0.001$) half ROI measurements.Pearson correlation shows strong correlation between full-thickness cartilage SyMRI and conventional T2 values ($r = 0.694$, $P < 0.001$), with moderately strong correlation for superficial ($r = 0.562$, $P < 0.001$) and deep ($r = 0.582$, $P < 0.001$) half ROIs.

Discussion: Cartilage T2 relaxation time measurements from SyMRI demonstrate strong correlation, with significantly higher T2 values obtained from SyMRI. SyMRI could be a promising biomarker in the quantitative assessment of chondral abnormalities.

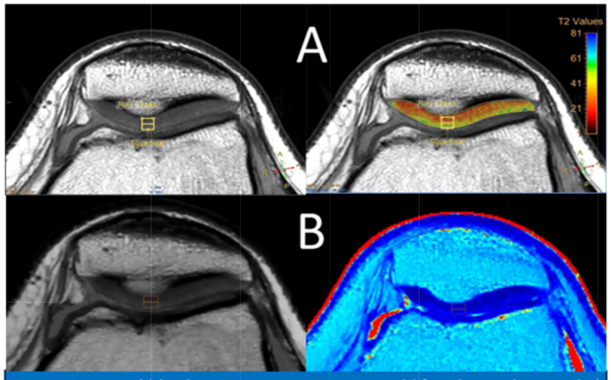

Figure 1. Conventional (A) and SyMRI quantitative T2 map images (B) from the same knee. Matched regions-of-interest (ROI) were drawn over the thickest part of the patellar apex cartilage on both maps using the corresponding intermediate-weighted fast spin-echo image as an anatomical guide. Full-thickness, superficial-half and deep-half cartilage T2 relaxation time measurements were obtained.

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Selection and application of coils in temporomandibular joint MRI

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Objective: To evaluate the signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) values between a 15-channel phased array head coil and 6-channel dS Flex M surface coil in MRI of temporomandibular joint (TMJ).

Methods: 25 patients were examined using a 15-channel phased array head coil. Another 25 patients were scanned using a 6-channel dS Flex M surface coil. All of the data was set in the same six regions of interest (ROIs) including the temporal lobe (S_1), condyle neck (S_2), lateral pterygoid muscle (S_3), parotid gland (S_4), the adipose area (S_5) and an area of background noise(S_∂). Ethics approval was granted.

Results: The lowest value of the SNR was SNR_3, and that of the CNR was CNR_2. The SNR_3 was the lowest in five groups, but the SNR by using the surface coil was lower. The mean values of SNR_1 and SNR_5 in OCor T_2WI were highest by using head coil. The CNR values of OSag T_2WI by using head coil were highest; those of OSag PdWI by using the surface coil were lowest. The SNR and CNR values of 15-channel phased array head coil were higher than those of 6-channel Flex M dS surface coil at the same parameters and sequence in each match groups. The images by using these two coils were both obtained to meet the requirements of imaging diagnosis respectively, the diagnostic rate were 95.83% (head coil) and 91.67% (Flex coil).

Conclusion: Both the phase-array head coil and dS Flex M surface coil could be used for TMJ MRI.

A cloud-based computational platform for MRI perfusion analysis in cognitive decline and demented elderly

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Background and Aim: Arterial spin labelling (ASL) MRI is a non-invasive perfusion technique. It can measure absolute cerebral blood flow (CBF) and has a high sensitivity to detect subtle change.[1] Mathematical subtraction and modelling of the pre-labelled and post-labelled images give voxelwise CBF values. Data processing usually requires running advanced computer program scripts and models across multiple software. The lack of powerful computers, specialised software, expertise and time are inhibitors for the quantitative use of ASL in the clinical environment. This presentation aims to introduce a comprehensive, installation-free, web-based tool for ASL data analysis to differentiate normal ageing and Alzheimer's disease elderly by comparing CBF and volumes of commonly affected brain regions.

Methods: MRI data analysis was performed using ASL-MRICloud.[2-4] DICOM images of 3D-T1-FFE and ASL sequences were collected. Image format conversion, brain segmentation and CBF quantification were performed in ASL-MRICloud.

Results: 25 subjects were clinically classified into subjective cognitive impairment (SCI) ($n = 6$), mild cognitive impairment (MCI) ($n = 4$), Alzheimer's disease (AD) ($n = 9$) and vascular dementia ($n = 6$). Normalised volumes and regional CBF of four brain regions: the hippocampus, precuneus, posterior cingulate and rostral anterior cingulate, were calculated for each group. AD subjects had the lowest regional CBF of four brain regions; the values are significantly lower than the SCI group ($P < 0.05$). Hippocampi of AD subjects were significantly smaller than MCI subjects ($P < 0.05$).

Conclusion: ASL-MRICloud provides a free, simple and one-off processing pipeline for ASL analysis. Reporting brain region volumes and CBF values to quantify patients at different severity of cognitive decline becomes clinically achievable.

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Saturday 30 March, 09:00–10:30 Clinical Education Combined Session

When worlds collide: disconnected expectations on student clinical placement

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Introduction: Student clinical placement experience forms an integral part of pre-registration training in radiation therapy. Students are part of the radiation therapy workforce during clinical placements with the primary goal that they learn profession associated applied skills. However, expectations of learning between students and staff can be at odds. This disconnectedness can have an impact on the effectiveness of the clinical placement experience.[1]
Method: At Peter MacCallum Cancer Centre, a quality improvement anonymous evaluation was undertaken to measure the experience of radiation therapy students on short-term (1–6 weeks) clinical placements during 2017. Similarly, an anonymous evaluation of clinical staff was undertaken during April to May 2018, to determine their experiences in providing effective clinical supervision to students.
Results: 46 student responses were completed following their clinical placements (40.4% response rate). Although weighted average responses to statements were all greater than 2.98 (option range 1–4), some students perceived effective clinical supervision and feeling a sense of value were not always apparent. 46 valid responses were received from clinical staff (~20% response rate). The mean rate of confidence in providing effective clinical supervision was 7.25 (option range 1–10); however 21% of respondents indicated they were not very confident. The main perceived challenges were individualising teaching and managing at-risk scenarios. Free text comments from both cohorts indicated challenges around disconnected expectations.
Conclusion: Clearly defined challenges within the clinical learning environment have been identified. As a result, improved communication and training strategies have been implemented to aid student integration and staff engagement in teaching.

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Professionalism in radiography and radiation therapy: understanding professionalism dilemmas through student narratives about workplace learning

Caroline Wright[1]
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Objectives: Although students learn about what constitutes good professional practice, they may encounter professionalism dilemmas in the clinical environment (e.g. witnessing emotional maltreatment of patients or sub-standard technical performance).[1,2] These professionalism dilemmas may cause distress and can impact negatively on students' developing professional attitudes and behaviours.[3] This paper aims to explore the range and nature of professionalism dilemmas that radiation therapy (RT) and radiography students encounter during their clinical placements.
Methods: This qualitative study involved 31 radiography and 39 RT students from six Australian universities. Ethics approval was granted from all institutions and students were recruited via flyers, email and student representatives. Students participated in group/individual narrative interviews which were digitally recorded and transcribed anonymously. Team-based framework analysis was used to identify initial themes for subsequent coding.
Results: Initial framework analysis identified the following themes and sub-themes: Theme 1: Practitioner behaviours (uncaring, dismissive, inappropriate language, inappropriate humour, sexually oriented remarks/advances); Theme 2: Expectations of supervision (conflicting instructions, expectations, lack of direct supervision); Theme 3: Student fears (confrontation, failure, not getting a job); Theme 4: Radiation safety lapses; Theme 5: Unnecessary protocol deviations; Theme 6: Pressure to perform unreasonable tasks; Theme 7: Reporting of professionalism lapses; Theme 8: Student guilt (not acting in patients' interest, complying with inappropriate requests, being a bystander).
Discussion and Conclusion: Professionalism dilemmas experienced by radiography and RT students are varied and have differing impacts on student competence, confidence and wellbeing. The results of the study have implications for student and staff education and training, and patient care.

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Working towards better patient outcomes: understanding clinical decision making learning through student voices

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Objectives: Clinical decision-making (CDM), is a complex cognitive process that influences patient outcomes and the quality of care.[1] CDM is an elusive practice that appears multidimensional and seemingly lacks process and structure.[2-4] At the University of Auckland (UoA), a CDM framework[5] has been developed to assist sonography students in their clinical reasoning. This study aimed to determine student views on the CDM framework to inform educators of strategies to better support CDM learning.

Methods: Using purposive sampling, five clinical supervisors and two students participated in semi-structured interviews. Focus groups with students were also conducted at the end of each semester, between 2014 and 2016. Thematic analysis was used to analyse and to make sense of the data (UoA ethical approval: 013182).

Results: Students found the framework useful to scaffold their CDM thinking especially during the first 3 months of sonography training. Students who did not have a radiography background rated the model more highly than their radiography peers. There was a variation of CDM competency and confidence level even among students at the same level of training, with some expressing anxiety while others felt sufficiently confident in their CDM learning.

Conclusion: The CDM framework offers a structured approach to the development of sonography CDM competency. Sonography educators need to be aware of student education background and be cognisant of student affective elements towards CDM learning. This will enable educators to develop strategies to better support students in the development of CDM competency to achieve better patient outcomes.

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Promoting and supporting the health and wellbeing of medical radiation science students on clinical placement

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Background and Objectives: Student clinical placements are an integral part of medical radiation science (MRS) courses. While the student's knowledge and clinical skills are constantly assessed, one area that can be overlooked is the student's wellbeing. Literature on supporting student wellbeing focusses on nursing and allied health streams other than MRS. With individual MRS clinical placement blocks ranging from 2 to 18 weeks, awareness of MRS student wellbeing is timely.

Methods: #studentcorner@SCUH-MiD was created at the beginning of 2018 at the Sunshine Coast University Hospital Medical Imaging Department to provide MRS students the opportunity to support their wellbeing. Themed weekly meetings combining both learning and healthy discussion attempted to create a sense of belonging and professional fellowship amongst students, leading to an overall more rewarding placement. Feedback was sought at the completion of placement with an optional short questionnaire.

Results: To date, 19 students have participated in #studentcorner@SCUH-MiD of which 13 (68%) returned the questionnaire. Eleven (84%) students found the project worthwhile and two (16%) students had mixed feelings about the project. All respondents enjoyed meeting with the other students.

Discussion and Conclusion: Students on clinical placement who feel a sense of belonging generally report a more successful placement.[1] Also widely accepted is that people who have supportive relationships will generally experience less stress and be more physically and psychologically healthy.[2] MRS students on lengthy clinical placement periods are potentially vulnerable to stressors that may impact on learning. #studentcorner@SCUH-MiD attempts to ensure MRS students get the most out of their clinical placement.[3]

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Preparing better professionals within the university sector

Julie Burbery[1]
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Emerging trends related to funding, staffing and student demands influence how education providers create authentic teaching and learning environments. To develop student knowledge and professional behaviour requires the utilisation of innovative methods within the constraints of university limitations. This presentation will highlight recent innovations particularly with the context of strategic planning for a 4-year undergraduate radiation therapy program.

The university ethos of providing flexible learning environments to accommodate student needs creates disengagement within the cohort, as students choose not to attend face-to-face lectures. Tackling these issues and improving the first-year experience has become a recent focus of tertiary education providers to increase engagement, build collegiality and reduce student attrition. The introduction of 'Yarning Groups' and student partnership programs aims to facilitate greater student involvement throughout their degree.

Furthermore, students in professional programs often experience financial difficulties arising from the need to self-fund the large clinical placement component. Increased competition for student scholarships and bursaries exemplify this, and the priority of the university to expand opportunities for work-integrated-learning means that students no longer have the luxury of learning or earning as they are required to juggle both. The strong partnerships formed between the university and clinical departments are fundamental in providing students with the best possibilities.

Additionally, academic staff teaching within the program are required to provide a clinically relevant curriculum that meets university accreditation and professional registration requirements. The development of specialist staff appointments and expansion of professional development opportunities support the immersive experiential learning environment and create better professionals.

Saturday 30 March, 09:00–10:30
Health Service Delivery

Coordination and resource considerations for a multi-centre trial comparing a silicon-based gel with standard care for radiation dermatitis

Cathy Hargrave,[1,2] Brigid Hickey,[1] Pauline Rose,[1] Sylwia Zawlodzka-Bednarz,[1] Narelle Wallace,[1] Margot Lehman,[2] Rochelle Pallesen,[2] Desiree Edeling,[2] Kylie Robbie,[3] Amber Scull,[3] Susan Hewitt,[3] Anne Bernard[4]
[1]Princess Alexandra Hospital, Queensland, Australia [2]Queensland University of Technology, Queensland, Australia [3]Townsville Cancer Centre, Townsville Hospital, Queensland, Australia [4]QFAB Bioinformatics, Institute for Molecular Bioscience, University of Queensland, Australia

Radiation dermatitis is a common acute toxicity of external beam radiation therapy (EBRT).[1] To date, numerous studies have found no significant difference between standard care using aqueous or sorbolene cream, and alternative topical creams or dressings in managing radiation dermatitis.[2,3]

Radiation Oncology, Princess Alexandra Hospital – Raymond Terrace is coordinating an ethics approved multi-centre randomised controlled trial comparing the effectiveness of StrataXRT (Stratpharma AG, Switzerland), a silicon-based gel, with standard care. This study includes cancer patients undergoing EBRT to the head and neck region, breast, chest wall post-mastectomy, the axilla/groin region or whole pelvis. Stratified randomisation by cancer site is used to allocate a total of 200 participants to receive either standard care or StrataXRT.

Data collection for this study is resource intensive. Endpoints include clinician and patient skin assessments using the Radiation-Induced Skin Reaction Assessment Scale (RISRAS) and blinded photographic assessment using the Common Terminology Criteria for Adverse Events scale. A RISRAS assessment and photographs are taken on Day 1 of treatment, then weekly until 4 weeks post-treatment. A log of creams and dressings used is completed for each patient. At 3 and 12 months post-EBRT, participants are assessed for late-effects skin toxicity.

This presentation will discuss approaches where existing infrastructure, such as MOSAIQ quality check lists and assessments, is being used to coordinate and assist the multidisciplinary team with uniformity of data collection across various Queensland Health sites. Quality assurance procedures, including those established for the blinded assessment photographs and study monitoring processes, will also be presented.

References

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Variations in radiotherapy patterns of care in the radical treatment of South Australian non-metastatic prostate cancer patients

Stamati Morias,[1] Elizabeth Buckley,[1] Kerri Beckmann,[1] Martin Borg,[2] Michael O'Callaghan,[3] Michala Short[1]
[1]University of South Australia, Australia [2]GenesisCare, Australia [3]South Australian Prostate Cancer Clinical Outcomes Collaborative, Australia

Objectives: To investigate associations between socio-demographic characteristics and radiotherapy patterns of care in men with non-metastatic prostate cancer in South Australia (SA) between 2005 and 2015 and to document the changes in external beam radiotherapy (EBRT) and brachytherapy (BT) over time.

Methods: SA men with non-metastatic prostate cancer were identified from the SA Prostate Cancer Clinical Outcomes Collaborative database. Variables analysed included patients' age at diagnosis, residence, socio-economic status (SES), year of treatment, clinical risk and radiotherapy mode and technique. Associations between socio-demographics and radiotherapy, adjusted for clinical risk and year of treatment were analysed using multivariable logistic regression.

Results: The final cohort included 1874 patients. Men with low and intermediate risk disease who were more than 65 years of age and lived in metropolitan areas were more likely to have received EBRT compared with men who were younger and resided in regional/remote SA. No associations were found between radiotherapy patterns of care and SES. Increased use of dose escalation and intensity modulation was seen for EBRT after 2010. For BT, men with intermediate and high-risk disease diagnosed after 2010 were between 2 and 4.5 times more likely to have received BT compared with men with similar clinical characteristics diagnosed before 2010.

Discussion and Conclusion: This retrospective cohort study showed radiotherapy patterns of care have changed over the past decade and identified the disparities among men with different socio-demographic factors. These findings inform clinicians and health service providers of improvements that may be needed in the health service provision.

Change management in radiation oncology: transitioning to the new Royal Adelaide Hospital

Charlotte Sale[1]
[1]*SA Health, South Australia*

Background: One of the largest change operations to take place in South Australia was the moving of the Royal Adelaide Hospital (RAH) to its new site in 2017. Change can impact on workplace effectiveness and staff satisfaction and morale. Understanding the stages of change staff experience and carefully managing the process is important. This presentation aims to describe a change operation of moving a radiation oncology department to a new site with a focus on the change experience for staff.

Method: This presentation is descriptive in nature utilising a four-stage model of change (Table 1) as a framework to describe the change experienced by staff throughout the transition to the new hospital.

Results: A description of how and when staff moved through the stages of change, denial, resistance, exploration and commitment. Along with the complex mix of different perceptions emerging from 51 staff at the RAH and 69 across the state wide service.

Conclusion: The move to the new site was a great success with a transition period working across two sites enabling a slower ramp up of activity at the new site supporting staff and patients in adjusting to the new environment. The four-stage model of change assisted in the smooth implementation of a transition plan for radiation oncology. At the RAH innovation and development are encouraged, along with management having a comprehensive understanding of organisational change enabling the radiation oncology department to successfully navigate rapid change.

Table 1: Stages if change and management strategies for dealing with change

Stages of change	Management strategies.
DENIAL	Communication of information. Time.
RESISTANCE	Acknowledge and listen to individuals.
EXPLORATION	Practical encouragement and support. Highlight the benefits of the change. Provide training. Set short term goals.
COMMITMENT	Recognise those individuals who have acclimatised to change well. Set long term goals.

(Sale & Batson[1, p15]; Scott & Jaffe[2]; Reynolds[3]; Rashford & Coghlan[4])

Implementation of a multidisciplinary allied health meeting and education program to increase allied health referrals of radiation therapy patients

Natalie Coburn,[1] Shivanjini Naiker,[1] Dawn Hutley[1]
[1]*Nepean Cancer Care Centre, New South Wales, Australia*

Objectives: Allied health (AH) referrals are required to provide education and assistance for patients with treatment related side effects. Without referrals, patients lack opportunity to access optimal care.[1-4] AH professionals at the Nepean Cancer Care Centre (NCCC) identified that patients requiring AH intervention were not being referred by radiation therapy (RT) staff. As a result RTs implemented a fortnightly multidisciplinary allied health (MAH) meeting, creating a platform where potential AH patients are discussed and referred if required. Our overall aim was to increase referral rates as well as deliver education to RTs on when it is appropriate for referrals to be made.

Method: The MAH meeting was first held July 2017. Referral rates were obtained retrospectively for all NCCC RT patients who held an appointment with an AH practitioner between 1 July 2016 and 30 June 2018 (12 months before and post-implementation) in order to ascertain whether referral rates were increased and sustained over this period. Approval was granted from the Nepean Blue Mountains LHD Human Research Ethics Committee.

Results: In the 12 months before the implementation of the MAH meeting, 19 AH referrals were made by RT staff. In the 12 months post-referral, numbers rose to 72.

Conclusion: AH services are vital for the provision of optimal care to patients undergoing radiation therapy. Without referrals to such services, patients lack appropriate support. The preliminary results indicate implementation of MAH meetings has increased collaboration between the AH professions in order to improve patient care.

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Using PROs and PROMs in routine head and neck cancer care: what do health professionals perceive as barriers?

Hanh Nguyen,[1] Lucinda Morris,[1] Katrina West,[1] Alison Brown,[1] Phyllis Butow,[2] Haryana Dhillon,[2] Puma Sundaresan[1,3]

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Objectives: Patient-reported outcomes (PROs) are reports that come directly from the patient about the status of their health condition without amendment or interpretation by others. Patient-reported outcome measures (PROMs) are usually standardised questionnaires patients complete by self-assessing their health status. Domains assessed include the patient's physical, emotional, social and overall quality of life.

The use of PROMs to measure PROs has been shown to improve patient overall survival and toxicity outcomes, patient-centred care, patient-health professional (HP) communication and service level quality.[1-10] Yet, PROMs are not standardly used in many oncology institutions. The aim of this study is to examine HPs' perceptions of barriers to the routine use of PROMs in head and neck cancer (HNC) care.

Methods: A mixed method approach will be employed where both quantitative (survey) and qualitative (interview and focus group) data will be collected. Survey data will be summarised using descriptive statistics. Interviews will be audio recorded, transcribed verbatim and then thematically analysed. All HPs involved in the delivery of HNC care across Western Sydney Local Health District will be invited to participate.

Results: Barriers investigated include time and resource requirements, workflow issues, role ambiguity, lack of experience and attitude towards PROMS.

Discussion: There may be many HP level barriers that impact routine PRO collection. Understanding these barriers is crucial. This is because successful and sustainable adoption of new practices needs to be compatible with stakeholder values and minimise implementation burden on them.[11,12]

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When the power goes out

Debbie Bellingham,[1] Catherine Beaufort[1]
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When the power goes out in a radiotherapy department you would normally follow the department's protocol – remove the patient from the bed (if treating), notify patients in the waiting room, and perhaps wait for the back-up generators to kick in. But what happens if the back-up generators fail and there's no electricity at all including phones, personal computers and lights? And what happens when it doesn't come back on for a week? Add in the fact you're a paperless department and you have the situation faced by Gippsland Radiation Oncology on 29 December 2017.

This presentation will recap what happened, look at what actions we took initially and then the ongoing discussions and actions that followed on a daily basis.

We will look at how we managed the co-ordination behind minimising delays in the treatment of the patients of the Gippsland Radiation Oncology Department. And most importantly, the lessons we learnt as a department and organisation.

Saturday 30 March, 09:00–10:30 RT – Comparative Approaches to Planning

Dose comparison of deep inspiration breath-hold with free breathing for mediastinal lymphoma cases

Jessica Adams,[1] Anita Whibley,[1] Cameron Stanton,[1] John Atyeo,[1] Maiko Crispin,[1] Susan Carroll,[1] Marita Morgia[1]
[1]*Northern Sydney Cancer Centre, Royal North Shore Hospital, New South Wales, Australia*

Background: Survivors of Hodgkin's lymphoma who have received radiotherapy as part of their combined modality treatment have an increased risk of lung and breast cancer and are also at risk of cardiovascular disease.[1]

Objectives: The aim of this study was to evaluate whether deep inspiration breath hold (DIBH), compared to free breathing (FB), significantly decreases organs at risk (OAR) dose in the treatment of mediastinal lymphoma.

Methods: 10 previously treated mediastinal lymphoma patients were obtained from our ethically approved database (LNR/15/HAWKE/355) for this study. Patients were scanned in both DIBH and FB. All plans are to be re-planned using intensity modulated radiotherapy (IMRT) on both datasets. PTV coverage, OAR doses (V30, V25, V20, V5 and mean dose) to the right and left breast, combined lung, and heart will be assessed between the plans.

Results: Table 1 shows preliminary results, which compare mean dose to the PTV and OAR for FB and DIBH. Current results indicate that DIBH does not impact on left and right breast dose, but does appear to decrease lung and heart dose.

Table 1. Preliminary results

		FB	DIBH
PTV	D50%	30.37 Gy	30.49 Gy
Combined lung	Mean	7.93 Gy	7.49 Gy
Heart	Mean	10.87 Gy	10.31 Gy
Right breast	Mean	2.61 Gy	3.76 Gy
Left breast	Mean	4.16 Gy	4.18 Gy

Discussion and Conclusion: DIBH for the treatment of mediastinal lymphoma can reduce dose to the lungs. DIBH did little to reduce breast dose, but this may be affected by beam arrangement. Although not conclusive, it appears that DIBH is more likely to reduce late side effects when compared to FB for mediastinal radiotherapy.

Reference

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Potential gains: comparing a mono-isocentric 3DCRT planning technique to IMRT to the whole breast and supraclavicular fossa

Lorraine Lewis,[1] Leigh Ambrose,[1] Cameron Stanton,[2] John Atyeo,[2] Regina Bromely,[1] Marita Morgia,[2] Gillian Lamoury,[1] Susan Carroll[2]

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Objectives: To develop a clinically acceptable mono-isocentric intensity modulated radiation therapy (IMRT) planning technique for treatment of breast and supraclavicular fossa (SCF).

Methods: An ethically approved (LNR/18/Hawke/55) random sample of 17 patients previously treated at the Northern Sydney Cancer Centre (NSCC) for whole breast and supraclavicular fossa were selected for this retrospective study. Target coverage and organ at risk (OAR) doses were assessed on four different IMRT planning approaches. These were developed using Varian Eclipse 13.6 (for treatment on Varian Trilogy with Millennium MLC) to establish the best technique to compare with the centre's standardised three dimensional conformal radiation therapy (3DCRT) method. Normal Tissue Index (NTI) was used as a quantitative measure of the normal tissues inside the boundaries of the treatment portal exposed to radiation.[1] Homogeneity Index (HI) and Conformity Index (CI) were also used to assess plans.

Results: A mono-isocentric hybrid-IMRT technique consisting of mixed energy (6X dynamic/18X base) SCF and 6X dynamic tangential fields was assessed as the optimal dynamic technique investigated due to coverage of the nodal chain at depth. Compared with 3DCRT, minimal changes in OAR doses resulted and all target coverage doses of PTV breast and PTV SCF were achieved. The greatest improvements were in target homogeneity and conformity as evidenced by the reduction in HI, CI and NTI.

Conclusion: A clinically acceptable mono-isocentric hybrid-IMRT radiotherapy technique for treatment of breast and SCF was successfully developed at NSCC with the added benefits of improved dose conformity and homogeneity of target volumes.

Reference

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A modified supine VMAT cranio-spinal irradiation technique utilising two isocentres

Minh Nguyen,[1] Kelsie Henry,[1] Alison Jenkins,[1] Liz Deegan,[1] Thu Dang,[1] Andrew Pullar,[1] Robyn Cheuk,[1] Lucy Sim,[1] Adrian Gibbs[1]

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Objectives: A volumetric modulated arc therapy (VMAT) technique with skull, upper and lower spine arcs is currently used to treat paediatric patients requiring cranio-spinal irradiation (CSI). A modified CSI VMAT technique using two isocentres instead of three was evaluated with respect to plan dosimetry, treatment delivery and resource use gains.

Methods: Ethics approval was granted for this study. Five paediatric patients previously treated with the VMAT CSI 3 isocentre (3-ISO) technique were retrospectively replanned using a two isocentre (2-ISO) technique.[1] The 2-ISO technique utilises two to three arcs to treat the skull and upper thoracic region, and two partial arcs to treat the mid-thoracic and lower spine region. Target volume and organ at risk doses for the two techniques were compared. Clinically acceptable 2-ISO plans underwent patient-specific machine quality assurance (QA) procedures.

Results: Plan dosimetry and machine QA results were comparable for both techniques. Physics QA equipment limits maximum jaw length to 17.5 cm. 45% of previously treated 3-ISO CSI treatments were suitable for the 2-ISO technique. It is estimated that planning time per patient will be reduced by up to 50% and daily treatment time reduced by 0.5 h. The 2-ISO technique will require fewer daily online localisation images reducing overall radiation exposure. Treatment time reductions will improve patient comfort and decrease sedation time for paediatric patients requiring anaesthetic.

Discussion and Conclusion: The 2-ISO VMAT CSI technique provides comparable plan dosimetry to the 3-ISO technique. It is anticipated that it will improve the patient treatment experience and provide departmental resourcing gains.

Reference

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Better technique, better treatment, better outcome: a pilot study between RapidArc® scalp and conventional photon-electron scalp

Maria Le[1]
[1]*Chris O'Brien Lifehouse, New South Wales, Australia*

Aim: To compare the doses to organs at risk and the planning target volume (PTV) coverage between conventional photon-electron (PE) scalp and RapidArc® (RA) scalp treatments.

Introduction: Traditionally, total scalp irradiation uses lateral electron fields with megavoltage photon fields to treat surface lesions, but the technique is difficult in obtaining conformity and field matching during treatment. RA total scalp irradiation has been reported to be the optimal treatment as it provides shorter treatment times and reduced intra-fraction motion[1] while delivering comparable homogeneity, conformity, better tissue sparing and minimal hotspots.[2]

Method and Design:

- Participants – four patients previously treated at Lifehouse/RPA with photon/electron scalp treatment.
- Project design – retrospectively planning photon/electron and variety of RA plans for each patient aiming to achieve set DVH constraints.
- Data analysis – comparing and evaluating PTV coverage, conformity index (CI), homogeneity index (HI) and OAR (brain, hypothalamus, eyes, lens, optic chiasm, optic nerves, brainstem) doses per patient and as a cohort.

Results: Initial results suggest better PTV conformity and significantly lower brain doses. Comparative to the PE technique, RA had lower hotspots due to the absence of junctions.

Conclusion: The study demonstrates that patients have a better chance of receiving better outcomes from RA total scalp treatment as oppose to the conventional photon-electron technique.

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Stereotactic ablative body radiotherapy vs. stereotactic ablative body proton therapy for unresectable pancreatic cancer: a comparative planning study

Raymond Dalfsen,[1] Hien Le[1]
[1]*Royal Adelaide Hospital, South Australia*

Purpose: Proton therapy has the ability to spare normal tissue more effectively in comparison with conventional photon therapy.[1] This study dosimetrically compared stereotactic ablative body radiotherapy (SABR) and stereotactic ablative body proton therapy (SABPT) for unresectable pancreatic cancer patients.

Methods and Materials: 10 patients who received SABR treatment at the Royal Adelaide Hospital between November 2016 and December 2017 were reviewed. Patients were prescribed 30 Gy in five fractions to the tumour bed. Blood vessels within 5 mm were given a simultaneous integrated boost (SIB) to 35 Gy. SABR plans were generated using a volumetric modulated arc therapy technique, incorporating a 5 mm planning target volume margin, accounting for inter-fractional and intra-fractional uncertainties. SABPT plans were robustly optimised to target volumes with a 5 mm set-up uncertainty margin and a 3% proton range uncertainty margin. Dose-metrics for both techniques were utilised, assessing target coverage and organs at risk (OAR) sparing. Stomach and duodenal general equivalent uniform doses were compared to assess normal tissue complication probability (NTCP).

Results: SABPT plans were associated with significantly greater D100 coverage to target structures. Significant dose decreases were observed for the Dmax, Dmean and D50 to OAR with SABPT. NTCP values were comparable for each technique.

Conclusion: This planning study suggests that SABR and SABPT techniques for the treatment of unresectable pancreatic cancer can offer acceptable dose coverage of target volumes. SABPT however, is able to reduce dose to OAR, potentially decreasing the risk of normal tissue complications to these patients.

Reference

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Dosimetric implications in radiation therapy planning and treatment of AeroForm® carbon dioxide filled breast implants

Marika Lathouras[1]
[1]*Royal Brisbane and Women's Hospital, Queensland, Australia*

Background: AeroForm® tissue expanders consist of a CO_2 filled metal cylinder and pump constructed of high Z metals. The dosimetric impact of treating the chest wall and internal mammary nodes of a patient with an expander in-situ has been investigated. Areas of concern included the increased scatter and shadow effect around the metal components, the potential of loss of build-up of dose within the thin chest wall tissue and the accuracy of the tomotherapy TPS in assigning density overrides and doses to the various artifacted tissues and components.
Methods: A tissue-equivalent 3D printed replica of the patient's chest wall was produced and fitted over a sample expander and attached to a thorax phantom. Strips of Gafchromic film were placed inside and outside the mold and on the chest wall under the metal components. The tomotherapy plan was recalculated on to the phantom and delivered twice, with the filmstrips being changed between treatments.
Results: Analysis of the film strips demonstrated agreement between the dose delivered and the planned dose from the TPS for both surface dose and at the internal tissue expander interface. The accuracy of the density and artifact over-rides in the TPS and potential loss of build-up effect as radiation travelled through the gas filled expander were validated by the internal film measurements, which matched the treatment plan. The dose shielding caused by the metal components was consistent with the planning system modelling.
Conclusion: The tomotherapy planning system reliably models the dose effects caused by AeroForm® tissue expanders when inserted into a patient's chest wall.

Saturday 30 March, 11:00–12:30 Plenary Session

Proton therapy basics

Justin Pigg[1]
[1]*Provision CARES Proton Therapy Center, Nashville, United States*

The purpose of this presentation is to give a general overview of proton therapy. During this talk, the attendee will learn about the history of proton therapy. We will also discuss the theory that makes proton therapy unique. This session will go over the comparison between photon and proton treatment plans. The attendee will also learn about the future of proton therapy.
After participating in this session the attendee will be able to:

- learn about the history of proton therapy
- realise the resources needed for a proton therapy centre
- understand the difference between photon and proton treatment plans
- explore the future for proton therapy.

Saturday 30 March, 14:00–15:30 Differing Perspectives on Medical Radiation

Technology-assisted orthopaedic surgery: the imaging behind the robots

Andrew Kurmis[1]
[1]*University of Adelaide/Northern Adelaide Local Health Network, South Australia*

With ever-present efforts to improve patient outcomes and optimise peri-operative efficiencies, in many domains of surgery 'technology-assisted' approaches are fast becoming the accepted standard of care. Be it optimised pre-operative planning, patient-specific implant and delivery systems, computer-navigation or robot-assisted orthopaedic surgery, one thing remains common – high quality patient imaging underpins all key advances within this realm. From the humble analogue plain radiograph using rigid cassettes, film and open manual wet processing through to dynamic, interactive real-time three-dimensional touch screen displays, the evolution of medical imaging applications to support contemporary orthopaedic surgery has been breathtaking.

This presentation will cover the evolution of the intimate interplay between imaging and arthroplasty (joint replacement surgery) technologies over the past 25 years; review the critical transition from analogue to digital imaging and the emergence of PACS; summarise the fundamental computational steps underpinning modern surgical applications; and review current technologies and explore future possibilities.

Moral injury: the invisible occupational hazard

Nicole Dhanraj[1]
[1]*Guam Memorial Hospital, GU, USA*

Within radiology, there is a focus on occupational hazards such as patient safety, ergonomics, stress and burnout. As managers, we develop quality and safety measures to mitigate the negative outcome of these issues so that our employees have the capacity to perform safely. However, in a healthcare world focussed on the black ink on balance sheets, increasing the competitive position and hammering productivity, healthcare workers (including radiology professionals) are faced with a significant silent crisis – moral injury.

Moral injury is largely ignored in radiology and the healthcare industry. Healthcare professionals are faced with ethical and moral challenges which can be very difficult to navigate, especially when confronted with operational experiences that undergird an employee's deeply held beliefs and values. Moral injury results, but it is often disguised as burnout, or as disgruntled and unco-operative workers, which can have significant impact on an employee's career or longevity in an organisation.

This session aims to provide an overview of moral injury in the workplace and its causes, and provide strategies on how to address these ethical dilemmas, including whistleblowing and employees who feel they are like 'fish out of water', which left unaddressed can have a negative effect on an employee's wellbeing and, ultimately, the delivery of care and an organisation's success.

Learning objective #1	Identify and define moral injury in the radiology department/clinic
Learning objective #2	Recognise the causes and impact of moral injury in radiology departments/clinics
Learning objective #3	Understand strategies to deal with ethical dilemmas and how to provide support for employees suffering from moral injury

Soil to sanctuary: creation of a radiology community garden to bring patients and professionals together

Renae McBrien[1]
[1]*Princess Alexandra Hospital, Queensland, Australia*

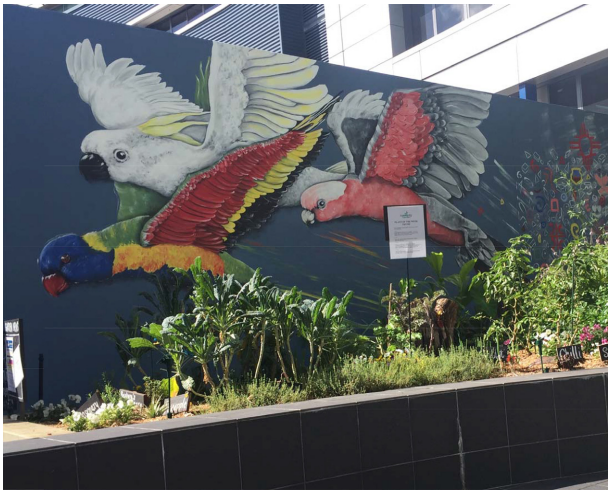
This presentation will share the journey and evolution of an 'X-ray Garden' – or the PAH Community Garden – within the Princess Alexandra Hospital in Brisbane and hopefully inspire radiographers to better their departments by showcasing the benefits and possibilities of creating a similar social project.

I established and funded a community garden as a social hub and wellbeing space connected to the radiology department for all staff, patients and visitors on our hospital campus. My garden project has been an incredible success to bring people together and has now been adopted across all metro south hospitals to support staff under a wellness strategy. The therapeutic garden is a national health innovation that has enjoyed media attention and accolades, and shows community leadership.

- Staff social hub for meetings, celebrations, retirement parties.
- Organic environment for staff breaks and outlet into nature and external environment.
- Garden is a platform to promote our cultural diversity.
- Sanctuary for patients to seek respite and rehabilitation out of waiting rooms and wards.
- Garden hosts events for patients and staff to attend together (e.g. Anzac Day service, Chinese New Year).
- Wider community group involvement (e.g. Men's Shed, RSL, volunteers, students, public art programs).
- Community compost station for hospital organic waste.

Key points:

- Innovation and governance required.
- Photos/stories of our radiology staff and patients adopting this community space.
- Present horticultural therapy case studies of patient rehabilitation and cognitive development.
- Deliver qualitative and quantitative feedback and results from patients and staff.



Radiation in space: the final frontier

Greg Trypis[1]
[1]*Sunshine Coast University Hospital, Queensland, Australia*

Ever since Wilhelm Roentgen discovered X-rays in 1896, humans have learnt to use these mysterious rays to both diagnose and treat those in need. We spend our day-to-day professional lives working with equipment that generate and detect these rays, we don specialised aprons to protect ourselves from their effects and we attend conferences listening to and learning about potential new uses for X-rays.

And yet 150 km above us and across the vastness of outer space, X-rays are abundant and move around relatively unhindered. This presentation will examine X-rays and radiation in outer space and how they are being used to help humankind's understanding of ourselves and the cosmos. With astronauts spending longer times in space and future missions planned to send humans to Mars, the danger of the effects of radiation is ever present. As science continues to explore the effects and different uses of X-rays in outer space, this knowledge will quite possibly affect and shape our use of radiation in our daily professional lives here on Earth. This presentation promises to be out of this world!

Radiology in works of art

Philippe Gerson[1]
[1]*ISRRT, France*

Pr Ledoux Lebard achieved the first X-ray taken of works of art in France during World War I on battlefields in the eastern part of France.
In 1920 the laboratory of the Louvre museum opened and in 1937 it became known on the international stage.
Today, it is located in the Pavillon de Flore covering over 5000 m^2 including a radiology department with three X-ray rooms.
Their mission is to authenticate the works of art of the public museums of France and to educate French and foreign students. This presentation includes examples of paintings and sculptures X-rayed such as Rembrandt, Poussin, Corot and Picasso and, notably, the famous Mona Lisa by Leonardo da Vinci.

Saturday 30 March, 14:00–15:30
MI Service Delivery 1

How does a medical imaging department satisfy ACHS and China 3A hospital accreditation? The experience of the University of Hong Kong Shenzhen Hospital

Edward Chan[1]
[1]*Hong Kong College of Radiographers and Radiation Therapists, Hong Kong*

The University of Hong Kong Shenzhen Hospital is a public hospital within Mainland China and a healthcare reform pilot hospital for introducing the Hong Kong Healthcare Management System. Thus, it has to comply with the healthcare accreditation system of the Australian Council on Healthcare Standards (ACHS) as the public sector in Hong Kong. Then, it has to adopt the local accreditation criteria as a 3A major general hospital. Medical imaging as the vital diagnostic service in a hospital must be involved in those accreditation campaigns. This paper will share what the medical imaging staff learned from the diversity and commonality in both systems.
Due to the history and background, ACHS and China 3A accreditation have different perspectives to assess healthcare institutes. One focusses on how the healthcare professions govern themselves to provide safe practice; another focusses on the patient's experience in the clinical management process. For example, China 3A accreditation has strict criteria of report-turn-around time as an indicator of good radiology practice because of local culture. The ACHS EQuIP6 HK Guide Book[1] requires the medical imaging department to provide reports in an appropriate manner, and is a mutual understanding between the professions and patients with no restricted timeframe required.
Both systems are helping healthcare workers to keep safe, and provide good services to patients, such as the CQI concept and correct patient identification. Therefore, we developed a specific committee and strategies to prepare and co-ordinate both assessments.

Reference

1. Steering Committee on Hospital Accreditation, Hong Kong. The ACHS EQuIP6 Hong Kong Guide: Accreditation, Standards and Guidelines - Clinical Function. Hong Kong: The Australian Council on Healthcare Standards (ACHS); 2016. 6th edn: Book 1.

A new hospital avoidance model of care: aged care mobile X-ray services

Ingrid Klobasa[1]

[1]*Northern Sydney Local Health District, New South Wales, Australia*

Aged care facilities are increasingly experiencing difficulties in obtaining ambulance transport[1] and nurse escorts to attend hospitals for simple imaging procedures. These patients face extended periods of discomfort on ambulance beds and time in emergency departments with increased risk of cross-infection and disorientation, whilst awaiting a diagnosis.[2]

Mona Vale Hospital is Australia's first public hospital to provide a mobile X-ray service as a hospital avoidance strategy to immobile, aged and disabled patients in their residence.

A clinical practice improvement methodology was employed to design and implement the new service. A multidisciplinary steering committee assisted in addressing stakeholder needs and ensured that a responsive service was achievable. Baseline data identified 80 patients a month could be referred to the service.

Successful seeding grants provided initial infrastructure such as mobile X-ray unit, digital plate, laptop, van (with lifting arm), real-time wi-fi image transmission and staffing. Protocols, memorandums of understanding and promotions were launched for over 50 local GPs and 84 aged care facilities.

Clinical audit data has shown that a 23.2% reduction of aged care facility patients presenting to emergency departments can be achieved; with 87.5% of van patients not presenting (within 2 weeks).

Over the past 5 years this service has successfully avoided over 9,500 emergency department presentations. Thus, local GPs and medical imaging can *together* assist hospitals in achieving emergency treatment targets.

Expansion of this inter-professional community service will improve patient experience and provide significant cost and time savings for emergency departments and ambulance services.

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2. Codde J, Frankel J, Arendts G, Babich P. Quantification of the proportion of transfers from residential aged care facilities to the emergency department that could be avoided though improved primary care services. Australasian Journal of Ageing 2010;29 (4):167-71.

A new beginning: the Sunshine Coast Hospital Health Service story

Cam Robertson[1]

[1]*Sunshine Coast University Hospital, Queensland, Australia*

The Sunshine Coast University Hospital opened its doors to the public on Tuesday March 28 2017. This presentation will outline the bringing together of people to a new medical imaging service, in a new hospital, to offer state-of-the-art imaging to the community of the Sunshine Coast. It will outline the processes to move from a general hospital medical imaging department to a tertiary hospital medical imaging department. As Acting Director of the service, this presentation will outline the steps involved in bringing together staff from the existing services of Nambour General Hospital and Caloundra Hospital as well as new staff that had not worked in the HHS previously. It will also outline the triumphs as well as the pitfalls encountered. This presentation will demonstrate methods used to utilise change management techniques as well as ensuring that the medical imaging department was operational from day one. It will demonstrate the increase in medical imaging technology across the Sunshine Coast in improving everyone's experience of healthcare throughout our health service network. In addition, the presentation will demonstrate ways in which we are optimising health outcomes of our community through collaboration and education.

The Melbourne Mobile Stroke Unit: Australia's first pre-hospital stroke ambulance

Francesca Langenberg,[1] Skye Coote,[2,3] Henry Zhao,[2,3] Patricia Desmond,[1,3] Damien Easton,[2] Michael Stephenson,[4] Lindsay Bent,[4] Shane Foster,[4] Karen Smith,[4] Bernard Yan,[2,3] Bruce Campbell,[2,3] Mark Parsons,[2,3] Geoffrey Donnan,[2,3,5] Stephen Davis[2,3]

[1]Department of Radiology, Royal Melbourne Hospital, Victoria, Australia [2]The Melbourne Brain Centre and Department of Neurology, Royal Melbourne Hospital, Victoria, Australia [3]Department of Medicine, Faculty of Medicine, Dentistry and Health Sciences, University of Melbourne, Victoria, Australia [4]Ambulance Victoria, Australia [5]The Florey Institute of Neuroscience and Mental Health, Victoria, Australia

Stroke is a leading cause of disability, and in Australia only one-third of patients reach hospital in time for critical stroke treatment.[1] The Melbourne Mobile Stroke Unit (MSU), Australia's first stroke ambulance, attempts to reduce this gap by providing expert pre-hospital stroke assessment, diagnosis and treatment. The MSU is a specialised Ambulance Victoria vehicle equipped with a CT scanner and on-board stroke and ambulance personnel, including a radiographer, stroke nurse and neurologist. Mobilising a CT scanner provided a unique set of challenges that needed to be addressed by the MSU team.

The Melbourne MSU launched 20 November 2017, and is staffed by nine MSU-trained radiographers. In the first 8 months of operation the MSU has performed 90 non-contrast brain scans, 80 cerebral CT angiography scans and has treated 61 patients. Operating a mobile CT in an ambulance required dedicated scanner applications training, extensive in-field ambulance training, collaboration with radiation physicists, and design and development of specialised scanning protocols. Team building and collaborative workflows were and remain a critical component to ensure safety of the patient, crew and bystanders.

Through the development of radiology-specific processes and expertly trained staff, the MSU has been able to perform pre-hospital scanning in a specialised ambulance, allowing more patients to be treated with a reduced time-to-treatment.

Reference

1. Watkins J, et al. Acute Services Report 2017. Melbourne: Stroke Foundation, p.5. Available at: http://www.strokefoundation.org.au [accessed 16 July 2018].

Clean up on radiology aisle: how to effectively manage the toxic employee

Nicole Dhanraj[1]

[1]Guam Memorial Hospital, GU, United States

At some point in a manager's career they are faced with dealing with a 'toxic' employee. Such employees are either inherited, hired inadvertently or, for various reasons, change from stellar employees to toxic ones. It can be a daunting task to manage this type of employee effectively. This session will provide an overview of reasons organisations become infected with toxic employees and how managers facilitate toxicity in their departments.

It is imperative that managers effectively manage these employees instead of allowing the situation to fester, which then negatively impacts patient care and operations. There are a range of methods to deal with toxic behaviours but often left alone by managers for fear of confrontation/conflict, or uncertainty in how to approach this sensitive human resource issue.

The session will provide guidance in differentiating between difficult, disengaged, rebellious and toxic employees, as well as prod thoughts on whether employees really are toxic.

Methods to evaluate current 'clean up' approaches in radiology to support ourselves as professionals and in the benefit of our patients, will be discussed.

Strategies to effectively manage these sub-optimal behaviours, including a manager's own behaviours, to increase team effectiveness, strengthen radiology departments and be *better together* to achieve operational results will be discussed.

Learning objective #1	Identify and define difficult, disengaged, rebellious, and toxic employees
Learning objective #2	Recognise how team leaders, supervisors, managers and directors facilitate toxicity in their departments
Learning objective #3	Discuss lessons learned and apply strategies to effectively manage the toxic behaviours

Throw away your pagers: revolutionising requesting a radiographer, the possibilities associated with a radiographer app

Tammy Brown,[1] Matthew Casey[1]
[1]*SAN Radiology, New South Wales, Australia*

For over a decade, when theatre or a ward required a radiographer, they would need to page them via a network-based program or phone. This paging process gave little to no information apart from an extension number or a few words requiring the radiographer to call the referrer to gain the information they needed. Over recent years this paging system became increasingly unreliable and unstable resulting in ongoing patient safety issues.

Previously, up to five radiographers would carry one pager each across the working day in order to be contacted to attend to theatre and mobile imaging. While all pagers were meant to receive a synchronised message, some would receive the message, others a jumbled message and occasionally some no message at all. There were considerable communication and workflow issues.

In conjunction with the Sydney Adventist Hospital IS Department, San Radiology developed a 'Radiographer App', which is now loaded onto five work-provided iPhones. The app utilises the hospital information system (SanCare) enabling users to select patients and order a radiographer to attend theatre or a mobile X-ray, automatically sending all required details to the app.

This presentation will show the evolution of the app, how it works and resultant improvements in efficiency, communication and patient safety. This project is a clear example of being better together; ensuring patient safety by utilising the possibilities of our professionals.

Saturday 30 March, 14:00–15:30
RT Quality and Safety

Can data accumulated from Australian Clinical Dosimetry Service dosimetry audits inform IMRT and VMAT treatment planning in clinical practice?

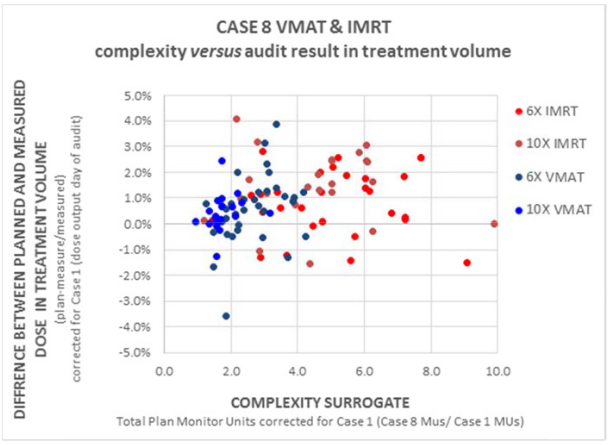
Cate Davey,[1,2] Andrew Alves,[1] Fayz Kadeer,[1] Maddison Shaw,[1,3] John Kenny,[1] Jessica Lye,[1] Jeremy Supple,[1] Rhonda Brown[1]
[1]*Australian Clinical Dosimetry Service, Victoria, Australia*
[2]*Alfred Health Radiation Oncology, Victoria, Australia*
[3]*Genesis Cancer Care, Victoria, Australia*

Introduction: The Australian Clinical Dosimetry Service (ACDS) conducts independent onsite measurement of radiotherapy dosimetry across Australia. The ACDS is staffed by radiation oncology medical physicists, physicists and radiation therapists and is overseen by a multidisciplinary clinical advisory group. The service was established in 2011 to provide quality assurance for radiation oncology facilities and patients. Since commencing operations, the ACDS has accumulated a national dataset of audit results. The objective of this presentation is to explore the potential of ACDS national data to inform and improve IMRT and VMAT planning in clinical practice.

Method: We compared the results of Level III audits with treatment plan complexity surrogates, to investigate the effects of IMRT and VMAT plan complexity on deliverability. The surrogates for complexity were monitor units per plan and dose to exclusion volume. To date, data on three audit cases with over 100 facility plans for each case, has been accumulated.

Results: Initial analysis indicates there is significant variability across Australia in planning complexity, and mixed ability for systems to plan and deliver complex plans. The data suggest that, compared to IMRT audit plans, VMAT audit plans vary less in complexity, have lower complexity and measured dose correlates more consistently with planned dose.

Discussion: Further data collection and analysis is required to determine clear patterns. ACDS intends to continue to collect, interrogate and share data with the aim of elucidating the ideal balance between complexity and deliverability; this could aid the entire multidisciplinary team and optimise patient outcomes.



Development of a virtual 3D linear accelerator model including patient specific geometry to facilitate collision prediction

David Willis[1]
[1]*Sunshine Coast University Hospital, Queensland, Australia*

Gantry-based linear accelerators can deliver non-coplanar treatment beams and are typically equipped with a range of retractable imaging devices. The complex geometry of moveable components makes it difficult to predict collisions when generating treatment plans. Individual patient anatomy and immobilisation devices further add to the complexity of such predictions, with dosimetry systems typically providing limited decision support on potential collisions.[1]

Discovering a plan is undeliverable at the time of first treatment or during a 'dry run' session necessitates re-planning, impacting on the commencement of care and departmental efficiency. A range of strategies have been developed to avoid these eventualities, including tables of safe parameter sets, visualisation aids and some three dimensional (3D) modelling of machine geometry.[2-5]

This project expands on the 3D modelling approach to allow the incorporation of individualised patient anatomy. The model was developed in-house by a radiation therapist using 3D computer-aided engineering software (Fusion 360, Autodesk, USA). Machine geometry was constructed from online schematics and laser surface scans of a Versa HD (Elekta, UK) linear accelerator. Patient geometry can be imported into the model via conversion from Digital Imaging and Communications in Medicine (DICOM) format, laser scanning or simple clinical measurements depending on the available data and equipment.

The presentation will describe the development of the model including measures taken to minimise cost and utilise existing resources. The model will also be demonstrated in a range of scenarios.

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Staff perception of the effects of automation in radiotherapy planning

Chelsea Slater,[1] Rhiannon Walker[1]
[1]*Liverpool and Macarthur Cancer Therapy Centres, New South Wales, Australia*

Purpose: While there is evidence to show automation improves overall radiotherapy department efficiency, there is no research to show how staff perceive these changes and how they will affect workforce. This survey aims to explore staff perceptions of the effects of automation in radiotherapy planning.

Methods and Materials: The link to the online survey (Kwik Surveys) was sent to all radiation therapists, medical physicists and radiation oncologists within Liverpool and Macarthur Cancer Therapy Centres.

Results: The survey was completed with an overall response rate of 61% (RT: 62%, MP: 67%, RO: 50%). 61% responded they very probably or probably felt empowered to drive decisions about implementing automated planning processes. When asked about staff attitude toward automation, the following responses were received: 19%: automation will reduce job satisfaction, 43%: automation will increase job satisfaction, 37%: automation will not impact job satisfaction. 76% of respondents either strongly agree or agree that automation will cause a loss of understanding of general underlying principles of radiotherapy, while only 28% respondents either strongly agree or agree that the current staff training and education tools are sufficient to ensure staff do not lose general understanding of radiotherapy.

Conclusion: The survey revealed that although the effect of automation is perceived positively, there are some concerns on loss of skillsets and the lack of training to maintain this. These results may be applicable to the overall health workforce to allow the managers to understand, anticipate, and balance staff perceptions against the potential benefits of automation.

Radiation therapist peer-to-peer plan review and feedback: quality improvement for optimal patient care

Kevin Tu,[1] Rebecca Height,[1] Rhonda Lawrence[1]
[1]*Peter MacCallum Cancer Centre, Victoria, Australia*

Objectives: The growing complexity of radiotherapy demands rigorous quality assurance to ensure optimal treatment delivery. Peer review can play a critical role in this process. The aim of this project is to implement a radiation therapist (RT) peer-to-peer planning review to a) improve the quality of RT learning and teaching and, b) demonstrate an improvement in the quality of the radiation therapy plans produced.
Method: Seven junior RT planners and four senior RT supervisors were trained in effective communication for giving and receiving feedback constructively to prepare them for the project. Ten plans per RT were assessed. Pre and post-intervention surveys were collected to assess improvements in the planning process, based on self-reflection and supervisor assessment. A peer-to-peer assessment was instituted after the completion of planning, prior to the supervisor check of the plan, to provide real time feedback to the RT planner.
Results: Preliminary results indicate that there is value in instituting a peer-to-peer plan review process for RTs. Supervisors have reported an improvement in the plan quality, subsequently put forward for final review. Planner self-assessment indicates improved role satisfaction and enhanced learning opportunities.
Discussion: RT peer-to-peer review is a valuable tool to enhance quality and safety of RT planning, maximising the opportunity for optimal patient care. Furthermore, it facilitates a collaborative culture, whilst providing a safe environment for effective learning and teaching.

Saturday 30 March, 14:00–15:30 Student MI Winners

Better together abroad: Australian radiography students in the United Kingdom

Lakna Kariyawasam,[1] Fiona Chen[1]
[1]*Curtin University, Western Australia*

During our international elective placement in the United Kingdom at the Hull Royal Infirmary, as third-year radiography students from Curtin University, we were given the opportunity to be part of a major trauma radiography team. The differences among the clinical protocols, department policies, workflow structure and patient demographics significantly impacted our clinical experience as student radiographers. It enabled us to gain the knowledge and skills from an international perspective but also promoted the sharing of information of diverse radiography practices between ourselves and the radiography team. It was an eye-opening experience to see the alternative approaches that were utilised in order to achieve the common goal of better patient outcomes.
This presentation will discuss how the differences and similarities encountered affected our student experience in a technical and patient care context, as well as the positive impact this placement has had on us.

The effect of changing the slice reconstruction interval on the spatial replication accuracy of three-dimensional printed models

Benjamin Searle[1]
[1]*Queensland University of Technology, Australia*

Objective: To determine the effect of changing the slice reconstruction interval (SRI) in computed tomography (CT) scan data on the spatial replication accuracy of 3D printed models.
Methods: Three bovine vertebrae and a forearm phantom were scanned utilising a CT scanner. The data was reconstructed into SRIs of 0.1 mm, 0.3 mm, 0.5 mm and 1.0 mm. The data was prepared for print by various software before construction by a 3D printer. Digital calipers were used to obtain measurements for comparison. Statistical analysis was performed using SPSS Version 25. The Queensland State Government *Animal Care and Protection Act 2001* did not apply as the animals were not killed for the purpose of carrying out a scientific activity.
Results: The mean absolute error from the original specimens for the 0.1 mm, 0.3 mm, 0.5 mm and 1 mm 3D-printed models was 0.592 ± 0.396 mm, 0.598 ± 0.479 mm, 0.712 ± 0.498 mm and 0.933 ± 0.457 mm respectively. Paired t-tests ($P < 0.05$) indicated there was a significant difference in all models except the 0.3 mm phantom 1 ($P = 0.209$), 0.3 mm vertebrae 2 ($P = 0.097$) and the 0.1 mm vertebrae 2 ($P = 0.061$) reconstructions.
Conclusion: It has been demonstrated that using a SRI similar to or slightly less than the limiting factor of either the acquisition slice width or printer resolution optimises the replication accuracy of the model whilst minimising the digital size of the data and time investment.

Is PMCT coronary artery calcium score a predictor of sudden death due to coronary ischaemia?

Oshani Jayasooriya,[1] Edel Doyle[2]
[1]*Monash University, Victoria, Australia* [2]*Western Health, Northern Territory, Australia*

Introduction: The role of CT coronary artery calcium scoring (CaSc) is well established in clinical practice to predict the risk of cardiac events in asymptomatic patients. However, the use of postmortem CT (PMCT) CaSc for the diagnosis of coronary ischaemia is minimal.
Methods: A review of the current literature was conducted to understand the extent of PMCT CaSc application in determining the cause of sudden death.
Results: Findings of the diagnosis from the CaSc correlated with that of autopsy. Two studies focussing on CaSc to diagnose sudden death due to coronary ischaemia were identified, highlighting a distinct gap in the literature on PMCT CaSc. Due to the limited analysis of PMCT CaSc available (both in general and in younger persons), the application of CaSc in live clinical studies for the diagnosis of either coronary artery stenosis (CAS) or coronary artery disease (CAD) was used as a proxy for determining the predictive capacity of PMCT CaSc. It was revealed that for live patients, low CaSc thresholds did not exclude and high CaSc thresholds did not necessarily predict CAS or CAD. There was no consistent discriminate threshold of CaSc in determining CAS or CAD.
Conclusion: While there is potential for CaSc to be used in the 'virtual autopsy' procedure, the inconsistencies of CaSc in determining CAS or CAD in live patients indicates that further research needs to be conducted in postmortem cases to better understand the value of CaSc as a predictor of sudden death due to coronary ischaemia.

Selection of immobilisation methods by Australian and New Zealand medical imaging technologists in paediatric examinations

Simon Christie,[1] Claudia Sa dos Reis,[1] Curtise Ng[1]
[1]*Curtin University, Perth, Western Australia*

Aim: To explore what influences the choices of medical imaging technologists (MITs) when selecting immobilisation methods for paediatric radiological examinations.
Methods: A mixed methods design was used. An online questionnaire was distributed to MITs in Australia and New Zealand to investigate which methods are used and what influences their choices. Individual follow-up interviews were conducted to explore the findings in greater depth. Ethics approval was received. Quantitative data were analysed using descriptive statistics (response percentages and Fisher's exact tests), while content analysis was used for qualitative data.
Results: 65 medical imaging technologists completed questionnaires, with seven also agreeing to be interviewed. Parental holding was most likely to be used (96.9%), but psychological methods were preferred where possible to avoid causing distress or injuries. Immobilisation methods were chosen on a case-by-case basis, using patient age and examination type as guides but adapting to other factors such as patient distress or cooperation. Training was mainly conducted in the workplace; experience in paediatric institutions and education on patient management was desired. Guidelines were thought to potentially limit professional autonomy and personalised patient care.
Conclusion: Immobilisation choices are based on professional judgement and assessment of many factors, with patient age and examination type as important but not infallible guides. Avoiding harm and distress are significant concerns. Short placements at paediatric institutions are recommended as a useful way of improving immobilisation education. Practice may be improved by increased education and training in paediatric development and psychology to better understand the adequate approach to each age.

The effect of visual hindsight bias on radiologist perception

Jacky Chen,[1] Warren Reed,[1] Stephen Littlefair[1]
[1]*University of Sydney, New South Wales, Australia*

Objective: To measure the effect of visual hindsight bias on radiologists' perception during chest radiograph pulmonary nodule lesion detection.
Methods: A prospective multi-observer study to assess the effect of hindsight bias on radiologists' perception was performed. Institutional ethics approval was granted. Sixteen radiologists were asked to interpret 15 postero-anterior chest images containing a solitary lung nodule of one of three classifications of conspicuities which became more blurred over 25 incremental levels. Participants first detected the nodule by reducing the blur of the images (foresight). Subsequently they reviewed the same, now sharpened image, and increased the blur until the same identified nodule was undetectable (hindsight). The participants then repeated the experiment, after being informed of the potential effects of hindsight bias, and asked to counteract these effects. Participants were also divided into two groups (experienced and less experienced) to determine the effect of expertise.
Results: Wilcoxon matched pairs analysis showed that these radiologists demonstrated hindsight bias ($P = 0.02$) but appeared more able to counteract its effects after being informed of its effects and ($P > 0.05$). Friedman analysis also determined overall significance in the hindsight ratios between nodule conspicuities for both experiments (experiment 1: $P = 0.02$; experiment 2: $P = 0.02$). There was no significance shown in the readings between the experienced and less experienced groups.
Conclusion: This study showed that radiologists exhibit hindsight bias but appeared able to compensate for this phenomenon once its effects were considered. This could potentially impact on outcomes of future medico-legal litigations.

Spontaneous splenic rupture secondary to Epstein-Barr virus infection

Courtney Aird[1]
[1]*University of South Australia, Australia*

Learning objectives:

- Provide knowledge on the aetiology and clinical presentation of spontaneous splenic rupture secondary to Epstein-Barr virus (EBV) infection.
- Investigate the different forms of diagnosis, imaging modalities utilised and treatment options for spontaneous splenic rupture.

Background: Epstein-Barr virus (EBV) is a common infection among young adults and adolescents, and is responsible for causing glandular fever.[1] The EBV infection results in extensive proliferation and infiltration of cells into the spleen, causing an increase in splenic volume and distortion to normal tissue anatomy.[2] Spontaneous rupture of the spleen secondary to EBV infection has an estimated incidence of 0.06% to 0.5%, and is a potentially fatal complication.[1]

Discussion: Enlargement of the spleen is typically asymptotic in EBV infection, and therefore the development of abdominal pain is an ominous sign of splenic rupture.[2] An ultrasound scan is typically first employed to assess for the presence of free fluid within the abdomen.[3] A CT scan may also be performed for injury staging to assist in treatment planning.[3] There is no clear consensus regarding the optimal treatment of splenic rupture.[1,2] While traditionally treated with removal of the spleen, management has largely moved to non-operative treatments due to the immunologic role of the spleen.[1]

Conclusion: Spontaneous splenic rupture should be considered for patients that present abdominal pain and positive EBV infection as a timely diagnosis and treatment are necessary to prevent significant morbidity and mortality. This presentation discusses the aetiology, symptoms, imaging features and treatment options for this rare (but fatal) complication of EBV infection.

References

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Saturday 30 March, 14:00–15:30 RT Technology and Technique Implementation

Clinical implementation experience of deformable image registration for pre-planning head and neck PET CT

Callie Choong,[1] Michael Jameson,[1] Dinsdale Glen,[1] Shrikant Deshpande[1]
[1]*Liverpool and Macarthur Cancer Therapy Centres, New South Wales, Australia*

Image registration forms a vital part of radiation therapy planning where secondary data such as PET scans are fused with the planning CT dataset to assist with target and organ at risk delineation. Rigid image registration is widely used and is the current standard in radiotherapy planning, however, this is insufficient when there are anatomical or positional differences between the two scans. Deformable image registration (DIR) is becoming increasingly used around the world in adaptive radiotherapy scenarios, although local knowledge and experience within Australia is limited. DIR is a complex technique and the clinical use of it brings many challenges, uncertainties and potential risks that must be carefully managed. A recent publication by AAPM Task Group 132 (TG-132) addresses this, and has outlined recommendations for mitigating potential risks associated with image registration.

The purpose of this presentation is to discuss our department's experience of the clinical implementation of DIR for pre-planning head and neck PET fusions. This will cover clinical considerations, workflow, quality assurance, education and training. How our department has incorporated the recommendations from the TG-132 report will also be presented.

Implementation of stereotactic ablative body radiotherapy in southern Tasmania

Michael Young,[1] Bronwyn Hilder,[1] Jonathon Duggan,[2] Joanne Harrison,[1] Jennifer McNickle,[1] Steven Wallace,[1] Tim Williams,[1] Andrew McGrath,[1] Eve Tiong,[3] Michael Jones,[1] Raef Awad,[1] Marketa Skala[1]

[1]Royal Hobart Hospital, Tasmania, Australia [2]Sunshine Coast University Hospital, Queensland, Australia [3]ICON Cancer Centre Midland, Western Australia

Objectives: The aim of this presentation is to describe the implementation of stereotactic ablative body radiotherapy (SABR) in a regional setting: the Royal Hobart Hospital in Tasmania.

Methods: The Royal Hobart Hospital services the southern Tasmanian population and began offering SABR in 2014 for small bony metastases in a limited number of patients. Gradually SABR was expanded to include other body sites and ultimately lung under the auspices of the TROG 09.02 CHISEL and TROG 13.01 SAFRON II clinical trials. The implementation process, range and examples of clinical cases and contribution to clinical trials are described.

Results: As at July 2018 approximately 90 patients have received SABR treatments including vertebral and other bony metastases, nodal and other soft tissue lesions, adrenal metastases under the TROG 16.01 NIVORAD trial and both primary and metastatic lung lesions. Patient outcomes indicate SABR treatments have been planned and delivered in a safe and effective manner.

Discussion and Conclusion: We have demonstrated that it is feasible to introduce a SABR program in a safe and effective manner in a small regional department, providing access to treatment for patients who would otherwise have been required to travel to mainland Australia or forgo this treatment option. Contribution to multi-institution clinical trials has been significant and provided external review and quality control essential to safe implementation.[1] Future directions include increased use of IMRT and/or VMAT to improve treatment delivery efficiency and access to care and expansion of the stereotactic program to include hepatic and intracranial treatments.

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Implementation of a pre-simulation assessment session for liver SABR (PASS): possibility of personalising respiratory motion management for patients

Maryam Hazem,[1] Mitchell Galayini,[1] Andrew Wallis,[1] Callie Choong,[1] Mark Lee,[1] Sankar Arumugam[1]

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Introduction: Stereotactic ablative body radiotherapy (SABR) delivers a high dose of radiation to a relatively small tumour in a single or small number of fractions. Tumours in the liver are susceptible to position variation due to respiratory motion. Motion management strategies such as expiration breath-hold (EBH) and abdominal compression (AC) limit respiratory motion, allowing for a reduced target volume margin and thereby improving normal tissue sparing.[1] EBH promises superior results, however, patient eligibility/tolerability can be a limiting factor.[2]

Aim: The aim of this project was to implement a pre-simulation assessment session for liver SABR (PASS) patients, utilising fluoroscopy to assess the impact of interventions such as EBH or AC on reducing diaphragm displacement.

Description of workflow: The PASS procedure occurs on a treatment machine before CT simulation. Workflow is shown in Figure 1. During this visit, patients are initially assessed for eligibility for EBH, including minimum breath-hold duration and tolerability of equipment. Then, a two-fold fluoroscopic diaphragm displacement assessment is conducted using KV imaging to determine i) the amount of

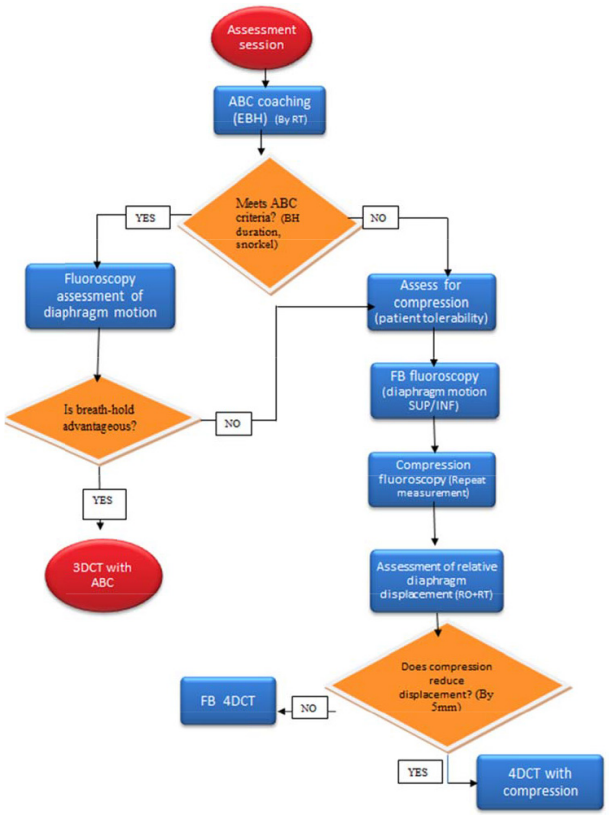

Figure 1. Workflow

displacement, and ii) the reproducibility of diaphragm position per assessment. If the patient fails the EBH assessment at any stage, they are then assessed for AC – where the relative reduction of diaphragm displacement in relation to free-breath (FB) is quantified. The patients are then taken to CT for simulation using the preferred method at RO discretion. If they fail both interventions, a FB simulation is done, with the possibility of larger target margins during treatment planning.

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Prospective implementation of knowledge based planning at Northern Sydney Cancer Centre: creating efficiencies and benefiting patients

James O'Toole,[1] Brian Porter,[1] Regina Bromley,[1] John Atyeo,[2] Thomas Eade[1,3]

[1]Northern Sydney Cancer Centre, New South Wales, Australia [2]Northern Sydney Cancer Centre, Royal North Shore Hospital, New South Wales, Australia [3]Sydney Medical School, New South Wales, Australia

Objective: To assess the impact of prospectively implementing knowledge-based planning[1,2] (KBP) on the time taken to create clinically acceptable plans for treatment at Northern Sydney Cancer Centre (NSCC).

Methods: All plans used in model creation were accessed from the NSCC ethically approved database (LNR/15/HAWKE/355). A dedicated knowledge-based planning team (KBPT) created RapidPlan (RP) models for all inversely planned sites with a small amount of testing, ensuring that the models produced clinically acceptable plans after one optimisation at least 50% of the time.

Data was collected and tracked for the success of the models in the clinical setting and reviewed weekly by the KBPT. After looking for patterns in plan failures, models were adjusted to alleviate these issues to increase the success of the models. Planning times were also collected to compare with a previous timing study undertaken before KBP was implemented at NSCC.

Results: Within 3 months of the prospective implementation of KBP, the success of the KBP models in creating clinically acceptable plans increased from 55% to 85%. The timing for producing these plans also decreased significantly, with the overall total planning time decreasing by 1002 h in an 8-month period.

Discussion: By using a prospective implementation method with a dedicated KBPT, we were able to create and implement models more quickly. Such efficiencies benefit patients by not only producing high quality plans, but in improving timely access to the start of radiotherapy.[3]

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Surface guided radiation therapy: an evaluation of AlignRT®

Anna Huynh[1]
[1]*Icon Cancer Centre, Victoria, Australia*

AlignRT® (Vision RT, London, UK) is a non-invasive, video-based 3D surface imaging system that requires no additional imaging dose. The patient's skin surface is tracked in 3D and compared to the reference topographic surface created from simulation. Visual feedback of the patient's translational and rotational positional discrepancies in six degrees of freedom, in the form of deltas, is provided to aid in the set-up process and during treatment delivery. This presentation will outline our initial experience with AlignRT® during a 6-month evaluation of the technology.

In assessing the efficacy of AlignRT® in improving setup accuracy across a range of treatment sites, the technology was introduced into our daily workflow in stages. Phase 1 utilised the technology in an entirely passive capacity for monitoring only with patients positioned using conventional tattoos. In phase 2, tattoos were used primarily for setup with AlignRT® introduced to fine tune patient positioning before internal imaging. In the final phase, patients were positioned entirely using the surface imaging system with skin marks ignored altogether.

The evaluation assessed the impact of AlignRT® on treatment duration as staff experience increased. It was also anticipated that there would be a closer correlation between real-time deltas and positional corrections from internal imaging over time. Staff feedback on its user-friendliness will also be presented along with our experience of the challenges encountered in our department as new users of the technology.

A retrospective analysis of robotic radiosurgery plan quality following the initial 4-year experience

Alan Brown[1]
[1]*Sir Charles Gairdner Hospital, Western Australia*

Objective: This study retrospectively compares robotic radiosurgery (CyberKnife) plan quality for common treatment sites over time, with the aim of identifying areas of improvement, stagnancy and regression. This information will help further increase plan quality in the future.

Methods: 120 radiosurgery plans were retrospectively analysed between 2014 and 2018, 40 from each of the common sites, and five from each time interval, 6 to 9 months apart. Criteria assessed included conformity indices, gradient ([conformity index] $CI_{V100\%}$, $CI_{V75\%}$, $CI_{V50\%}$ and $CI_{V25\%}$, where $CI_{Vn\%}$ = [volume receiving n% of prescribed dose]/[volume of target]), prescription dose coverage, as well as planning target volume minimum, maximum and mean (PTV_{Min}, PTV_{Max} and PTV_{Mean}). Estimated time, number of beams and Monitor Units per Gray (MU/Gy) were indicators of efficiency.

Results: For all sites, an improvement in plan quality was observed. Few individual criteria regressed, and a few remained constant. Most criteria showed an improvement. Criteria that showed marked improvement were different for each site. Brain plans displayed a 7.3% increase in PTV_{Min} dose and a 20% improvement in conformity. Gradient was steeper. The number of beams decreased 14%, and MU/Gy was reduced by 60%. Lung plans improved by 12% in conformity indices, and a 7% increase in PTV_{Min}. Estimated time remained constant and MU/Gy decreased by 43%. Prostate plans displayed modest improvements in efficiency. Moderate improvements were seen in PTV coverage (5%) and conformity indices (3–9%).

Conclusion: Plan quality has improved over the life of the machine.

Saturday 30 March, 15:45–17:15 Combined – the Human Aspect of Medical Radiation Practice

Management of a terrorist attack situation in Paris

Philippe Gerson[1]
[1]*ISRRT, France*

This presentation traces the history of the attacks that took place around the Hôtel-Dieu de Paris (where I am the Chief Manager) from 1982 up to the 13 November 2015 attack. This practice of a difficult and complicated situation gave me the possibility to manage the attack over the November weekend.

Thanks to images from my colleagues in other Paris hospitals, you will see the atrocity of war wounds and how much the presence of radiographers is important. Other postmortem images will show the importance of forensic radiology in this type of event.

The psychological support given to patients and those involved in these attacks remains an important element in the management of such a situation.

The human aspect of forensic imaging: post-traumatic stress disorder

Denise Elliott[1]
[1]*International Association of Forensic Radiographers, Queensland, Australia*

Post-traumatic stress disorder (PTSD) as a result of vicarious or secondary traumatisation may be a risk for forensic workers who are indirectly exposed to traumatic events through handling the victims.[1] The incidence of PTSD among New York police officers before 9/11 was 3%, whereas it had increased to ~10% in the 10 months following the terrorist attacks on the World Trade Centre. The signs and symptoms of stress can manifest physically or cognitively.

The National Institute for Health and Care Excellence (NICE) guidelines state that PTSD sufferers 'involuntarily re-experience aspects of the traumatic event in a very vivid and distressing way'.[2] PTSD can only be treated effectively if the disorder is recognised. Forensic radiographers must be familiar with the signs and symptoms of PTSD so that we can recognise distress in ourselves, or our colleagues.

Following as mass disaster, the NICE guidelines do not recommend a 'single session' debrief.[2] Those at high risk of developing PTSD should be screened 1 month following the disaster. It is clear that provision should be made for social and psychosocial support in all mass disaster plans.

While it is acknowledged that returning to work is important for the wellbeing and recovery of the PTSD sufferer, it is not surprising that many workers with PTSD find remaining at and returning to work difficult.[3] Support and awareness from their colleagues may assist.

This presentation will review published evidence to promote awareness of the signs and symptoms and mitigating actions of PTSD among radiographers who perform forensic imaging.

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An investigation of factors leading to burnout in Australian radiation therapists

Janine Robertson,[1] Yolanda Surjan,[2] Ben Britton,[3] Helen Warren-Forward[2]

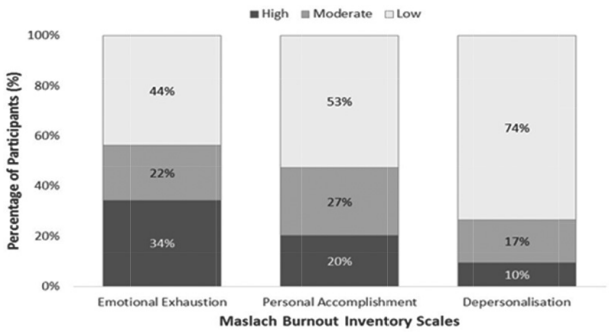
[1]University of Newcastle, New South Wales, Australia
[2]University of Newcastle, New South Wales, Australia [3]John Hunter Hospital, New South Wales, Australia

Objectives: Recent research has indicated that Australian radiation therapists (RTs) experience higher levels of burnout than previously reported data and significantly higher levels than RTs in other countries.[1-4] This research aimed to replicate the assessment of burnout in Australian RTs and more significantly to identify factors responsible for burnout and to assess what strategies are being used to alleviate burnout.

Methods: A survey containing over 90 items was administered to registered Australian RTs to assess levels of burnout (Maslach Burnout Inventory (MBI)), factors relating to burnout and stress alleviating lifestyle factors.

Results: Over 200 RTs responded to the survey. 15% of RTs self-reported to be stressed most of the time, with 42% reporting to be often stressed. Mean MBI scores for emotional exhaustion, depersonalisation and personal accomplishment were 21.99, 5.9 and 36.3 respectively. There was no significant difference between gender, department type or length employed as an RT. 34% of respondents reported high emotional exhaustion (see Figure). Participants cited "time constraints" (61%), "heavy workloads (3%)" and "caring for patients of a similar age" (50%) as the main factors affecting them in their job. Strategies used to alleviate stress included "exercise" (75%), "spending time with family" (73%), and 'drinking alcohol" (45%), with 8% attending counselling.

Discussion and Conclusion: This study reported lower levels of stress than the most recent Australian study[1], and similar levels to other studies.[2-5] While burnout is prevalent in many Australian RTs there are currently no workplace interventions in place to alleviate burnout in staff with high levels.



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So, you're a radiation therapist... what can you do?

Stephen Manley[1]
[1]*North Coast Cancer Institute, Lismore Cancer Care and Haematology Unit, New South Wales, Australia*

Background: Research on the Australian workforce has forecast that Generation Z will have an average of six careers in their lifetime.[1] To understand the drivers influencing our future workforce, New South Wales Health has undertaken horizon scanning for the medical radiation sciences workforce.

What does this mean for the current radiation therapy workforce and their career aspirations?

We know there are alternate career pathways outside of the clinical workforce and many have taken the step into the commercial world. Likewise, within the profession there are opportunities to specialise in key roles that can provide enhanced job satisfaction.

Career changes can be rewarding for the individual, but the loss of valuable experience and corporate knowledge can have unwanted impacts for an organisation.

Critical appraisal: This presentation will look at the relatively small workforce on the mid and far north coast of New South Wales. Several radiation therapists have transferred their skills into a variety of different roles to provide their careers with some much needed variety while returning that acquired experience into their substantive clinical roles and enhancing the organisation.

Through a series of video interviews and short case studies the richness of a radiation therapist's contribution to the health system will be demonstrated. New and recent graduates will see that a career in radiation therapy can be diverse, fulfilling and that what you do in the clinic does not completely define you as a professional.

Perhaps multiple careers in a lifetime can still be achieved without leaving the best career of all.

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Secondary traumatic stress: a literature review and personal reflection

Caitlin Haimes[1]
[1]*Sydney Adventist Hospital, New South Wales, Australia*

The ASMIRT 2018 Fellowship session was a very powerful, personal and emotional one. Undertaking the Fellowship assignment prompted my own professional reflection. Trauma and stress surrounds our profession and whether we like it or not, impacts on our lives. There is much that we can do as medical radiation science professionals (MRSP) to recognise warning signs and reduce stigma surrounding mental illness (MI).

Secondary traumatic stress (STS) is a psychological response to a specific indirect stressor.[1] It originates through interactions with another person who has experienced a traumatising event. STS is unique to the individual based on their own previous life experiences.[2] Burnout presents in physical, psychological and behavioural form and leaves sufferers at risk of developing STS.[3,4]

As MI is generally poorly understood, the stigma surrounding it can label sufferers with inaccurate, degrading stereotypes.[5] Although one in five people will experience a mental illness in their lifetime, three out of four people have reported experiencing the stigma.[6] Together MRSP must ensure MI is spoken about and normalised within the profession.

MRSP can reduce MI stigma through positive lifestyle choices, self-education, self-awareness of emotional responses, informal debriefing with colleagues and reflection.[1,7] Organisations must acknowledge the emotional toll MRSP experience and provide educational material, formal debriefing, transparent communication and encourage mentoring.

As MRSP we must create an environment that empowers others to recognise STS and burnout and challenges the MI stigma. To care for our patients, we must first learn to care for ourselves.

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Radiation therapists' perceptions of peer group supervision

Gay Dungey[1]
[1]*University of Otago, Wellington, New Zealand*

Introduction: International and New Zealand studies indicate that radiation therapists (RTs) are at risk of burnout and some have poor coping strategies for managing work-related stressors. An effective way of helping staff with these stressors is peer group supervision (PGS). PGS can improve reflective practice, encourage team dynamics, and provide support in the clinical setting. The aim of this research was to evaluate New Zealand RTs' perceptions of participating in PGS.

Methods: Over 100 RTs across five radiation therapy departments in New Zealand agreed to participate in PGS. Representatives attended training workshops facilitated by the New Zealand Coaching & Mentoring Centre. The evaluation utilised the Clinical Supervision Evaluation Questionnaire, a 14-item evaluation tool that measures staff perceptions of purpose, process and impact of PGS. The questionnaire was sent to 109 participants utilising an anonymous participation and collection method.

Results: Data was collected from 71 (of 109) RTs, who consented to participate. RTs responded favourably to PGS, reporting that PGS was good for stress management and work-related issues but not for patient care; and that patient care/clinical insights and skills are not well understood to be a key purpose of PGS. Indicating there is a need to address the ground rules and aims of PGS.

Conclusion: Overall, the data show there is a need for the ongoing development of PGS and support structures for RTs in New Zealand. This study is ongoing and will be repeated in 8 months to detect meaningful changes in staff perceptions of PGS over time.

Saturday 30 march, 15:45–17:15
MI Advanced Practice

Clinical-academic roles: experiences and impact in medical imaging

Nick Woznitza,[1] Bev Snaith[2]
[1]*Homerton University Hospital & Canterbury Christ Church University, United Kingdom* [2]*Mid Yorkshire Hospitals NHS Trust & University of Bradford, United Kingdom*

Clinical-academic roles are designed to bridge the theory-practice gap, enabling evidence-based clinical practice and increased research activity. Despite the international call for such roles there are a limited number within radiography, particular in senior clinical posts. Using personal case studies the enablers and barriers to such roles will be explored. Benefits to practitioners, departments and post holders will be explored, highlighting how embedded researchers can act as a conduit for evidence-based practice and service innovation. Challenges experienced, such as management conflict and time pressures, will be shared as learning opportunities for aspiring clinical academics. Professional, educational and personal characteristics of current clinical academics will be shared, to act as a potential road map to encourage others into this role.

Racing against the clock: a comparison of the availability of a radiographer's PIE vs. the radiology report in ED

Ellen Casagrande,[1] Michael Neep,[1] Daniel Sgualdino[1]
[1]*Logan Hospital, Queensland, Australia*

Objective: Plain radiographs are frequently requested by emergency referrers to aid in diagnosis and treatment of patients who present to the emergency department. Often these treatment decisions occur before the availability of the 'gold standard' radiologist report.[1,2] This occurrence has been suggested to contribute towards diagnostic errors. The primary objective of this study was to assess the availability of the radiologist's report before patient treatment and discharge. Availability of the radiographer's preliminary image evaluation (PIE) was also evaluated.

Methods: Retrospective review of patients' electronic medical records and radiology information system was conducted for examinations between 3 March and 9 March 2018. The review included a range of adult and paediatric examinations of the appendicular and axial skeleton including the chest and abdomen. For each examination the availability of the radiologist's report, radiographer's PIE and referrer's treatment/discharge decision were collected and compared. Mean scores were calculated.

Results: Average time for radiology report availability was 14 h and 35 min. Report turnaround times ranged from 2 min to 94 h. For the 308 cases reviewed, the radiologist report was available prior to patient discharge 39.9% of the time. In comparison, the radiographer's PIE was available 100% of the time.

Conclusion: This study demonstrates that the existing model of care, where emergency referrers discharge patients prior to the availability of the radiology report, could contribute towards diagnostic errors. It also highlights the necessity of a radiographer PIE that is available to assist the emergency referrers clinical management decisions.

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Which is more nourishing for radiographers? The whole PIE at once or in pieces: results from an Australian randomised controlled trial

Michael Neep,[1] Tom Steffens[2]
[1]*Logan Hospital, Queensland, Australia* [2]*Princess Alexandra Hospital, Queensland, Australia*

Preliminary image evaluation (PIE) is a brief description of radiographic findings provided by performing radiographers when images are captured. PIE has been suggested as a mechanism for reducing errors in emergency departments. As an important element of PIE is each radiographer's ability to detect and describe abnormalities on trauma radiographs, effective training is imperative.

The objective of this study was to compare the effectiveness of the same image interpretation education program delivered over an intensive period versus a series of shorter regular workshops. The intended effect of the education was to enhance radiographers' ability to detect and describe abnormalities on trauma radiographs.

Methods: Following ethics approval, a multi-centre, stratified (by years of experience) two-group parallel arm, single blind, randomised controlled trial ($n = 48$) was conducted. Participants were allocated to one of two groups to receive education: intensive (13.5 h, two consecutive days) or non-intensive (sequential 90-min workshops, 1 week apart) formats. Participants undertook X-ray interpretation tests before education, and at 1 and 12 weeks post-education completion.

Results: Image interpretation performance was not significantly different between groups at baseline. A generalised linear model indicated that participants who received intensive education improved more than those in the non-intensive education group at 1-week ($P = 0.002$) and 12-week ($P < 0.001$) follow-up assessments (Table 1).

Discussion and Conclusion: Findings indicated that while both formats resulted in improvements in radiographers' ability to interpret trauma radiographs, the intensive format of delivery proved more effective at doing so in the weeks after completion of the image interpretation education program.

Table 1 Summary of Image Interpretation Test scores at each assessment by group

Variable	Baseline		1 week following education		12 weeks following education	
	Non-intensive	Intensive	Non-Intensive	Intensive	Non-Intensive	Intensive
Summary score	75 (59-93)	75 (52-88)	78 (63-106)	87 (54-128)	97 (71-123)	124 (89-138)

Team ED vs. team MID: a comparison of X-ray interpretation accuracy

Ellen Casagrande,[1] Michael Neep[1]
[1]*Logan Hospital, Queensland, Australia*

Objective: Emergency departments are often staffed by junior referrers who may have limited skills in interpreting radiographs.[1] Misinterpretation of musculoskeletal injuries may lead to a delay in treatment and poor patient outcome.[2] The objective of this study was to investigate the accuracy of emergency referrers' radiographic interpretations compared against radiographers' preliminary image evaluations (PIE).

Methods: Human research ethics committee approval has been granted. A total of 308 radiographic examinations were reviewed from 3 to 9 March 2018. The range of examinations incorporated in the review included the appendicular and axial skeleton including the chest and abdomen. For each examination the referrer's interpretation was compared to the radiographer's PIE and radiologist's report. Results were categorised as a match, no match or partial match. This allowed overall interpretive accuracy to be analysed. Mean scores were calculated.

Results: The emergency referrer's overall accuracy of interpreting radiographs was 87.9%, while the radiographer's PIE accuracy was 84.7%. For all cases, the emergency referrer's interpretation and the radiographer's PIE agreed 90.3% of the time. Of the 25 cases where there was disparity between the emergency referrer and the radiographer, the radiographer's PIE matched the radiologist report in eight cases (32%).

Conclusion: The results of this study indicate that radiographers can provide an accurate interpretation of radiographs to compliment an emergency referrer's diagnosis when a radiologist's report is unavailable.

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Saturday 30 March, 15:45–17:15
SABR

Motion pictures: assessing breath-hold reproducibility in abdominal SBRT using intrafraction imaging

Elizabeth Brown,[1,2] Patrick O'Connor,[1] Erika Eaves,[1] David Pryor[1,3]
[1]*Princess Alexandra Hospital, Queensland, Australia*
[2]*Queensland University of Technology, Queensland, Australia* [3]*University of Queensland, Australia*

Objectives: Intra fraction imaging is an Elekta XVI feature that enables volumetric kV image acquisition simultaneously with MV treatment delivery. It has facilitated the introduction of breath-hold gated stereotactic body radiotherapy (SBRT) by enabling visualisation of tumour and organs at risk (OAR) during each treatment arc.[1,2] The aim of this study was to assess breath-hold reproducibility using intra fraction imaging and quantify any diaphragmatic feathering demonstrated.

Methods: Ethics approval was granted to evaluate intra fraction imaging for abdominal SBRT patients where breath-hold was achieved using the Elekta Active Breathing Control (ABC) system. Positional couch shifts >2 mm were applied after online intrafraction image registration. Average couch shifts for each breath-hold type (deep-inspiration (DIBH) or end-expiration (EEBH)) were recorded as an indication of reproducibility. Diaphragmatic feathering was quantified by performing two registrations of intrafraction cone beam CTs (CBCT) with the planning CT: at the most superior and inferior visible edges of the diaphragm.

Results: To date, 50 intrafraction images from 17 SBRT patients have been reviewed. Ten patients were treated in EEBH and seven in DIBH. Twenty-four of 50 fractions had an intrafraction couch move applied with 66.7% of these occurring in EEBH patients. Shifts were most frequently applied in the superior/inferior direction (58%). Diaphragmatic feathering has been minimal.

Conclusion: Breath-hold for abdominal SBRT treatment was found to be reproducible using intrafraction imaging. Its implementation has made it possible for more patients to receive SBRT as a result of in-treatment target and OAR visualisation, coupled with the advantages of using breath-hold to manage motion.

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MLC tracking in lung radiotherapy: LIGHTSABR Trial at The Northern Sydney Cancer Centre

Meegan Shepherd,[1] Jeremy Booth,[2] Paul Keall,[3] Vincent Caillet,[2,4] Adam Briggs,[2] Alex Podreka,[2] Kathryn Szymura,[1] Mark Stevens,[1] Dasantha Jayamanne,[2] Nick Hardcastle,[5,6] John Atyeo[2]

[1]Northern Sydney Cancer Centre, New South Wales, Australia [2]Northern Sydney Cancer Centre, Royal North Shore Hospital, New South Wales, Australia [3]University of Sydney, New South Wales, Australia [4]ACRF Image X Institute, University of Sydney, New South Wales, Australia [5]Peter MacCallum Cancer Centre, Victoria, Australia [6]CRF Image X Institute, University of Sydney, Victoria, Australia

Objectives and Aim: The Lung Intensity Guided and Hypofractionated tumour Tracking with Stereotactic Ablative Body Radiotherapy (LIGHT SABR)[1] study aims to demonstrate the accurate use of tumour tracking technology[2] to deliver high doses to Stage I NSCLC or oligometastatic lung tumours, delivering better treatment accuracy by reducing dose to healthy lung tissue[3] and increasing patient survival.[4]

Methods: In this Phase I feasibility study (HREC/15/HAWKE/55), 20 patients will have three radiofrequency emitting beacons implanted into airways surrounding the tumour. Real-time geographic tumour location is possible via beacon monitoring with the Calypso Tracking System and leaf position optimisation using a MLC tracking algorithm. All patients will be planned with 4D planning[3] at end-exhale phase using knowledge-based planning (where possible) and treated with MLC tracking. Additionally, patients are planned with a standard ITV-based SABR plan to compare volumes and dosing to target and organs at risk.

Results: To date, 15 patients have successfully completed treatment on the LIGHTSABR trial. PTV volumes have been reduced on average by 27% (range 12–49%). The greatest reduction has been in patients with greater respiratory motion (motion >1 cm, $N = 6$, 31–49% reduction).

Discussion and Conclusion: Trial challenges include posterior tumour position and access to surrounding airways. These challenges have resulted in varied positioning (nine supine, five prone, one on side) and immobilisation of patients, as well as careful pre-implantation planning, to allow for successful tumour tracking. Regardless of tumour positions and case-to-case challenges, all 15 patients have successfully completed their treatment with observed reductions in treated volumes.

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Dosimetric evaluation of continuous positive airway pressure with 4DCT for lung SBRT

Harrison West,[1] Alex Podreka,[1] Adam Briggs,[1] Vincent Caillet,[1,2] Nicholas Hardcastle,[3] Jeremy Booth,[1] Thomas Eade,[4,5] Dasantha Jayamanne,[1] John Atyeo[1]

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Objectives: To retrospectively investigate the dosimetric impact of using continuous positive airway pressure (CPAP) patient regulation with four-dimensional computed tomography (4DCT) for volumetric modulated arc therapy (VMAT) lung stereotactic body radiation therapy (SBRT).

Methods: Eight patients from our ethically approved database (LNR/15/HAWKE/355) were simulated with both conventional free-breathing (FB) and CPAP-regulated 4DCT. Both 4DCT datasets were contoured and planned following departmental protocol in an effort to maximise consistency and facilitate quantitative plan comparison. Varian RapidPlan (RP) was used with Varian Eclipse (version13.6) software to standardise the optimisation methods. Plan comparisons evaluated differences between standard free-breathing 4DCT plans and retrospectively planned CPAP-regulated datasets. Assessment was based on improvements for lung means, heart, oesophagus and spinal cord dose.

Results: In a cohort of four patients, the results showed the advantages of CPAP in reducing heart dose, and slight increase in lung constraints while keeping good PTV coverage and better max points. Spinal cord and oesophagus doses were minimally different between FB and CPAP use.

Conclusion: Preliminary results do not show a benefit for all patients, suggesting that the benefit may be proportional to the tumour amplitude and PTV reduction. More data will allow analysis of the benefits relative to large and small tumour motion. While maintaining PTV coverage, CPAP does appear to have the potential to reduce OAR dose to both heart and lung.

	FB	CPAP
PTV mean	108%	107%
PTV max	120%	117%
Lung mean	259cGy	209cGy
Lung max	117%	112.8%
Lung volume	3214cm^3	4126cm^3
Heart(0.1cc)	854cGy	601cGy
Oesophagus(1.0cc)	639cGy	591cGy
Spinal cord max	12.3cGy	12.8cGy

Table 1. Plan and OAR comparisons between FB and CPAP regulated 4DCT

Individualised stereotactic ablative radiotherapy for lung cancers: report on patients using bio-visual feedback for gated VMAT FFF treatment

Daniel Pham,[1] Peter Maxim,[1] Max Diehn,[1] Billy Loo[1]
[1]*Stanford Cancer Center, CA, United States*

Background: Stereotactic treatment has been used to treat lung tumours for over two decades.[1-3] In recent years technological advances in image guidance[4] and treatment delivery[5] offers motion management solutions to more confidently deliver treatment. At the Stanford Cancer Center iSABR a phase II trial (NCT01463423) was opened in 2011 evaluating local tumour control with individualised dose regimens. This presentation will investigate efficiency of treatment for a subset of patients who received 25 Gy/1 Fx using either breath-hold or gated free-breathing technique.

Method: Patients with limited primary or metastatic tumours were recruited onto the study. All patients underwent a 4D planning CT and if eligible (based on screening) a breath-hold scan. Patients were planned using a single partial VMAT arc with 10X FFF (2400 MU/min). All plans were calculated using Acuros™ algorithm. Pre-treatment verification using 2DkV and CBCT was required before treatment on a Truebeam™ Linac (VMS, Palo Alto, USA).

Results: 52 targets with median GTV volume of 1.68 cc (0.1–11.9) from 35 patients were identified for preliminary analysis. The average gated beam-on time was 191 sec compared to breath-hold of 241 sec. The mean MU from gated treatment was 5916 compared to breath-hold treatment of 6009. Three of 32 (9%) gated sessions had at least one interruption during beam delivery compared to 4/20 (20%) in the breath-hold group.

Conclusion: Preliminary analysis suggests longer beam delivery times associated with breath-hold treatment. Further statistical analysis with the final patient number will be used to inform pre-planning and treatment guidelines.

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A collaborative approach to determine the most appropriate motion management strategy for liver stereotactic ablative body radiotherapy patients

Long Nguyen[1]
[1]*Peter MacCallum Cancer Centre, Victoria, Australia*

Introduction: Accounting for tumour motion is crucial when delivering stereotactic ablative body radiotherapy (SABR), particularly for liver lesions where motion is significantly impacted by the diaphragm.[1,2] There are many options to reduce or account for motion including voluntary exhale breath hold (VEBH), abdominal compression or free-breathing.[1,2]

Case presentation: From June 2017 to June 2018 at Peter MacCallum Cancer Centre, 21 patients with liver lesions underwent a motion management assessment session and were treated with motion managed liver SABR. The motion management strategy was informed by multidisciplinary assessment of the patient's reproducibility of VEBH or abdominal compression effectiveness. Collaborative decisions regarding patients' abilities and coaching approaches were shared between radiation therapists, oncologists and physicists to ensure the most appropriate motion management for each patient.

This presentation, as part of an institutional ethics approved study, focusses on three cases that highlight the variability in patient experiences with a review of how individualised care plans can be most efficiently managed.

Management and Outcome: The motion management approach for liver SABR is continually being refined to effectively streamline the decision making process without compromising patient care. Improved patient education for VEBH and stricter criteria during the assessment procedure has been introduced to minimise the number of treatment re-plans and prevent undesirable stress on patients. Professional collaboration between all disciplines is essential to provide a holistic care approach in managing the care of our patients.

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A collaborative approach to management of a patient with two lung oligometastases prescribed stereotactic ablative body radiotherapy

Bruce Ha[1]
[1]*Peter MacCallum Cancer Centre, Victoria, Australia*

Introduction and Case presentation: This case study will present a collaborative approach to planning a complex SABR case. A 79-year-old male* presented with metastatic colon cancer, with two closely located oligometastases of the right lung lower lobe (Figure 1). The proximity of the oligometastases to each other, combined with respiratory motion, created significant planning challenges. Additionally, a colostomy bag rendered the patient unsuitable for use of a compression drape.

Management and Outcome: A 4DCT demonstrated extensive tumour motion, which would result in wide PTV margins. To account for this: the patient was re-simulated in expiration breath-hold (EBH) with the aim to minimise tumour motion.

A multi-isocentre flattening free filter (FFF) VMAT plan was created and approved through the multidisciplinary peer review process. Given the case complexity, collaboration between radiation therapist, radiation oncologist and medical physicist was key to establishing the most effective and deliverable plan for the patient. A mock-up, with verification CBCT was undertaken to ensure machine clearance, EBH reproducibility and tumour status/visibility.

The mock-up showed that the multi-isocentre plan did not account for the individual independent tumour motion, resulting in desynchronisation of dosimetry. A subsequent multidisciplinary discussion agreed to a replan with a single isocentre, non-FFF VMAT plan, with increased margins for greater treatment uncertainty.

Discussion: The collaborative approach utilised by the multidisciplinary team during the management of this case enabled an optimal plan to be generated and delivered for this patient. At 2 months follow up, the patient has shown a complete metabolic response.

*Patient provided consent for case presentation

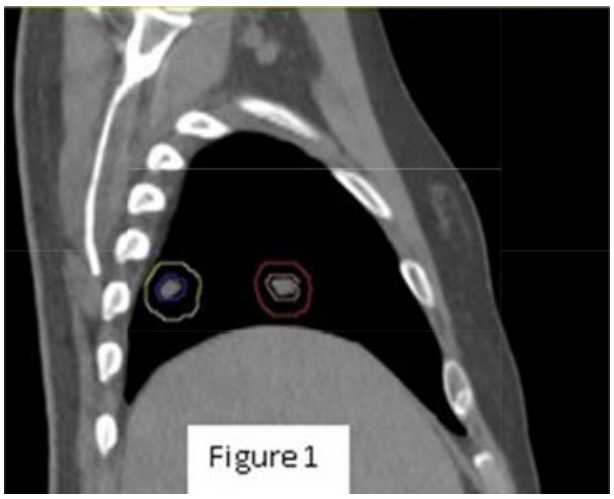

Figure 1

Saturday 30 March, 15:45–17:15 Student RT Winners

Literature review on efficacy and toxicity of hypofractionated radiotherapy to the prostate compared with conventional fractionation

Daniel Hughes[1]
[1]*Queensland University of Technology, Australia*

Background: The low alpha/beta ratio of the prostate suggests that a higher dose per fraction would provide a biological advantage, as it is more radio-resistant. Current studies have demonstrated that hypofractionated radiation therapy of the prostate delivers similar efficacy to conventional prostate fractionation, with similar long-term toxicity side effects.

Objectives: Beneficially, the shorter fractionation has demonstrated shorter overall treatment times, increased departmental efficiency and reduced late toxicity outcomes. While some studies include high-risk patients, the majority of evidence supports use for low and intermediate risk patients only.

Methods: Research was conducted across four medical databases to select four studies that were analytically compared for bias, differences in exclusion criteria and overall result. Through a comparative analysis of the literature, it was found that all articles displayed relatively low level of bias and were in support of hypofractionated radiotherapy.

Results: Arcangeli[1] displayed a 10-year freedom from biochemical failure of 72% in the hypofractionated group and 65% in the conventional group with similar efficacy. Comparably, the other studies displayed a greater proportion of patients free from biochemical failure having undergone the hypofractionated regimen.[2,3] Interestingly, Pollack[4] found that those with pre-existing compromised urinary function had increased toxicity with regards to biochemical disease failure.

Conclusion: The literature investigated found that hypofractionated radiotherapy showed non-inferiority to conventional fractionation.

References

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The necessity of skin markings used for patient positioning in external beam radiotherapy: a literature review

Quocviet Nguyen[1]
[1]*RMIT University, Victoria, Australia*

Introduction: Traditionally, permanent tattoos were delivered for radiotherapy patient positioning. However, in recent years alternative techniques such as temporary tattoos, ultraviolet (UV) tattoos, lines drawn by permanent markers and AlignRT® have been developed.
Objective: To evaluate the peer-reviewed literature exploring the advantages and disadvantages of using UV tattoos, temporary markers, henna tattoos and AlignRT® in radiotherapy to determine the necessity of skin markings used in patient set-up.
Methods: PubMed, SCOPUS and ScienceDirect databases were used in the literature search. Keywords included radiation therapy, UV tattoos, temporary markers, henna tattoos and AlignRT®. The first 10 articles that are of relevance to the study were selected.
Results: Whether UV tattoos, henna tattoos or AlignRT® were used, studies found that patient set-up using any of these techniques could be just as effective as black tattoos. However, the use of non-visible tattoos or AlignRT® has been suggested to decrease psychological and emotional distress in comparison to standard permanent tattoos.
Conclusion: The studies analysed in this literature review have positively highlighted the efficacy of all patient positioning techniques used in external beam radiotherapy. Unfortunately, there is still a gap in research regarding the efficacy of skin markings used in radiotherapy for the treatment positioning of cancer patients and the psychosocial effects skin markings can have on patients. Further study and research is required before a more conclusive deduction can be determined.

The use of h-IMRT to reduce treatment-related morbidity for locally advanced non-small cell lung cancer

Min Sung Park[1]
[1]*University of South Australia, Australia*

Concurrent chemo-radiation therapy is the standard treatment for locally advanced NSCLC.[1] However, radiation treatment to lung cancer can be challenging due to the risk of normal tissue toxicities.[2] Techniques such as 3DCRT, IMRT or VMAT have been used to treat NSCLC. IMRT and VMAT are advanced techniques of 3DCRT which allow tighter conformity around the PTV while minimising the dose to organs at risk (OAR).[3] However, these techniques increase the low dose regions in OAR leading to a higher integral dose. Furthermore, there would be uncertainties in the dose distribution that could arise due to the possible motion interplay effects from a mobile PTV.[1,2]
To reduce treatment-related morbidity for locally advanced NSCLC, it is important to spare OAR, such as the oesophagus and normal lung.[2,3] Using the 3DCRT, PTV coverage may not be optimal and therefore, using IMRT fields will compensate the under-dosage at the PTV borders.[5] As result, h-IMRT showed to have lower TL-V20 values and CL-V5.[2-5]
The approach of h-IMRT, using static 3DCRT and IMRT fields, can be beneficial in reducing treatment-related morbidity for patients with NSCLC. There could be significant normal tissue toxicities when treating NSCLC. h-IMRT can achieve optimal dose coverage of PTV while sparing the lungs in terms of TL-V20 and CL-V5.

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Saturday 30 March, 15:45–17:15
Proton Therapy

Technical aspects of proton therapy

Justin Pigg[1]
[1]*Provision CARES Proton Therapy Center, Nashville, United States*

The purpose of this presentation is to inform and educate fellow therapists about the unique aspects of proton therapy. This talk will explain the distinct differences in proton therapy versus conventional therapy. The attendee will become aware of the innate characteristics of proton therapy and how they are applied to patient treatments.
After participating in this session the attendee will be able to:

- understand the basics of proton beam production
- realise the differences in proton beam characteristics vs. photon
- learn about the different beam delivery methods
- become aware of the patient imaging procedures and setup
- compare proton treatment plans vs. photon treatment plans.

Three key things the radiation therapist should know about proton therapy

Taeyoon Kim,[1] Doohyun Lee,[1,2] Jonghwi Jeong[1]
[1]*Department of Proton Therapy Center, Korea National Cancer Center, South Korea* [2]*Department of Medical Physics, Graduate School of Bio-Medical Science, Korea University, South Korea*

In the recent decade, the field of radiation treatment has grown remarkably with the development of advanced machines. Proton therapy, one of the latest treatment techniques for the next generation, is also widely used in many clinical centres around the world. The key advantage of proton therapy is to maximise therapeutic effect on tumours by giving a higher dose and minimise damage in normal tissues using its unique physical characteristics called Bragg peak. In order to maximise the benefits, it is important to understand the proton therapy system and to establish appropriate working procedures for CT simulation, treatment planning and patient treatment set-up.
The Korea National Cancer Center (KNCC) started the nation's first proton therapy in 2007 and has been treating about 2700 patients. The KNCC performed CT simulator with homemade immobilisation device for more accurate patient position and established various protocols for proton treatment planning. The dedicated image verification system was also developed for the precise patient set-up. In particular, the KNCC Proton Therapy Center employed the patented eye tracking and gating system to treat orbital tumours for better dose distribution. The KNCC treats various patient cases, including paediatric, liver and lung cancer, and a number of studies are now underway on pencil beam scanning method, which uses scanning magnets to deliver proton beams without modifiers.
The purpose of this presentation is to share 10 years of experience at the KNCC Proton Therapy Center and review various cases, as well as suggest the future direction of proton therapy.

Figure 1. Overview of KNCC Proton Therapy Center

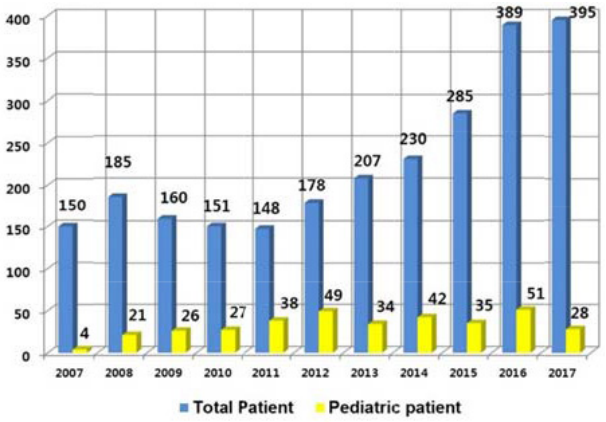

Figure 2. Statistics of KNCC Proton Therapy Center: accumulated number of new patients per year. About 2500 patients in total from March 2007 to December 2017

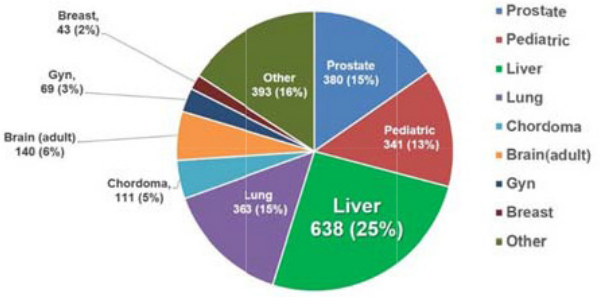

Figure 3. Statistics of KNCC Proton Therapy Center: accumulated number of treatments with various type of cancers

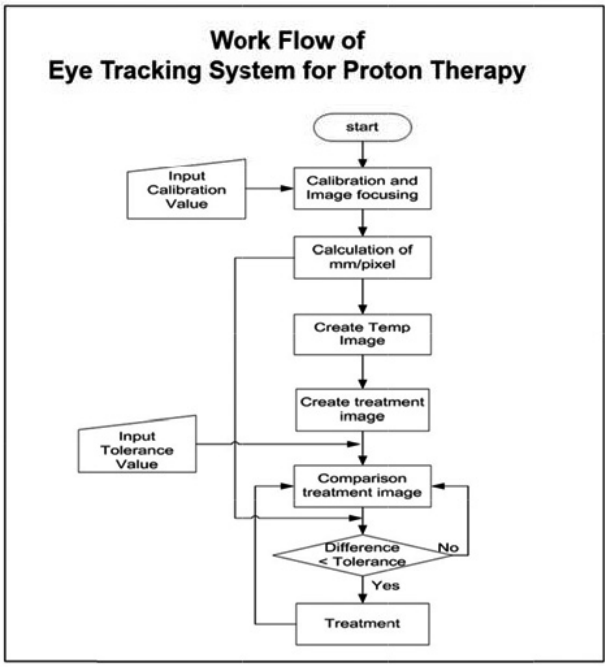

Figure 4. Workflow of eye tracking system for proton therapy

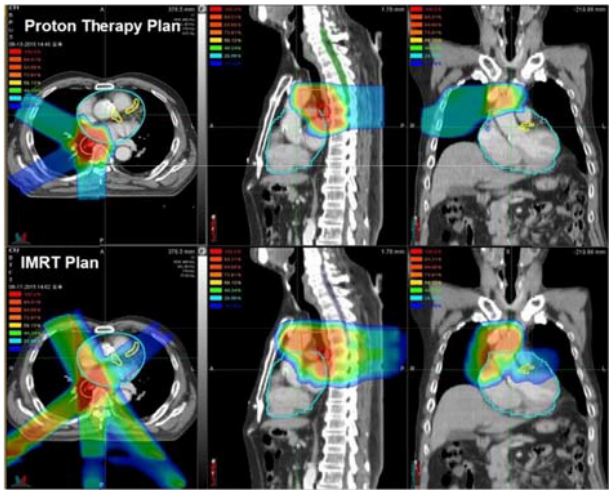

Figure 5. Clinical case review for lung cancer: IMRT vs. proton

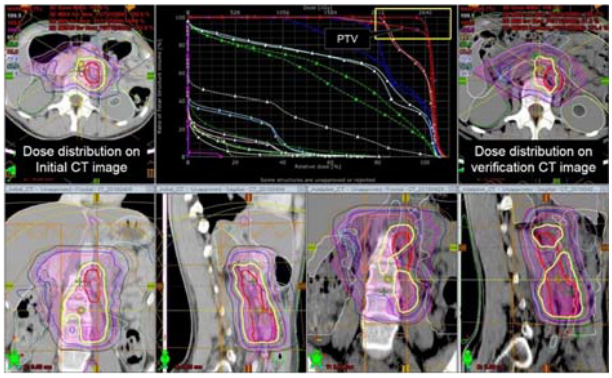

Figure 6. Clinical case review for PAN: proton beam range difference on the bowel gas variation

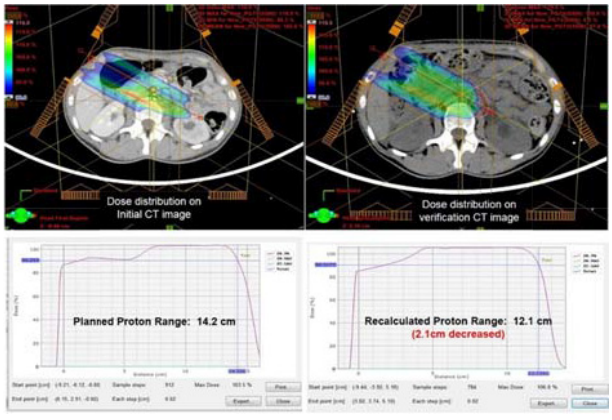

Figure 7. Clinical case review for PAN: proton beam range difference on the bowel gas variation (single field evaluation)

Robust dosimetric evaluation: a method of comparing modern photon and proton planning techniques

Raymond Dalfsen,[1] Scott Penfold[1]
[1]*Royal Adelaide Hospital, South Australia*

Background and Aim: In 2015, the Royal Adelaide Hospital implemented an ongoing study, analysing the dosimetric quality of volumetric arc therapy versus intensity modulated proton therapy planning techniques Historically, these two planning methods have presented difficulty in analysis due to differing techniques used to incorporate uncertainty into the optimisation and evaluation processes.[1] To extract comparable parameters, plans were evaluated under a range of uncertainty scenarios, foregoing the traditional methods of using planning target volumes and planning organ at risk volumes, as the sole means of plan evaluation. This presentation aims to provide an in depth focus on a single case study which was particularly interesting due to the location of the target volume.
Methods and Materials: Varian Eclipse treatment planning software was used to generate clinically appropriate treatment plans with each technique. Dose volume histogram statistics for each method were evaluated with a range of uncertainty scenarios also applied, comparing varying dosimetric scenarios to structures. Doses from these uncertainty scenarios were then used to provide a robust analysis of each planning technique and quantify 'worst case' dosimetric scenarios.
Results: The results of this study highlighted apparent dosimetric benefits of proton therapy, even in a range of uncertainty scenarios. The dosimetric analysis observed substantial decreases in OAR dose, while adequately maintaining target coverage.
Conclusion: Through comparing a range of uncertainty scenarios we are able to quantify the dosimetric differences between modern photon and proton planning techniques, despite using different optimisation methods to account for plan uncertainty.

Reference

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Sunday 31 March, 09:00–10:30
MI Service Delivery 2

Perspectives of medical radiation technologists regarding involvement in planning and implementation of work related organisational changes

Greg Toffner[1]
[1]*Ontario Association of Medical Radiation Sciences, Ontario, Canada*

Introduction: Changes being implemented by leaders can affect internal dynamics within organisations that can negatively or positively affect employees and desired outcomes. This study explored perspectives of front-line MRTs concerning their involvement in work-related organisational changes.
Aims: The aim of this 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. How change is managed will have an impact on quality, accessibility and efficiency of health services and sustainability of the healthcare system.
Methods: 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.
Discussion and Results: This study was remarkably consistent with the conceptual framework presented for the study. The theories presented by Lewin, Bridges, and Senge's change theories 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 and the MRT work environment.