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Oral Abstracts

Friday 24 March, 1100–1230 Medical Imaging – CT1 (Reach Beyond)

MR screening – the new paradigm mutation free alternative

James Nol, Andrew Jones, Reza Ali

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For the last 40 years the use of Computed Tomography "CT" in Medical Imaging has been increasing dramatically. Yearly CT scans done in US have risen from less than 3 million in 1980 to currently being more than 80 million a year.[1] Last year in Australia, Medicare has paid for 3 million CT examinations[2] that does not include Hospital inpatients, private insurance and workers compensation and Motor vehicle accident patients.

CT technology went through a phenomenal progress with Image quality and excelled to become the ultimate diagnostic tool in medicine.

The only missing pieces from the puzzle were Radiobiology and the mutagenic impact of ionising radiation on humans. Three from every 10 thousand patients exposed to ionising radiation will die from cancer. The grey zone is the neurological and immune system disorders that are developed even if cancer is not developed.[3]

It has also been estimated that in the USA, 29 000 future cancers (approximately 2% of the cancers diagnosed annually in the United States) could be related to CT performed in the United States in 2007.[4]

An Australian study that looked at more than 680 000 people who had CT scans as children compared with some 10 million children who did not have a CT scan had a 24 percent increased cancer risk. Each additional scan boosted the risk of increased cancer by 16 percent.

Is that ethically sound? We need our diagnostic tools. If Ionising Radiation is not the answer where do we go from here?

Five minutes MR Screening is the new paradigm.

Come along to understand the BMDH concept, see the images and prepare yourself to move away at warps speed in 2020.

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Dual energy vs FLASH CTPA: which results in more indeterminate reports?

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In many institutions CT Pulmonary Angiogram (CTPA) scans are routinely performed on a dual source Siemens CT scanner. The dual source capability allows scanning in a number of different modes, each having their own advantages. FLASH mode is low dose, motion free and provides excellent contrast enhancement, but dual energy (DE) allows for functional blood perfusion maps to be created which aids in detecting smaller pulmonary emboli (PE).[1]

An optimal CTPA scan is free of motion artifacts, with a minimum contrast enhancement of 250 hounsfield units (HU) in the pulmonary trunk and pulmonary arteries demonstrated to the subsegmental levels. This allows radiologists to confidently confirm or exclude PE. If scans do not meet this criteria they are considered indeterminate or non diagnostic as PE cannot be confidently excluded.[2]

Objective: To determine which scan method results in more indeterminate reports. The reasons for inderterminate scans will also be investigated.

Method: Data will be collected by reviewing approximately 6 months worth of CTPA scans using the AGFA IMPAX system at the Princess Alexandra Hospital. Each report will be classified as either confirming PE, PE excluded or indeterminate, by examining the text within each report. Terminology indicating an indeterminate scan has been gathered by a literature review. [2,3,4]

Results: Of the collected data:

- 13.9% scans indeterminate
- 75% of indeterminate scans DE
- Average HU diagnostic = 339
- Average HU indeterminate = 258

Conclusion: Outcome of this study will determine if a significant difference exists between scans types with respect to the reports.

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CT pulmonary angiogram audit: techniques and protocols

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Objective: To improve the diagnostic quality of CTPA examinations at The Alfred by studying technical factors and protocols.
Methods: Retrospective analysis of 2200 CTPA examinations conducted between 2014–2016 at The Alfred Hospital. The previous protocol was based on a timing bolus without any real consideration of body habitus, IV cannula sites, valsalva instructions, injection rates, contrast volumes. The new protocol is dependent on the above factors.
Results: Each of the 2200 studies were classified according to (1) Average Hu measurements (based on three different locations within the pulmonary arteries), (2) keywords used in the Radiologists report (e.g. excellent study, poor enhancement). Cat 1 (high-quality) studies were those with higher than 300 Hu, Cat 2 (diagnostic) studies = 210–300, Cat 3 (poor quality, non-diagnostic) under 210 Hu.
For further analysis of the body habitus, the SD (noise in the pulmonary artery), and patient size in X and Y axis (cross-sectional area) was compared against the quality of the scan to find a correlation.
The non-diagnostic rate of CTPA studies prior to the change of protocol was 11.8%. One year after changing the protocol, the non-diagnostic rate decreased significantly to 3.8%.
Radiation dose for each study was recorded in DLP over the 2 year period. Contrast volumes were also recorded in ml.
Conclusion: A range of protocol changes ultimately led to the increase in high-quality CTPA examinations, including injection rates, cannula sizes, positioning, contrast volumes, scan parameters and breathing instructions.

Alfred Hospital: saving dose – one CAP at a time

Ngon Tran
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A pilot study on "Single acquisition of CT chest abdomen pelvis with two separate injections" was initiated by The Alfred CT radiographers in July 2012. Five months later in January 2013 a formal research project was conducted with 70 research participants. This project was with a joint effort between a Radiology Registrar and several CT Radiographers.
Fields such as the dose length-product (DLP), attenuation values of the aortic arch and pulmonary trunk, liver and spleen attenuation, image quality and radiographer useability were analysed with the final result being a 25% reduction in overall dose to the patient.
Three years on approximately 1000 CT Chest/Abdomen/Pelvis exams using this Oncology (dual injection) protocol have been performed amongst over 6000 exams. This presentation will again look at the dynamic rationales of the research project such as:

1. How this protocol has been implemented into department day-to-day practice
2. The relationship between the injection flow rate and the scan technique in order to achieve portal venous phase of the liver
3. The changes that have taken place in order to fine tune the protocol and achieve even better image quality, based on patient's body habitus
4. Optimisation and further dose reduction initiatives such as ODM (organ dose modulation)

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Low dose CT vs general radiography: a comparison of image quality and dose (take 2)

Lesley Halmos,[1] Peter Barnes,[1] Madeleine Shanahan[2]
[1]*MIA East Melbourne Radiology, East Melbourne, Australia*
[2]*RMIT University, Bundoora, Australia*

Background: With the growing use of medical imaging, radiation dose must be kept to a minimum, adhering to the principle of As Low As Reasonably Achievable (ALARA). Modern imaging machines produce images with a higher resolution at lower radiation doses, making it important to be familiar with the capabilities and comparison of radiation dosage between imaging modalities.
Objective: To compare patient dose and image quality of digital general radiographs and low-dose Computed Tomography (CT) images of extremities to determine which imaging modality provides the most diagnostic information whilst adhering to ALARA.
Methods: A prospective study was conducted measuring the dose to adult phantoms in the imaging of extremities, including the hand, wrist, elbow, foot, ankle and knee. The equipment used for this study was from MIA East Melbourne Radiology and included a FujiFilm Acselerator Digital Radiography (DR) system and a Toshiba Aquilion One 320 slice CT. Doses were measured directly using Landauer nanoDot optically stimulated luminescence (OSL) technology, in addition to calculations from the exposure parameters. The uncertainty in the dose measurements is estimated to $\pm$2%. The image quality was assessed by three radiologists using specific anatomical markers.
Results: Preliminary results indicate radiation doses much more comparable than previously anticipated when comparing low-dose CT scans with general radiographs.
Conclusion: Results will provide useful information about dosage and image quality of extremity imaging when using low-dose CT and general radiography. This allows our medical practitioners to make an informed decision to justify the most appropriate diagnostic imaging for each client.

Friday 24 March, 1100–1230 Radiation Therapy - H&N / Brain (Reach Beyond)

Development of a supine cranio-spinal irradiation VMAT protocol

Kelsie Henry, Minh Nguyen, Thu Dang, Robyn Guidi
Radiation Oncology Mater Centre, Brisbane, Australia

Objective: To outline the challenges overcome whilst developing and implementing a cranio-spinal irradiation (CSI) protocol at Radiation Oncology Mater Centre (ROMC) using volumetric modulated arc therapy (VMAT).
Method: A literature review was performed to evaluate treatment delivery modalities for CSI and issues associated with junctioning fields. Both IMRT & VMAT protocols were designed using Pinnacle3 treatment planning system as an IMRT solution was required until VMAT became clinical at ROMC. Stabilisation equipment was custom designed. Image guided radiation therapy (IGRT) flowcharts and protocols were developed to address the challenges of a three isocentre technique with junctioning fields.
Results: In the absence of supporting literature, ROMC engaged a multi-disciplinary approach to protocol development. Radiation therapists (RTs) and radiation oncologists determined field arrangements, overlapping modulated junctions and planning goals, physicists developed unique beam models and treatment couch models in Pinnacle. Pinnacle scripts were created by RTs and physicists to support efficient planning. A vacbag and lockbars system was modified specifically for CSI in consultation with the vendor. An IGRT protocol was produced and flowcharts were developed to provide effective online decision-support.
Conclusion: Currently ten patients have been treated using VMAT CSI at ROMC. A project is currently under way to evaluate if online IGRT can be modified to minimise the imaging requirement.

Retrospective evaluation of setup errors for stereotactic brain radiotherapy

Carly Russell
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Objectives: The aim of this quality improvement study is to evaluate the effectiveness of current stabilisation equipment for stereotactic brain radiotherapy. This will include a review of the planning target volume (PTV) margins used and patient immobilisation with the aim of reducing setup errors.

Methods: The thirty patients selected for this study includes those who have been treated with volumetric modulated arc therapy (VMAT) or Tomotherapy® brain radiotherapy with cone-beam computed tomography (CBCT) or megavoltage computed tomography (MVCT) imaging respectively. This cohort will include 10 patients with a foam headrest and 10 patients with a Vac-Lok headrest treated on the standard linear accelerator machines, and 10 patients with a foam headrest treated on the Tomotherapy® machines. All patients will have a standard thermoplastic mask.

This study will utilise setup correction data from MOSAIQ® and TomoPortal™ to quantify the daily positional error of these patients and evaluate the efficacy of current stabilisation equipment. Data will be collected from existing system registrations from patient treatments between March 2014 and June 2016 and will include the setup error for all six degrees of freedom (both translational and rotational error) for the CBCT and MVCT images.

Results: TBA.

Conclusion: The expected outcome for this study will determine the positional error of the current stabilisation equipment and recommend the appropriate PTV margins that should be utilised within the department. In addition, this will provide a basis for a prospective review of the implementation of new stabilisation equipment.

Efficiency gained in planning whole brian hippocampal sparing using external beam radiation therapy

Nick Hutchinson
Royal Adelaide Hospital, Adelaide, Australia

Introduction: Whole brain Hippocampal sparing (WB HC) has proven clinical advantages and is becoming a common technique in many Australian departments for patients with brain metastases. Whilst dosimetrically advanced and beneficial for preserving short term memory the technique requires an increase in both planning resources and treatment time. This presentation will discuss a new technique to reduce the planning time required for WB HC while improving on RTOG 0933 trial constraints.

Methods and Results: Using Pinnacle version 9.10, a small cohort of planners, ranging in experience were asked to plan the same WB HC data set using the RTOG dose constraints and objectives. The planners were then instructed to use the newly developed planning technique and repeat the process. Adherence to the stipulated protocol and overall planning time were compared for the two planning techniques. The results of this study and an explanation of the planning technique will be discussed in full.

Conclusion: This new WBHC technique indicated to deliver high quality and efficient treatment clinical to the patient. Pinnacle scripting functions can also be exploited to further enhance the productivity in what may become a more routine technique.

Predictive modelling to personalise management of head and neck cancer patients

Nigel Anderson,[1,2] James Jackson,[2] Michal Schneider,[3] Morikatsu Wada,[2] Jennifer Smith,[4] Maureen Rolfo,[2] Maziar Fahandej,[2] Daryl Lim Joon,[2] Vincent Khoo[5]
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Objectives: Modern radiotherapy plays an integral role in head and neck cancer treatment and the multidisciplinary management of this traditionally complex patient population. Quality outcomes are very much dependent on precision treatment and optimal treatment tolerance. Precise, individualised treatment has enabled treatment intensification to levels never seen before. As a consequence, predictive measures to ensure optimal treatment tolerance are critical. The aim of this study was to develop a predictive tool for nutritional and dysphagia management via PEG feeding, to facilitate early prognostication and timely initiation of individualised nutritional and supportive care programs in head and neck cancer patients.

Methods: One hundred and thirty nine consecutive patients ($N = 139$) with locally advanced SCC of the head and neck, treated with definitive radiotherapy $\pm$ chemotherapy were retrospectively analysed. Patients were required to have been offered a prophylactic PEG and prospectively followed up by a dietitian for at least 8 weeks post-radiotherapy completion. Multiple patient, clinical, tumour and dosimetric measures were analysed for prognostic significance associated with PEG feeding intensity.

Results: Statistically significant increase in PEG feeding duration was observed in multiple prognostic factors – T-Stage ≥ 3 ($P < 0.001$), Level 2 nodal disease ($P < 0.001$), Cervical Oesophagus D50 ($P = 0.0002$) and Superior Pharyngeal Constrictor Muscles ($P = 0.0089$). Multiple predictive models were generated based on various permutations of these significant variables.

Conclusions: A PEG predictive tool may enable early identification of patients "at-risk" of significant dysphagia, better facilitating patient and multidisciplinary decision transparency, whilst ensuring timely initiation of care pathways to optimise treatment intent and patient survivorship.

The robustness of VMAT to anatomical changes in radiation therapy to bilateral head and neck

Brittany Callton, Brianna Minns, Darcy McNaughton
Royal North Shore Hospital, St Leonards, Australia

Objectives: To analyse the dosimetric robustness of Volumetric Modulated Arc Therapy (VMAT) to anatomical changes during head and neck radiotherapy, to determine whether a repeat CT scan and/or replanning during treatment is necessary. Our research tests the hypothesis that, VMAT's continuous delivery of arc therapy is more robust to patient contour difference and weight loss than our previously used static beam techniques.

Methods: A retrospective analysis was performed on 40 patients who had completed bilateral head and neck VMAT. Each subject received an initial planning CT and repeat CT at fraction 15. The original plan was copied onto the repeat CT data set to identify any dosimetric variance. Differences in dose statistics between the two scans were collected for organs at risk and target volumes. These differences will be analysed to determine statistical significance.

Results: Preliminary results show that only 3 of 40 patients were replanned after the fraction 15 scan evaluation (7.5%). Findings to date suggest there are minimal differences in dose (cGy) and structure volume (%) between the original planning CT scan and the re-scan. Tests of significance will indicate whether these differences are clinically significant and thus indicate if a fraction 15 rescan is necessary at the NSCC.

Conclusions: Evaluation indicates that the fraction 15 rescan is no longer required, as very few fraction 15 repeat CT scans actually lead to a patient being replanned mid-treatment. Further analysis will aid in identifying if this is due to the robustness of a VMAT technique.

Friday 24 March, 1100–1230 Combined MRS – Communications (Reach Across)

Reaching a paperless referral future

Marnie Rawle, Amanda McKinney
Queensland Health, Mackay, Australia

Radiology department workflows are being impacted by the introduction of electronic medical records (EMR) and accompanying electronic ordering of radiology examinations. Radiology staff and their reliance on paper referrals are being tested with the removal of, or reduction of, paper in the referral process. Can we really reach a place in which paper is not a routine requirement in the performance of medical imaging examinations?

We implemented a whole of department paperless radiology workflow using our existing Radiology Information System (RIS) over 18 months ago and wish to share our good and not so good experiences involved in the process.

Reaching out from beyond the mask to enhance clinical communication experiences of undergraduate students

Donna Matthews
University of South Australia, Adelaide, Australia

Objectives:

- Describe an innovative simulation approach termed Mask-ED.
- Explore student's experiences when engaging in a patient care session prior to their first extended placement.

Methods: Students attending a pre-clinical workshop prior to the first 2 weeks of placement participated in a 45 min patient care session. The focus was on communicating with a patient employing the Mask-ED simulation aid, who presented in a wheelchair for their first radiation therapy treatment to the thorax. In this simulation technique the educator wears a silicone-mask and body parts, transforming them into a female character. A novel feature of this method is that unlike a patient actor, the disguised masked educator provides "unmasked" feedback at the end of the session.[1] The premise of this approach is that the masked educator has domain specific knowledge related to the simulation scenario and can transmit this to learners in a way that is engaging, realistic, spontaneous and humanistic. Students completed surveys before and after the session, to assess their communication skill perceptions.

Results: Survey results indicated students' knowledge of how to communicate with a cancer patient and confidence to interact increased. Completing this preclinical workshop session has increased student preparedness to care for cancer patients. The session appeared to provide an enhanced educational experience prior to the first extended radiation therapy clinical placement.

Conclusion: Integration of simulated-based learning into radiation therapy educational programs presents an opportunity to enrich learning experiences of undergraduate students and potentially improve quality of patient care.

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Raising the profile of radiation therapy in the cancer community – the Targeting Cancer Campaign

Jenna Dean
Mid North Coast Cancer Institute, Port Macquarie, Australia

Radiation therapy is a component of cure in around 40% of cancer patients. However, radiation therapy as a useful treatment for cancer cure and palliation has traditionally had a lower profile compared to surgery and systemic therapies (chemotherapy). This has likely contributed to the utilisation rates for this form of treatment being lower than ideal, even in developed countries such as Australia and New Zealand. The issue is compounded by geographic distance and lack of knowledge of referring general practitioners (GPs) and specialists about the effectiveness of radiation therapy as a cancer treatment.

The Faculty of Radiation Oncology at the Royal Australian and New Zealand College of Radiologists (RANZCR) launched an initiative in October 2013 aimed at raising the profile of radiation therapy as a sophisticated, highly targeted, effective and cost-effective form of cancer treatment that often cures patients and/or improves their quality of life. This is a tripartite initiative with the ASMIRT and ACPSEM and we need all radiation oncology professionals to get involved.

The Targeting Cancer campaign, which aims to de-mystify radiation therapy and highlight the safety and quality of modern treatment, is centred on an informative website aimed at consumers and family members as well as GPs. It contains up-to date information about the types, benefits and side effects of radiation therapy, including videos and patient stories.

In this session, we hope to engage our fellow radiation workers with the Targeting Cancer campaign to help us promote awareness in the general community about radiation therapy. Through traditional and social media, the campaign has already reached in excess of 10 million people. Utilising social media is an easy and highly effective way we can all support the Targeting Cancer campaign.

Reaching beyond the classroom to teach communication skills to radiation therapy students in New Zealand

Gay Dungey, Hazel Neser
University of Otago, Wellington, New Zealand

Objective: Communication skills training has been progressively integrated into the Bachelor of Radiation Therapy programme in New Zealand throughout the last 3 years. This study aimed to explore students' perceptions of their learning from participation in communication skills workshops. The purpose was to expose students to a variety of common clinical situations that they could encounter.

Method: Common scenarios from the radiation therapy setting were developed, using trained actors as a standardised patient, staff member or member of the public. Students were briefed on their scenario and then required to manage their interactions appropriate to its context. A staff member and peers observed each student's interaction via a digital screen and assessed the student's performance in six key skills. Each student was videoed so that they could review their own interaction. Verbal and written feedback was given to each student. Students evaluated their experience using a 5-point Likert scale.

Results: Quantitative and qualitative data were collected from 116 of 150 students who consented to participate. Three main themes emerged from the data: the value of learning from peers; preparation for the clinical environment; and the ability to self-reflect. The quantitative data indicated that students' perceptions of the tool are positive and an effective learning experience.

Conclusions: Students' perceptions of participation in the communication skills workshops, with the integration of trained actors, are positive and students perceive the scenarios to be helpful for their learning. Opportunities are indicated to further develop of students' ability to self-reflect.

Improving efficiency of image approval to enhance treatment accuracy

Jason Chan
National Cancer Centre Singapore, Singapore, Singapore

A retrospective study was performed to examine the Portal Images (PIs) approval rates within first 5 days, from January 2015 to August 2015. The results were unsatisfactory and causes were determined by using Ishikawa Cause and Effect diagram. Three PDSA were applied. In PDSA 1, a letter of reminder was sent to all Radiation Oncologists (ROs) by the Head of Department to emphasize the importance of approving the PIs in a timely manner. In PDSA 2, periodic emails were sent out by Radiation Therapists to remind the ROs to approve the PIs. In PDSA 3, a 6 month's pilot project was done, where the Head and Neck (H&N) APRT was trained and tasked to approve the H&N PIs, together with ROs. PDSA 1 & 2 showed minimal improvement. PDSA 3 results was solely based on PI approval for H & N images. Based on the 6 months study, 177 images were submitted for image review and results were favourable to the APRT where the approval rate is 90% versus ROs' approval rate of 15%. A sustainable measure of role replacement in approving PIs was therefore adopted. APRT approving PIs is a role expansion for radiation therapists, and with the shared responsibility of APRTs along with the ROs in PI approval, the issue of timely approval of PIs will be improved, ensuring safe and accurate treatment delivery.

Relating and communicating with empathy: reaching out by reaching in

Pamela Rowntree, Debbie Starkey
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Empathy is a personal trait which is viewed as an essential component of patient-centred care across the health professions. The patient is a person with needs and wants and emotions. They wish to be treated with respect and understanding, and have clear communications with their health care provider.

The literature on this topic it is often written from the perspective of walking in the patients shoes. Indeed some articles and books on the subject have been written as a result of a doctor, nurse or other health professional becoming a patient, and their narrative of the treatment and care they received. The book, A Taste of My Own Medicine, was written by Dr Edward Rosenbaum based on a diary he had kept as a patient with throat cancer, and later became a successful movie called The Doctor starring William Hurt.

Understanding the need for empathy from first-hand experience as a patient is certainly one way in which it can be learned. For undergraduate students the experiential opportunities are more related to viewing videos, discussing scenarios and attending clinical placements where they see the patient staff interactions and can reflect on the outcomes.

This presentation will provide an overview of the way in which students are encouraged to reach in to the patient's needs and feelings by walking in their shoes, in order to reach out to them with understanding and compassionate care.

Friday 24 March, 1100–1230
New developments in oncology and imaging (Reach Beyond)

Liver elastography – the new technology evaluating liver disease

Marilyn Zelesco
Fiona Stanley Hospital, Perth, Australia

Chronic liver disease (CLD) is a substantial worldwide problem. The major consequence of CLD is the increasing deposition of fibrous tissue within the liver, leading to the development of cirrhosis. Cirrhosis may then progress to portal hypertension, hepatic insufficiency, or the development of hepatocellular carcinoma (HCC). The World Health Organisation (WHO) states that the global rate of cirrhosis at autopsy ranges from 4.5–9.5%.[1]

The ability to diagnose and accurately stage the degree of liver fibrosis is important to predict patient prognosis, and hence impact on the potential therapeutic pathways on a case by case basis. The process of fibrosis is dynamic, and studies have shown a regression of fibrosis is possible with treatment of the underlying condition.[2]

Previously, the only method of staging liver fibrosis was liver biopsy. However, not only are biopsy complications potentially severe in 1% of cases, the samples represent only 1/50 000 of the liver volume.[2] Therefore, non-invasive methods for liver fibrosis assessment have been an intense field of research, including elastography by either ultrasound or magnetic resonance imaging.

This paper considers both methods, with an emphasis on the ultrasound technique in clinical practice.

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PSMA-PET- seeing what others can't

Sharyn Bowe, Christy Glenn
Barwon Health, Geelong, Australia

Prostate cancer is the leading cause of cancer related deaths in the western world.[1] Accurate staging at initial diagnosis and evaluation of recurrent disease is vital in determining the most appropriate treatment pathway. Prostate Specific Membrane Antigen (PSMA) is a protein that is normally present in all forms of prostate tissue, but is overexpressed in prostate cancer cells as well as cancerous lymph nodes and bone metastases.[2] Using a PET scan, with a Gallium^{68} tracer that binds to PSMA is a highly effective imaging technique that has the ability to selectively identify and localise metastatic prostate cells throughout the body.

This presentation discusses the effectiveness of PSMA-PET studies in the radiotherapy planning process and provides clinical examples of how this emerging imaging modality has affected the treatment management for a number of patients at the Andrew Love Cancer Centre, Geelong.

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Reaching beyond Australia – the ASMIRT travel scholarship

Natalie Meagher
Radiation Oncology Queensland, Paddington, Australia

The Australian Society of Medical Imaging and Radiation Therapy (ASMIRT) annually awards four International Travel Scholarships at the end of each calendar year. Two are provisional scholarships offered to graduates and the other two are offered to one qualified radiation therapist and one radiographer. This presentation is to promote the ASMIRT Travel Scholarship through knowledge learnt from the American Society of Radiation Oncology (ASTRO) AGM 2016. It will also provide insight to two major radiation therapy centres in Florida; one of which is a proton centre.

The experience of ASTRO along with the site tours in Florida will not be happening until September, 2016 and so specific details of the presentation are not known. However the calibre of presentations and networking opportunities available at the conference along with the knowledge to be brought home from Florida will all be valuable information that I would love to 'reach out' and share with my fellow radiation therapists across Australia.

Friday 24 March, 1330–1500
Medical Imaging – Emergency/Trauma (Reach Beyond)

Advances in emergency imaging

Nick Woznitza[1,2]
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[2]*Canterbury Christ Church University, Canterbury, United Kingdom*

Maximising the contribution of all practitioners in the emergency care team is key to improved patient care and outcomes. Radiographers, with their unique skills and position at the interface between patient, referring clinician and imaging, have been shown to streamline patient pathways, reduce diagnostic errors and enhance efficiency. The complete patient pathway will be examined; presentation, assessment, diagnosis, management and discharge with opportunities for radiographers to improve care highlighted, based on a comprehensive review of the evidence.

Which patient presentation types require the most imaging? An analysis of emergency department imaging requests

Nadine Thompson,[1] Jason Chan,[2] Michelle Moscova,[3] Amith Shetty,[1] Doungkamol Sindhusake,[4] Noel Young[1]
[1]Westmead Hospital, Sydney, Australia [2]University of Sydney, Sydney, Australia [3]University of New South Wales, Kensington, Australia [4]Western Sydney University, Parramatta, Australia

Objective: This study aims to explore the utilisation of imaging with respect to patient presentation types in the Emergency Department at Westmead Hospital, a major teaching hospital in Western Sydney. This study further analyses a significant increase in imaging requests per patient presentation observed in August 2012 in a previous study.[1]

Methods: Imaging requests for patients in the Emergency Department from August to October 2011–2015 were reviewed from the Emergency Department Information System. The patient presenting problem (as documented at time of triage) were categorised into groups so that the imaging requests could be analysed with respect to patient presentation types.

Results: The data set includes 98925 imaging requests. Imaging requests increased by 40% from 2011 to 2012, "Trauma" was responsible for 31% of the increase in imaging requests.

Conclusion: Imaging requests for patients with the assigned presenting problems grouped to "Trauma" were responsible for the increase in imaging requests in August 2012 observed in a previous study 1. Each year trauma accounted for the vast majority of imaging requests as a total and also for both x-ray and CT.

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Imaging investigations of non-accidental injury in vulnerable persons

Edel Doyle
International Association of Forensic Radiographers, Geelong, Australia

As Radiographers, it is vital that we are aware of the role that we may play in the investigation of suspected NAI and that we understand the medicolegal considerations involved. The International Association of Forensic Radiographers published best practice guidelines in 2014 which outline the responsibilities of a Radiographer undertaking a forensic examination.[1]

Forensic imaging refers to any radiographic examinations that answer questions of law, which includes imaging of suspected NAI cases. Non-accidental injury can occur in any vulnerable person. This group of patients includes children, the elderly, those which a disability and those in care or dependent on a carer. Therefore, it is important that all radiographers are aware of the potential for NAI and the implications involved.

Knowledge of best practice in relation to the provision of imaging of suspected NAI is essential to reduce the risk of the imaging having to be repeated. It is also vital to the legal investigation that injuries which are suggestive of NAI are confirmed or excluded because the safety of the vulnerable person is of paramount importance. Appropriate imaging modalities which will address this clinical concern must be utilised. Strict adherence to policies and procedures to ensure that the images are admissible in court is vital to the safety of the vulnerable person. Ensuring the chain of evidence is a key part of this.

This presentation will discuss current international 'best practice' guidelines regarding imaging protocols, as well as legal considerations when undertaking forensic imaging which includes investigations of suspected NAI.

References

1. Society and College of Radiographers, International Association of Forensic Radiographers. London: SOR, UK; 2014.

Concussion in sport; what is the role of imaging?

Sharmaine Mckiernan,[1] Lauchlan Carey,[1] Peter Stanwell,[1] Andrew Gardner[2]

[1]University of Newcastle, Newcastle, Australia [2]Hunter New England Mental Health Service; Calvary Mater Hospital, Newcastle, Australia

Objectives: Concussion is a pathophysiological process caused by biomechanical forces transmitted to the brain. The majority of concussions in sport occur without loss of consciousness or overt clinical signs, making concussion difficult to detect. Whilst most recover from concussion symptoms within several days, there is the potential to develop long lasting symptoms which impact quality of life. The objective of this research is to investigate the role medical imaging has in the detection and management of sport related concussion.

Methods: A review of published literature examining the role of Magnetic Resonance Imaging (MRI), Computed Tomography (CT) and Doppler Ultrasound in the diagnosis of sport related concussion was conducted.

Results: The majority of studies suggest conventional CT and MRI techniques to be unremarkable in the assessment of sport related concussion. These techniques are used to exclude intracranial haemorrhage and cerebral contusions. More advanced MRI techniques such as Diffusion Weighted Imaging, Diffusion Tensor Imaging, Magnetic Resonance Spectroscopy and Arterial Spin Labelling Perfusion have demonstrated brain abnormalities in some patients.

There is growing interest in the use of Transcranial Doppler Ultrasound to assess blood flow velocities in the middle cerebral artery and hence investigate cerebrovascular reactivity following exposure to sport related concussion. Further research into the clinical utility of this technique is ongoing.

Conclusion: The complex pathophysiology of concussion presents a diagnostic challenge to clinicians. Medical imaging may play an important role in supporting clinical assessment and managing return to play following sport related concussion. Further validation of these techniques is required.

Friday 24 March, 1330–1500 Radiation Therapy – Patient Wellness & RT Care (Reach Beyond)

Exercise, patient wellness and improved oncology patient outcomes

Rob Newton[1,2]

[1]Exercise Medicine Research Institute, Edith Cowan University, Joondalup, Australia [2]The University of Queensland, Centre for Clinical Research, Brisbane, Australia

Several large studies have revealed a 0.6 to 0.4 hazard ratio for all-cause mortality and cancer specific mortality as a result of the patients undertaking a relatively modest amount of physical activity. Increasingly, exercise is being viewed as a medicine, in part because it produces substantial shifts in the hormonal, immune, cytokine, thermal, and blood perfusion environment systemically within the body including locally within tumour tissue. But exercise is not a single medicine and how it is prescribed in terms of mode and dosage has quite dramatic impact on the effects. The observational studies broadly assessed physical activity with some including qualitative measures of intensity. However, it is reasonable to expect that tailored exercise medicine should result in even greater survival benefit as it could target the specific cancer and treatment related issues facing the individual patient. Such survival improvements are in addition to the considerable benefits in terms of quality of life, physical function and ameliorated treatment side effects that have been demonstrated in a growing number of randomised controlled trials. There are currently two large international trials one in colon cancer and the other in advanced prostate cancer where the primary outcome measure is overall and progression free survival. Both these studies include detailed examination of the biological mechanisms by which exercise actually suppresses tumour progression. This presentation explores these mechanisms and details the specifics of exercise prescription for different cancer types and stages.

Reaching new heights in patient care

Nicholas Livio, Melanie Lane
Liverpool and Campbelltown Cancer Therapy Centres, Sydney, Australia

The Radiotherapy Patient Care Group was formed at Liverpool and Macarthur Cancer Therapy Centres which, along with the introduction of the Essentials of Care framework, has set about formalising, developing and fostering a workplace culture of patient care innovation.

Both staff and patients were surveyed to determine how to best develop new and existing wellness and holistic care initiatives. A NSW Agency for Clinical Innovation Patient Experience Tracker (ACI PET), a portable electronic feedback system was used in conjunction with physical surveys to collect the information. An online Staff Satisfaction Survey was also used to assess staff well-being, as this is often linked to patient satisfaction.[1,2]

Respondents identified numerous methods that could be used to improve patient's experiences and, as a result, numerous changes have been made across both sites. This includes celebrating the completion of patient's treatments with multiple initiatives, hosting holiday and 'fun' themed days, updating facilities and improving comfort for patients while they are in the department. Additionally, a departmental logo and mission statement were developed and prominently displayed.

Surveys are currently being conducted to determine what impact these strategies have had on patient's experiences. So far anecdotal feedback has been very positive. Early reports indicate that there has been an improvement in patient compliance and morale and a decrease in patient stress. Staff have also interviewed 17 patients over a 2 weeks period to create "Patient Experience Stories" which will be analysed and used to further improve patients' experiences in the future.

References

1. Boorman S. NHS health and wellbeing review: interim report. London: Department of Health, 2009.
2. Royal College of Physicians (RCP). Work and wellbeing in NHS: why staff health matters to patient care. London: RCP, 2015.

What do radiation therapists in Australia and New Zealand know about patient anxiety? Survey results

Kelly Elsner,[1] Diana Naehrig,[2] Georgia Halkett,[3] Haryana Dhillon[2,4]
[1]Central Clinical School, Sydney Medical School, University of Sydney, Sydney, Australia [2]School of Psychology, Faculty of Science, University of Sydney, Sydney, Australia [3]School of Nursing, Midwifery and Paramedicine, Faculty of Health Sciences, Curtin University, Perth, Australia [4]Centre for Medical Psychology and Evidence-based Decision-making, University of Sydney, Sydney, Australia

Objectives: Many people undergoing radiation therapy experience anxiety. This can lead to emotional stress for patients and radiation therapists (RTs), difficult communication, delays in procedures, limited co-operation, lower quality service delivery, and treatment errors. The aim of this research was to determine RT knowledge and confidence in detecting and managing patient anxiety.

Methods: An online survey was developed, consisting of: demographic data; patient vignettes; two existing survey tools (tested in radiation therapy research); and a burnout questionnaire (ProQoL5). The survey was distributed to Australian, New Zealand (NZ) and Canadian RTs via email, and promoted by professional bodies, research networks, and social media. University of Sydney Human Research Ethics Committee granted ethics approval. Descriptive analysis of Australian and NZ results are reported here.

Results: A total of 118 responses (Australia 89, NZ 29) were received over 11 days, indicating substantial interest in this research. Participants were mostly female, 84%, and professional experience was between 1 and 41 years. RTs demonstrated the ability to detect patient anxiety and select appropriate management strategies, the most endorsed was acknowledgement of concerns and encouragement to express these. When dealing with patients showing signs of anxiety, 9% of respondents rated themselves as 'very confident' and 77% as 'somewhat confident'. RTs reported a strong 43% or moderate 36% need for Communication Skills Training (CST).

Conclusion: RTs indicate a strong interest in further training in CST, psychosocial support, and screening processes. These results will facilitate a systematic approach to up-skill RTs to improve psychosocial care outcomes for cancer patients.

References

Please note this abstract uses preliminary results as the survey is currently recruiting through August and September 2016. Actual results will be presented in March 2017.

Reach out: radiation therapists individually preparing patients for radiotherapy reduces patient anxiety

Georgia Halkett,[1] Moira O'Connor,[1] Sanchia Aranda,[2] Michael Jefford,[3] Susan Merchant,[4] Debra York,[1] Robert Kane,[1] Penelope Schofield[5]
[1]Curtin University, Perth, Australia [2]Cancer Council Australia, Sydney, Australia [3]Peter MacCallum Cancer Centre, Melbourne, Australia [4]Royal Adelaide Hospital, Adelaide, Australia [5]Swinburne University of Technology, Hawthorn, Australia

Objectives: This study aimed to determine whether a radiation therapist (RT) led education intervention for women with early breast cancer reduced anxiety and depression, decreased concerns about radiotherapy, increased patient knowledge of radiotherapy and improved patient preparedness.
Methods: A multiple baseline study was conducted. Usual care data were collected prior to starting the intervention at sites in Victoria, South Australia and Western Australia. RTs participated in communication and consultation skills training prior to delivering the intervention. Patients in the intervention group received two consultations with an RT, prior to treatment planning and on the first day of treatment. Radiation therapists focused on providing sensory and procedural information and addressing patients' pre-treatment anxiety. Outcome measures included anxiety and depression, concerns about radiotherapy, patient knowledge of radiotherapy and patient preparedness. Data were collected on four occasions: after meeting with radiation oncologist, prior to planning CT, on the first day of treatment and after treatment completion. Generalised Linear Mixed Models were used to analyse the data.
Results: Usual care was delivered to 218 participants and 190 received the intervention. The intervention reduced anxiety at the commencement of treatment and after treatment completion ($P < 0.05$). The intervention also reduced patient concerns about radiotherapy (prior to treatment planning and at treatment commencement), increased knowledge about RT (prior to treatment planning and treatment commencement) and improved patient preparedness (at all subsequent time points).
Conclusion: Additional education and support with RTs reduced patient anxiety and prepared them for treatment. Methods of implementing this intervention need to be explored.

Friday 24 March, 1330–1500 Combined MRS – Workforce & culture (Reach Within)

What's happening behind closed doors? The impact of bullying in healthcare settings

Andrea Thompson
University Of Auckland, Auckland, New Zealand

Have you ever experienced or observed a bully in action? It is estimated that one in four people will experience bullying at work (Olsen, 2012). Bullying is not uncommon in education and health organisations. International research provides evidence that a marked percentage of employee stress-related illness is associated with workplace bullying (Hurley, Hutchinson, Bradbury & Browne, 2016). Workplace bullying is defined as "unwanted and unwarranted behaviour, that a person finds offensive, intimidating or humiliating and is repeated so as to have a detrimental effect upon a person's dignity, safety and well-being" (Wave, 2012 p.2). The act of bullying is frequently due to a power differential between the perpetrator and victim (Askew, Schluter, & Dick, 2013). This presentation intends to enhance your understanding and awareness of workplace bullying. The notion of workplace bullying will be briefly explored, to include, how to identify a bully, the challenges and implications of bullying and legal issues.

References

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The emotional intelligence of Australian radiographers through the lifecycle: from student to chief and beyond

Grace Eccles,[1] Stuart Mackay,[2] John Robinson,[1]
Sarah Lewis[1]
[1]University of Sydney, Sydney, Australia [2]The University of Liverpool, Liverpool, United Kingdom

Objectives: Trait Emotional Intelligence (EI) is hypothesised as a predictor of workplace performance and organisational leadership. There has been recent research investigating the value of Trait EI in radiography, given the personal and emotive nature of professional work. The aim of this study was to measure and map the Trait EI scores throughout the "lifecycle" of Australian radiographers, from student to experienced practitioners.

Methods: The EI scores of students ($n = 95$), inexperienced practitioners ($n = 94$), experienced practitioners ($n = 348$), chief radiographers ($n = 107$), clinical supervisors ($n = 24$), application specialists ($n = 24$) and academics ($n = 16$) were measured via the Trait Emotional Intelligence Questionnaire – Short Form (TEI-Que-SF), producing scores for Global EI, Well-being, Self-Control, Emotionality and Sociability. Ethics approval was granted for this study and the data was collected via an online survey.

Results: A Kruskall-Wallis test identified differences between samples for Global EI, Self-Control and Well-being, with students demonstrated consistently lower scores than qualified radiographers ($P = 0.001$). Chief radiographers demonstrated higher scores for Well-being than inexperienced radiographers, academics and students ($P = 0.001$). The greatest positive change in Global EI was seen between radiographers of 1–10 years' experience.

Conclusion: There is a steady increase in the Global EI scores for Australian radiographers through their professional "lifecycle" with a plateau at 10 years of clinical experience. Chief radiographers had the highest scores for Well-being, which is consistent with prior research that indicates the importance of EI in organisational leadership.

Taking it 'personnel-y': the importance of boosting morale in the healthcare team

Hannah Stubbings
Royal Brisbane and Women's Hospital, Brisbane, Australia

Even with ample equipment and other physical capital, it is the highly skilled and specialised staff that are the hardest resources to develop, motivate and retain and thus often the differentiating factor in an organisation's success.[1] Therefore, it is paramount to create a working environment where morale is high in order to maximise the performance of staff.

Morale simply refers to the spirits of a group or individual, and can be seen by their confidence, attitude, discipline and willingness to perform tasks.[2] Low morale can have a big impact by decreasing productivity, encouraging higher absenteeism, increasing patient dissatisfaction with healthcare providers and increasing employee turnover.[2] This presentation explores current literature on the importance of morale and presents practical methods to boost morale in a healthcare setting. These techniques include coaching for managers, communication and relationship building strategies, mentoring and clinical supervision, peer reflections, team goal setting and training targeted to an individual's motivations. In a busy healthcare environment, clinical care is often prioritised over non-clinical development such as boosting team morale, however an engaged and motivated workforce is vital to a department's success.

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2. Parke J. High Cost of Low Staff Morale in Healthcare [Internet]. Linkedin. 2016 [cited 10 August 2016]. Available from: https://www.linkedin.com/pulse/high-cost-low-staff-morale-healthcare-jeff-parke

Positive outcomes from an adverse event in radiography

Gary Denham
Hunter New England Health, Taree, Australia

"You've made a mistake!" These words from a colleague send chills through your body. You have made an error that results in adverse events for two patients. Your mind scrambles for the details of what happened. Possible repercussions of the incident are already being formed by your imagination. It is the moment that no medical radiation professional wishes to experience.

When an adverse incident occurs it must be investigated and a root cause analysis performed to determine any underlying system failures. Recommendations drawn from the investigation should bring about change to prevent similar incidents happening again. Involvement in an investigation into an adverse event is stressful due to the fear of blame and litigation, the sense of guilt and the lack of support.

This presentation details an incident event that occurred at a rural hospital in NSW, the root cause analysis investigation and the resulting positive changes to the organisation and staff after the event.

"Why don't doctors report clinical incidents?"

Arjun Shivananda
Sir Charles Gairdner Hospital, Ocean Reef, Australia

Background: Clinical incident reporting is important to learn from errors and to improve systems. However doctors rarely report incidents and at SCGH, of all the incidents reported in 2015, doctors reported 2.1%.

Aim: To determine the root causes for poor reporting rates by doctors and to implement targeted interventions.

Analysis: A cross-sectional survey was designed to determine the level of awareness about incident reporting and was completed by 92 doctors including consultants. A focus group with 20 doctors was held where an affinity diagram was used to determine the root cause for the lack of incident reporting by doctors. The ideas generation session utilized a solution matrix to rate solutions on an impact vs do-ability scale.

Outcomes: Over 95% of doctors had never referred to the policy and only 45% were confident in identifying an incident. 73% were not aware about the reporting process. Only 7% of doctors had reported a clinical incident. The RCA identified several potential root causes which were ranked as follows; lack of awareness on reporting process, negative connotations associated with reporting, lack of awareness on responsibility, lack of knowledge on identifying incidents and a lack of feedback.

Conclusion: In keeping with literature, our study also showed that <10% of doctors had reported an incident. The major barriers were a lack of knowledge of the process, belief that reporting has no value, often related to poor feedback and the negative stigma around reporting. Based on this information, innovative interventions were implemented to encourage reporting by doctors.

Friday 24 March, 1330–1500 Medical Imaging – CT 2 (Reach beyond)

Know stroke, know the signs, act in time!

TJ Singh
Neurological Intervention and Imaging Service of Western Australia (NiisWA), Perth, Australia

In the last year there has been 5 randomised trials showing level 1 evidence for stroke thrombectomy in improving outcomes for acute stroke. This is time critical and has spurred the need for hyperacute stroke triage, imaging and intervention. This talk will focus on the evolution of imaging for acute stroke and the current status of radiological guided stroke intervention.

Patient preparation for CTCA with heart rate control premedication: a best practice implementation project

Gordon Mander
Toowoomba Hospital, DDHHS, Queensland Health, Toowoomba, Australia

Background: CTCA patient preparation with Heart Rate (HR) control premedication is employed in CT departments across Australia. However, the methods of administration vary widely between institutions and do not always follow best practice. This study aims to identify best practice in HR control premedication and implement appropriate measure in order to achieve best practice in a CT department at a regional hospital in Australia.
Methods: The Joanna Briggs Institute have validated the Practical Application of Clinical Evidence System (PACES) and Getting Research into Practice (GRiP) audit and feedback tools to assist with best practice implementation projects. This project used these tools, which involve three phases of activity – a pre-implementation audit, reflecting on results and implementing strategies to address non-compliance and, conducting a post-implementation audit to assess the outcomes.
Results: A baseline audit identified non-compliance for the majority of measured audit criteria. Following implementation of GRiP, the post implementation audit showed Compliance with best practice across all audit criteria (see Figure 1). Of particular note, an evidence-based institution-specific guideline was created.
Conclusion: After the PACES and GRiP tools were employed, the implementation of an institution-specific policy regarding HR control premedication in CTCA and activity consistent with best practice was achieved.
Supporting documents:

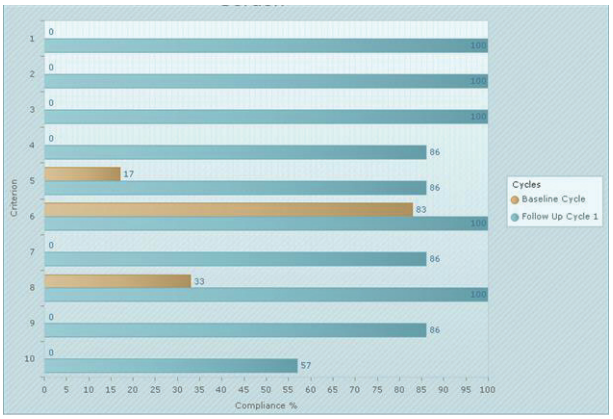

Figure 1: Compliance with best practice audit criteria in follow up audit compared to baseline audit (%)

Impact of reconstruction techniques and mAs reduction on image quality for chest computed tomography

Cláudia Sá dos Reis
Curtin University, Perth, Australia

Purpose: To analyse the effect of reconstruction techniques and mAs reduction on the visualisation of anatomical structures of lung Computed Tomography (CT) images using an anthropomorphic chest phantom with nodules.
Methods: CT images were acquired using a phantom and manipulating mAs and reconstruction techniques. Image quality (IQ) was analysed with two methods: visual/perceptual using 5 observers and an objective (edge gradient calculation) to calculate the sharpness of the structures. Dose (CTDi) was recorded. Wilcoxon Signed Rank test was used to compare the data from the visual analysis. *P*-values for the reconstruction techniques and mAs values were corrected (Bonferroni-Correction method). For the reconstruction techniques and for the mAs *P*-values of <0.0083 and <0.0167 were considered significant, respectively.
Results: The Wilcoxon-Signed-Rank-Test showed no significant difference between the reconstruction techniques ($P < 0.05$) and no significant difference between any of the mAs values when Bonferroni correction was used. However, for 10 mAs the observers scored differently, depending on which structures they assessed visually. This assumes that mAs should be considered, depending on the clinical indication. When FBP was compared with SAFIRE, the visualisation of anatomical structures was less defined when using FBP at 10 mAs in axial images. This is supported by the calculated edge gradients due to the noise increase.
Conclusion: The visual measures of IQ were largely unaffected by reconstruction techniques or mAs values. However, further work is needed for a better understanding of visual and clinical value of reconstruction techniques at lower doses.

Because accidents happen

Melanie Rosenberg
Royal Perth Hospital, Perth, Australia

Computed Tomography (CT) has revolutionized the field of imaging and medicine since its introduction in the 1970's. One of the major changes in imaging applications is the extensive use of multidetector CT (MDCT) as a major diagnostic tool in multi-trauma patient care in the Emergency Department (ED). MDCT has proved to be a quick and accurate tool for imaging the extent of injury. The Trauma Service at Royal Perth Hospital sees more than 6000 admissions a year, more than 115 cases a week, and almost half of these patients are a result of some form of road trauma.[1] At RPH we also see gunshots, stabbing injuries, sporting injuries, falls, assaults and work related injuries.
In this presentation I will discuss our CT trauma protocols, trauma mechanisms and the resulting injuries. Cases presented will include facial fractures, spinal injuries, abdominal and pelvic injuries, thoracic trauma, gunshot injuries and life threatening vascular injuries.

Reference

1. Health Department of WA RPH Hub

Friday 24 March, 1530–1715 Medical Imaging – Quality (Reach Beyond)

Radiation dose reduction: reaching beyond traditional practice

Madeleine Shanahan
RMIT University, Bundoora, Australia

Background: A professional capability of Medical Imaging practitioners is to understand and apply radiation dose reduction methods. Whilst radiographic principles offer radiation dose reduction methods for practice, typically these are presented as theoretical understanding, rather than direct application in radiography education.
Objectives: To reach beyond theory so that students are ready to apply dose reduction techniques in practice, radiation dose measurements were acquired using Projection VR™ (a virtual radiography simulation) and dosimeter for two radiation dose reduction methods (15% rule and exposure (density) maintenance formula).
Methods: Entrance skin dose measurements (mGy) were acquired using Projection VR™ simulation and Landauer nanoDot™ optically stimulated luminescence (OSL) dosimeters for the AP lumbar spine (simulation and phantom, respectively). Imaging parameters of SID, exposure factors and collimation were standardised across the two measurement systems.
Results: Whilst there was difference in the mGy measurements recorded for the two measurement systems, the percentage of radiation dose reduction was very similar between the two systems. Application of the two radiographic principles resulted in radiation dose reduction for AP Lumbar Spine between 15–37%. Having acquired radiation dose measurements, 91% of students (51/56) strongly agreed (45%) or agreed (46%) that they are better prepared to implement radiation dose reduction methods in practice (Ethics Approval granted).
Conclusion: Reaching beyond traditional practice and incorporating radiation dose measurements within radiography education supports students to understand and apply radiation dose reduction methods in practice. Projection VR™ provides a realistic method for assessing radiation dose reduction practice, an integral part of radiography education.

Digital radiography versus computed tomography for trauma cervical spine imaging: a dose comparison

Natasha Radbone
Logan Hospital, Brisbane, Australia

Objectives: Due to its higher sensitivity at detecting pathology, the international gold standard for cervical spine (c-spine) imaging is computed tomography (CT).[1–3] This raises the question: why do medical imaging departments continue to perform c-spine x-rays in a trauma setting? This study investigates the difference in radiation dose between digital radiography (DR) and CT of the c-spine.
Methods: Twenty-six c-spine DR examinations were retrospectively compared with twenty-six c-spine CT examinations. DR projections of the c-spine that were selected for analysis were: antero-posterior (AP), odontoid peg, horizontal beam lateral (HBL) and swimmers C7-T1 junction lateral. The dose-area product (DAP) was recorded for each resultant image. The dose-length product (DLP) was recorded for each CT examination. The DAP and DLP were then converted to effective dose (mSv) for comparison.
Results: The mean doses for the DR series excluding a swimmers projection (series-s), DR series including a swimmers projection (series+s) and CT were 0.042 mSv, 0.452 mSv and 2.3 mSv, respectively. The difference between series−s and CT was 2.26 mSv, CT being 54.8 times the dose of series−s. The difference between series+s and CT was 1.85 mSv, CT being 5.1 times the dose of series+s.
Conclusion: The considerable differences in dose between series−s, series+s and CT suggests that DR may be the more appropriate trauma c-spine investigation for patients who will not require a swimmers projection. Future research could investigate whether the higher sensitivity of CT is worth the increased dose for patients who require a swimmers projection to visualise the c-spine.

References

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3. Bailitz J, Starr F, Beecroft M, Bankoff J, Roberts R, Bokhari F, et al. CT should replace three-view radiographs as the initial screening test in patients at high, moderate and low risk for blunt cervical spine injury: a prospective comparison. J Trauma 2009; **66**: 1605–9. doi:10.1097/TA.0b013e3181a5b0 cc.

Comparison of quality of clinical information on requests before and after implementation of electronic requesting

Chelsea Castillo
Metro South Health-Princess Alexandra Hospital, Brisbane, Australia

Objectives: To investigate the change in quality of clinical information on radiology requests since the introduction of an electronic medical record with integrated electronic requesting, at a large Metropolitan Hospital.

Methods:

- Approval granted- local Ethics committee
- Three examinations (Trauma Wrist X-ray, CT Brain, Ultrasound Biopsy) -chosen to represent a cross-section of examinations.
- A pilot study was undertaken to determine required sample size.
- Cases were randomly selected from seasonally matched populations before and after implementation of electronic requesting.
- Essential clinical details for each examination (4 for Wrist and CT Brain, 3 for Ultrasound Biopsy) were determined by a panel of Consultant Radiologists. This formed the reference standard for assessing requests.
- 50 requests for each examination and time point were assessed against the reference standard by two independent assessors. A third assessor acted as an independent arbiter.
- Resultant compliance scores calculated for both pre and post implementation groups.
- A power calculation was performed to assess statistical significance of results.

Results: Preliminary findings from a small scale pilot study have shown a decrease in overall mean quality score for Wrist x-rays (2.6/4 pre, 2.2/4 post), with CT Brain remaining unchanged (2.6/4) and Ultrasound Biopsy showing a slight decrease (2.3/3 pre, 2.2/3 post). Results from the full-scale study are pending.

Conclusion: Preliminary results have indicated a decrease in request quality for x-ray Wrist and Ultrasound Biopsy yet CT has remained unchanged since implementation of electronic requesting. Results will be shared with referrers to enable improvements.

Changes in education and supervision of X-ray operators and the effect on image quality

Nathan Tosh, Leeanna Wonka
Toowoomba Hospital, DDHHS, Queensland Health, Toowoomba, Australia

One of the methods the Darling Downs Hospital and Health Service (DDHHS) uses to remotely supervise Licensed X-ray Operators (LXO's) remotely is a review of their images uploaded to the PACS system. This review system has been used daily for the last 4 years and has resulted in over 30 000 studies reviewed. Gathering data has allowed the evaluation of a number of different factors that have influenced the quality of the x-ray service provided to rural and remote communities by LXO's. Some of the factors that have shown effects according to data gathered are the length of time a LXO has been practising (closely related to the turnover of LXO staff), the amount of education and supervision provided (which includes feedback provided on examinations), and the timeliness of feedback on non diagnostic examinations. One of the benefits of compiling this data is that the effectiveness of the education provided can be evaluated empirically based on the quality of the imaging performed by the LXO's as evaluated by their Radiographic Advisors (RA's). The aim of this study was to determine whether changes in education and supervision had an effect on the quality of images produced LXO's within the DDHHS over a period of 4 years. Results of the data analysis will be presented.

Mobile CXRs: reaching within to develop a culture of reflective practice

Caitlin Haimes, Nadine Thompson
Westmead Hospital, Sydney, Australia

Objective: Quality assurance (QA) is fundamental to radiography, ensuring the best possible imaging techniques are utilised and patient dose optimised. More than 45 mobile chest x-rays (CXRs) are performed at Westmead Hospital on a daily basis and therefore a thorough QA program is required to ensure best practice. A comprehensive data export is available from all Shimadzu Dart Digital Radiography Mobile X-ray Machines. This study aims to engage radiographers in reflective practice and to remain mindful when performing mobile CXRs.
Method: Data for mobile CXRs from 01/01/2016 to 30/04/2016 was merged with a time-matched period of data from the Radiology Information System using the procedure ID. This enabled the data to be thoroughly explored. The number of exposures per CXR request were analysed according to performing radiographer.
Results: During the study period 5558 mobile CXRs were performed by 43 radiographers. On average, 85% (range 60–100%) of mobile CXRs were performed with one exposure, 15% (range 2–40%) with two exposures and less than 1% with three or four exposures. This review will be repeated with full comparative results available in March 2017 for presentation.
Conclusion: While this study did not investigate the reason for multiple exposures per procedure ID, it did highlight to the performing radiographers the number of times they expose a patient per CXR request. Encouraging reflective practice is a crucial component of QA in radiography.

Do requests for acute abdomen radiographic examinations correlate with evidence based guidelines?

Gary Denham,[1] Tony Smith[2]
[1]Hunter New England Health, Taree, Australia [2]University of Newcastle Department of Rural Health, Taree, Australia

Background: There is a common perception that erect and supine abdomen radiography is over-requested in the emergency department. Studies have shown that erect abdominal views are generally unhelpful.
Objective: The aim of this study was to investigate whether supine and erect plain abdominal radiography requested in the emergency department at a regional hospital could be justified according to clinical guidelines and the in opinion of emergency physicians.
Methods: With institutional ethics approval, clinical information was made available to three Fellows of the Australian College of Emergency Medicine regarding the presentation of adult patients referred for erect and supine radiographs for suspected bowel obstruction at Manning Rural Referral Hospital between 1/9/13 and 30/9/13. The consultants reviewed the clinical histories to determine what, if any, abdominal radiography should have been requested. Agreement between the consultants was analysed using Krippendorff's alpha coefficient.
Results: Eighty-one patients were referred for erect and supine abdominal radiography in the 3-month period and 80 cases were reviewed, with one excluded due to missing notes. The alpha coefficient was 0.276, indicating a low level of agreement between the consultants. There was complete agreement in 37 cases, 33 (41%) of which were that no radiography was necessary. In 34 cases two of the three consultants agreed with each other.
Conclusion: In spite of previous studies questioning the value of requesting erect and supine plan abdominal radiography, there is surprisingly little agreement between referring doctors and consultant emergency physicians, nor between different emergency physicians.

Reaching out for answers, what is that artefact on my abdominal x-ray?

George Sammour, Nadine Thompson
Westmead Hospital, Sydney, Australia

An unusual image artefact was observed when performing a lateral horizontal beam abdomen x-ray, on a patient with large body habitus. The electronics of the digital radiography wireless detector could be seen on the image. A radiographer with 40+ years' experience in general radiography stated that this was a back-scatter artefact from the x-rays passing through the detector and being reflected back from the aluminium cassette holder onto the image receptor. Our department's physicist was consulted and could not explain the phenomenon nor replicate it, disagreeing that back-scatter was the cause. The artefact was removed by inserting a regular grid on the back side of the detector. The vendor was consulted and their technical specialists agreed that it was due to back-scatter.

This presentation explains the artefact observed, how it was corrected and the differing perspectives of the novice and experienced radiographer, the physicist and the vendor's technical expert. Appreciating all perspectives and reaching out to others for expert knowledge and input is key to collaborative practice and improved knowledge.

Friday 24 March, 1530–1715 Radiation Therapy – Prostate (Reach Beyond)

Benefits of opposed overlapping field IMRT in pelvic radiotherapy with bilateral hip prosthesis

Ben Starvaggi, Nigel Anderson
Peter Maccallum Cancer Centre, Australia

Introduction: Patients with bilateral hip prosthesis requiring pelvic radiotherapy pose significant planning challenges due to the dosimetric inhomogeneity and imaging artefact that high density materials produce. This is particularly relevant for prostate cancer patients due to the proximity of the prostate to the prostheses. Previous studies recommend planning to avoid beam entry through the prosthesis for improved dosimetry.[1] The aim of this study is to perform a preliminary analysis of the clinical and practical viability of a new IMRT technique in these patients.

Methods: Ten patients were included for retrospective review in this pilot study. The investigative IMRT technique- using Opposed Overlapping Field (OOF) IMRT- was compared to Peter MacCallum Cancer Centre standard practice (manual adjusted fields (MAF) IMRT). This study compared dosimetry, planning efficiency, physics QA and treatment time of each technique.

Results: Preliminary results demonstrated comparable dosimetry – with PTV 95% conformity index (CI) presenting minimal discrepancy (MAF: 1.16 ± 0.04; OOF: 1.23 ± 0.08). Organ at risk doses also demonstrated equivalence- in particular, key dose indicators for both rectum and bladder (Rectum V50 Gy MAF: 41.2 ± 0.17; OOF: 44 ± 3.1; Rectum V60 Gy MAF 30 ± 2.9; OOF 30.6 ± 1.7; Bladder V70 Gy MAF: 13 ± 2.7; OOF: 12.2 ± 1.5).

Monitor unit and treatment-time discrepancy remained negligible. However, marked improvement was seen in physics QA, where 15% of individual fields treated with MAF failed predetermined gamma criteria (compared to 0% for OOF).

Conclusion: Preliminary results of the OOF technique present a promising clinical alternative. Further investigation is warranted to confirm this preliminary data, in what is a traditionally difficult cohort for accrual.

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Reach beyond – HDR brachytherapy – single fraction monotherapy for prostate cancer. An Australian first

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Purpose: High dose rate (HDR) Brachytherapy as single fraction monotherapy is a relatively new brachytherapy procedure for early stage prostate cancer and as the first department in Australia to offer this service we will provide an overview of the technique utilised and the dose volume histogram (DVH) statistics at the Royal Adelaide Hospital.

Methods: Patient selection criteria includes histologically confirmed adenocarcinoma of the prostate, T stage between T1–T2a, PSA $\leq$ 10 ng/ml, Gleason Score $\leq$ 7, TRUS volume estimate 15–50 cc, Qmax flow rate $\geq$ 13 ml/s and an eligibility cystoscopy. Treatment technique details including applicator, imaging, catheter and implant procedure. Treatment dosimetry criteria based on DVH results: Prescription of 20.0 Gy (or 19.0 Gy) 1 fraction. Prostate Target: D90 = 100–110%, V100 $\geq$ 95%, V150 $\geq$ 35%, V200 $\geq$ 10%. Urethra: Vcrit $\leq$ 1.0 cc (critical dose = 110%), V 117% $\leq$ 0.1 cc, Max Dose = 17.0 Gy. Rectum: V75 $\leq$ 1.0 cc, Max Dose $<$ 13.0 Gy.

Results: As a still emerging technique long term follow-up results are as yet unavailable from our department. DVH statistics for all patients treated using single fraction monotherapy HDR brachytherapy between April 2015 and September 2016 will be analysed.

Conclusions: HDR monotherapy as a single fraction with interactive planning and dosimetry performed using real-time TRUS-based image acquisition after the insertion of the brachytherapy catheters provides a high degree of accuracy, clear images of catheters and critical adjacent structures and good time efficiency making this is an excellent treatment modality for early stage prostate cancer.

Cone-beam CT for prostate radiotherapy – dosimetric effects of imaging frequency and PTV margin reduction

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Objective: To assess the effect of frequency of CBCT on doses delivered for prostate IMRT and investigate the possibility of reducing PTV margins using daily online IGRT.

Methods: 20 patients were planned to 74 Gy/37# with 7-field Step and Shoot IMRT using Pinnacle3 TPS. A CTV to PTV expansion margin of 7 mm was used. Daily online CBCT was performed for each patient using Elekta XVI. On completion of treatment a total of 844 CBCTs for 20 patients were exported to the TPS and fused with the plans in their treated position. The prostate, rectum & bladder were re-contoured on every CBCT. The plans were re-optimised with a 5 mm and 3 mm PTV margin. Doses delivered to the prostate, bladder and rectum were reviewed for the 7 mm plans and total dose delivered to the prostate was compared across the 7 mm, 5 mm and 3 mm plans.

Results: Daily CBCT improved CTV coverage in 90% of patients when compared to weekly imaging. Daily achieved complete CTV coverage for a median of 37 fractions across the cohort compared to 34 fractions for the weekly protocol for the 7 mm PTV plans. The daily protocol also demonstrated a reduction in rectal dose for 80% of patients. Daily CBCT maintained adequate CTV coverage when reducing the PTV margin to 5 mm, however a significant decrease in target coverage was observed for the 3 mm margin plans.

Conclusion: The application of daily online CBCT for 7-field prostate IMRT improves CTV coverage, reduces rectal doses and allows for reduction of PTV margins to 5 mm.

Developing a robust CBCT program with the Protura™ Robotic Patient Positioning System: Experience and challenges

Chris Hoyne
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Objectives: A strong image guided radiotherapy (IGRT) program is essential to the continual development of process and technique within a radiotherapy department. To enable advanced delivery techniques including Stereotactic Ablative Body Radiotherapy (SABR) and Volume Modulated Arc Therapy (VMAT) to be successfully implemented, a robust IGRT framework must be in place to facilitate the safe execution of these techniques.[1,5]
Methods: Cone beam computed tomography (CBCT) imaging was introduced as a standard imaging modality across various anatomical sites initially in an offline setting. With SABR soon to be implemented, the aim of this approach was to improve user confidence and efficiency with the matching and assessment process, whilst also offering opportunity for analysis of the soft tissue anatomy. Daily online CBCT has recently been implemented with 25 patients treated with the utilisation of the Protura™ Robotic Patient Positioning System (six degrees of freedom) for head and neck radiotherapy.[6]
Results: The application of the rotational axes has increased treatment accuracy, whilst providing valuable information on soft tissue changes. Online CBCT has since been rolled out to other applicable sites, with the option to use Protura™ analysed for clinical benefit to the patient.
Conclusion: The implementation of Online CBCT with Protura™ has allowed us to refine our practice to ensure we are ready for the implementation of new technology within our department. Exposure to soft tissue matching and analysis has provided our therapists the skillset and confidence to safely deliver treatment in a SABR setting.

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A novel intra-fraction motion management technique for prostate SABR: Clinical experiences from radiation therapists perspective

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Purpose/Objectives: SeedTracker is a software tool developed in-house to perform real-time position verification of fiducial markers during prostate Stereotactic Ablative Radiotherapy (SABR). The aim of this study is to present the clinical experiences of using SeedTracker for prostate SABR.
Materials/Methods: Using the Elekta XVI system, SeedTracker and the Pinnacle treatment planning system, monoscopic images were acquired during treatment delivery and compared to the predicted fiducial marker coordinate positions generated from Pinnacle. First, monoscopic kV images were acquired as the gantry rotates by the Elekta XVI system. Using the coordinate positions of the fiducial markers in Pinnacle, an algorithm was able to predict the position of the markers at any given image projection angle. SeedTracker was utilised for real-time monitoring of the prostate position for patients undergoing stereotactic boost treatments within the PROMETHEUS trial in Sydney South West Local Health District, Australia.
Results: Out of the 20 PROMETHEUS patients treated utilising SeedTracker there were 7 instances where interruptions were necessary. The primary benefits observed include real-time verification of patient position, the ability to interrupt and adjust isocentre location during treatment delivery if necessary and organisational efficiency gains; achieved through less Linac time required per patient.
Conclusion: Our clinical experiences with SeedTracker as a real time position verification system for fiducial markers in prostate SABR are positive. By ensuring the accuracy of treatment, SeedTracker has many observable benefits for patient outcomes as well as improvements in organisational efficiency without significantly impacting on current workflow practices or use of departmental resources.

Putting prostate intra-fraction motion on hold – assessment of an innovative motion tool

Kaitlin Reid
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Objectives: Auto beam hold is a new tool available on the Varian TrueBeam® that utilises triggered kV images to monitor the intra-fraction movement of implanted fiducial markers. The integrated tool automatically acquires kV images at a frequency based on user input, then employs an algorithm to detect the markers and determine if they reside within a user defined region of interest. Auto beam hold is utilised when the markers are outside of this defined region. The purpose of this study was to investigate the functionality and accuracy of the auto beam hold tool for prostate patients with either gold or polymer fiducial markers.
Method: Testing was conducted on the CIRS Electron Density Phantom (Model 062M) using gold and polymer seeds that were imbedded in Jelly Bolus. The parameters of the auto beam hold were tested including the interval and frequency of imaging, the search region diameter, marker detection method, kV acquisition settings and the ability to accurately hold the beam.
Results: Auto beam hold performed well for the gold fiducial markers but limited success was had with the ability of the application to detect the polymer seeds, specifically through lateral projections. Through further optimisation of the input parameters either fiducial marker type could potentially be used for prostate patients.
Conclusions: Following the successful testing of the clinical suitability of the auto beam hold application prostate patients with fiducial markers inserted will be treated with this system in place with the future intention of possible PTV margin reduction.

Hydrogel use in prostate cancer patients – indications and economic value

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Objectives: To determine the most suitable cohort of prostate cancer radiation therapy patients for implantation of a prostate-rectum tissue-spacer hydrogel and the economic impact this may have.
Methods: Baseline toxicity, quality of life and planning data was collected at follow-up from prostate cancer patients treated radically with radiation therapy between 2010 and 2015. This data was used to develop a predictive selection model for clinical use of a prostate-rectum tissue-spacer hydrogel.
Additional data was collected from patients treated with a hydrogel spacer in place. A state-based model was developed identifying the health states prostate cancer patients entered into following a course of radiotherapy with or without a prostate-rectum tissue-spacer. Costs were assigned to each of the health states providing an evaluation of the economic value of the intervention.
Results: Preliminary results are presented showing the patients most likely to develop a rectal injury following radiation therapy to the prostate, and subsequently the factors used to identify patients suitable for a hydrogel implant. Quality of life and utility outcomes are also presented along with their influence on the cost-effectiveness of hydrogel as a toxicity reducing intervention.
Conclusion: Further work is ongoing to definitively state the cost-effectiveness of hydrogel spacers. Patient selection criteria for its use should be based on local clinical data.

Friday 24 March, 1530–1715 Combined MRS – Using big data, management & service management (Reach Beyond)

Improving the patient journey: Utilising feedback from the results of a survey

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Patient satisfaction, care quality and needs are best assessed from the patients' perspective.[1,2] If this perspective is acquired and utilised when making decisions affecting patient care, there is evidence that overall patient satisfaction is improved.[3] This study aims to use a survey to measure and evaluate the satisfaction of patients in a radiation therapy department. Patients over the age of 18, diagnosed with cancer and with sufficient English, will be invited and consented over an initial period of 6 months (Sept 2016–Feb 2017) to answer a series of quantitative and qualitative questions, available in either in a touchscreen or paper format. The results of this study will be analysed and areas that have the greatest influence on overall patient satisfaction will be identified. These outcomes will lead to further investigation of patients' perspective and of how their experience and satisfaction may be improved. Quality improvement initiatives may also be developed and introduced as a consequence.

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Reaching out, beyond and across with data

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The information age has revolutionised healthcare with electronic medical records becoming increasingly popular in hospitals across Australia and the world. The benefit to radiographers comes in many forms including electronic imaging requests and integrated hospital and radiology information systems. Along with improved data tracking and export capabilities from the imaging modality. With this comes an access to data which leads to infinite collaborations with referring clinicians and other disciplines.

Electronic requests and integrated healthcare systems allow radiographers to understand their patients and referrers like never before. This presentation gives an overview of the types of data that can be mined from hospital and radiology information systems and the types of outcomes that can be achieved with the data. The types of data that can be collected from x-ray equipment from a variety of vendors will also be described.

This presentation aims to inspire radiographers to ask questions and to utilise data to provide the evidence to answer these questions.

The evaluation of an in-house KPI tool – a 5 year review

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Patient waiting times has a significant impact in a patient's overall satisfaction of their healthcare experience.[1] The main contributors to patient waiting times are inadequate appointment duration, staff experience level, patient late arrival and machine breakdowns.[1] Literature on radiation oncology productivity is dominated by variation and validation of the BTE model.[2] However, the technological advancements in imaging and treatment modalities such as intensity modulated radiation therapy (IMRT), image guided radiotherapy (IGRT), volumetric RT (VMAT) and Tomotherapy have changed the landscape of RT and its productivity measures.[3]

In 2011, the management team at Liverpool and Macarthur Cancer Therapy Centre (LMCTC) introduced an in-house key performance indicators (KPI) tool to measure the performance of the treatment machines. The catalyst for the design and implementation of the tool was the introduction of the NSW Performance Measures report of 2010.[4] The main objective of the tool was to capture each individual patient's appointment time to ensure adequate and individualised patient appointment scheduling. It was hypothesised that the introduction of this tool would reduce the waiting room time for patients and consequently it may reduce treatment staff stress and incidents.

There are many advantages to developing such a tool. These include the ability to measure machine utilisation, patient waiting times, impact of new technologies, and individual patient appointment times. The period of January 2011 to December 2015 will be analysed and reviewed. The analysis is in progress and results will be presented.

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Risk management and lessons learnt from a flood

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On the 11th April 2016 the Radiation Oncology Department, Alfred Health, Melbourne experienced a catastrophic flood which damaged three of it's four linear accelerators rendering them clinically inoperable. This paper will describe the causes of the flood and the failures that contributed to it, the response to the immediate crisis of 11th April, the medium and longer term responses, and the lessons learnt relating to risk management. Particularly relevant to crisis management is the latest work to come out of Harvard's School of Public Health on crisis management, crisis leadership and some of the latest directions in neuro-science dealing with leader thinking in crisis situations. It is interesting to reflect on the flood crisis and our management of it in light of Harvard's work in developing the National Preparedness Program for the United States government.[1] If, in sharing the Alfred's experience with others and similar disasters can be avoided elsewhere then something very positive will have resulted from our crisis.

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Factors associated with appointment non-attendance at a Medical Imaging department in regional Australia

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Objectives: Appointment non-attendance costs the healthcare sector millions each year in wasted resource allocations and diminished downstream health outcomes. Previous studies have looked at various primary and secondary healthcare settings and outpatient clinics.[1,2,3] Medical Imaging (MI) departments commonly schedule appointments for most modalities; however no study has specifically addressed patient compliance in this setting. This study aims to identify factors that influence appointment non-attendance at a regional hospital in Australia.

Methods: Several factors were collected from an Enterprise Reporting System for all patients (n = 13433) referred to the MI department in 2015. The data was analysed using Chi-squared analysis and Binary Logistic Regression. The likelihood/odds of each of these associated factors were calculated. Exemption from ethical review was granted by the institution's Hospital Research Ethics Committee.

Results: Gender and Indigenous status were significantly associated with non-attendance. Male patients who did not identify as Indigenous were 1.83 (95% CI 1.55–2.16) times more likely to miss a scheduled appointment than female patients who did not identify as Indigenous. Female patients who identified as Indigenous were 3.08 (95% CI 2.43–3.90) times and male patients who identified as Indigenous were 3.64 (95% CI 2.43–5.45) times more likely to miss a scheduled appointment than female patients who did not identify as Indigenous.

Conclusion: MI department appointment non-attendance is multifactorial. Several key factors appear to affect Medical Imaging appointment non-attendance. Key factors include indigenous status, gender, and age. Further study and possible intervention is suggested to better meet the needs of underrepresented patient demographics.

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Big data analytics in cardiovascular disease: Paradigm shift in medical imaging data management

Zhonghua Sun

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Medicine is undergoing a paradigm shift about how we store and process larger amounts of data. The "big data analytics" are generated because of the convergence of increasing data availability, analytical capabilities, and increasing need to improve healthcare quality and patient outcomes. The use of big data in cardiovascular disease has shown great potential to deliver precision medicine and evidence-based practice, thus, improving value of healthcare in patients with cardiovascular disease. This presentation provides an overview of application of big data analytics in cardiovascular disease, with a focus on the data analytics and algorithms (computer-assisted decision-making) using medical imaging data in cardiovascular disease.

The Australian Clinical Dosimetry Service on a national and global scale

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Introduction: The ACDS has recently expanded its audit service by incorporating IMRT, VMAT and FFF dosimetry. The vision of the ACDS is to provide a comprehensive suite of audit modalities covering all common clinical practice, ultimately to ensure patient safety and to improve national dosimetry. The ACDS also aims to provide dosimetric information that can be used domestically and globally in the clinical trial setting.

Method: To ensure efficient delivery of the audit service, all modalities relevant to a facility's clinical practice are measured in a single audit visit. The ACDS offers site visits in the Level II and Level III audits, incorporating 3DCRT, IMRT, VMAT and FFF.

Australian Radiotherapy facilities undergo varying levels of dosimetry audits on a 4 year schedule. As such, the ACDS has a large body of data to assess dosimetry on a national scale, offering insight into how different equipment combinations may perform in an audit, and identifying outliers in audit results.

Results: The ACDS is constantly developing audits to remain at the forefront of treatment techniques employed by Australian radiotherapy facilities. Small field and SABR audits are soon to be released clinically; with 4D, kV and MRI radiotherapy audits planned for development.

The ACDS works closely with other agencies in the clinical trial setting, such as TROG and IROC/RTOG, for global harmonisation of dosimetry and mutual recognition of service.

Conclusion: The ACDS is developing a comprehensive suite of audit modalities aimed at ensuring patient safety across a range of clinical practice.

Friday 24 March, 1530–1715 Radiation Therapy – New and evolving practice (Reach Beyond)

Liver SABR end expiration breath hold – reaching beyond to overcome the challenges

Anne McMaster, Jacqueline Foo
Nepean Cancer Care Centre, Kingswood, Australia

The addition of Liver Stereotactic Ablative Body Radiotherapy (SABR) to Nepean Cancer Care Centre's SABR service for patients with hepatocellular carcinoma and liver metastases, provided multiple challenges. Radiation treatment for liver can be a clinical challenge due to multiple lesions, respiratory motion, liver organ deformation and difficulty visualising the tumour on CT and CBCT scans.

These multiple challenges required the collaboration of an interdisciplinary team of Radiation Therapists, Radiation Oncologists and Medical Physicists to enhance the radiation therapy imaging, planning and treatment process. Collaboration was also necessary with MRI Radiographers and Nuclear Medicine Technologists to ensure their images were optimal for Liver SABR.

We will detail how the Nepean team needed to reach beyond our previous SABR experience utilising our existing equipment in new ways to overcome the following challenges for Liver SABR:

I. Patient immobilisation
II. Respiratory motion management using End Expiration Breath Hold
III. Acquisition of triple phase IV contrast planning CTs
IV. Image registration of multiple CT, MRI and PET scans
V. PTV delineation between multimodality imaging with liver deformation
VI. Achieving the highest prescribed dose using a highly conformal VMAT technique, while sparing the nearby radiosensitive gastrointestinal tissues and remaining healthy liver
VII. Optimising the image quality for IGRT and the use of tumour surrogates for localisation in daily IGRT
VIII. Treatment delivery

Future goals in developing a motion management assessment tool to ascertain the most optimal motion management strategy for Liver SABR patients will also be discussed.

Radiation therapy for retroperitoneal sarcoma – Peter MacCallum Cancer Centre experience

Clare Manczak
Peter MacCallum Cancer Centre, Melbourne, Australia

Introduction: Retroperitoneal sarcomas (RPS) account for approximately 15% of all sarcomas. The treated volume is often large and close to radiation sensitive intra-abdominal structures resulting in significant challenges for planning radiotherapy. Anatomical changes as a response to therapy, rapid tumour growth, combined with intra-fraction and inter-fraction movement of both the target and normal structures present significant challenges in treatment delivery and verification.
Discussion: Since 2013 Peter MacCallum Cancer Centre has treated approximately 30 pre-operative retroperitoneal sarcoma cases with doses ranging from 45 Gy to 56 Gy. To manage the complexities presented by this patient group, we have utilised a range of planning techniques and have developed a soft tissue image guidance protocol to address the challenges of treatment verification. The experience of managing this patient cohort has led to the development of a complex image guided radiotherapy (IGRT) protocol to account for inter- and intra-fractional motion using both kilo-voltage (KV) imaging and cone beam computed tomography (CBCT).
Conclusion: The aim of this presentation is to review and share our experience in the management of these patients. Changing volumes during the radiation therapy course require an adaptive approach to planning and treatment in RT. The presentation will detail our current practice, and explore anticipated future developments that will help ensure that optimal care is within reach for this patient group.

BOSTON clinical trial: a review of SABR techniques

Dianne Kelly
Peter MacCallum Cancer Centre, Melbourne, Australia

Introduction: The principal objective of the BOSTON trial was to test the hypothesis that stereotactic ablative body radiosurgery (SABR) is feasible and safe for patients with bone only oligometastatic breast cancer. A variety of techniques may be used to deliver SABR, including 3D conformal, IMRT and VMAT. This analysis describes the radiotherapy techniques utilised on the fifteen patients recruited to the BOSTON trial.
Methods: Fifteen (15) patients with bone only oligometastatic breast cancer were recruited between September 2014 and October 2016. All patients were treated using SABR according to the trial protocol. Each metastasis was treated with a dose of 20 Gy in one fraction. Treatment sites included Sternum (6), Hip (2), Scapula (1), Spinous process (10), Humerus (1), Rib (1), and Skull (1). Treatment techniques included 3D conformal, IMRT, and VMAT.
Results: The total number of metastases was 22, with some patients having two sites treated. The Planning Tumour Volume ranged in size from 14.4 to 197 cubic centimetres. Conformity indices (V100) averaged 1.2 and 4.5 for V50. Typically the Dmax was 125%. Dose to organs at risk were adhered to as per protocol, with spinal cord dose guidelines most difficult to achieve due to target proximity.
Conclusion: Using a range of planning techniques, we were able to successfully plan all twenty-two bony metastases adhering to the guidelines. We are now recruiting for BOSTON2, which involves the same planning guidelines as BOSTON, with the use of the MK-3475 (Pembrolizumab) antibody.

Optimising radiotherapy for lymphomas of gastric and peritoneal/abdominal origin

Senalee Karunanayake, Karen McGoldrick
Peter Maccallum Cancer Centre, Melbourne, Australia

Objective: Diffuse Large B-Cell Lymphomas of Gastric and Peritoneal/Abdominal (P/A) origin often present significant radiotherapy planning challenges, delivering complex tumour volumes in close proximity to multiple organs at risk (OAR). The aim of this study was to analyse available imaging and planning techniques for this patient cohort, to ensure optimal tumour/OAR delineation and treatment planning.

Methods: 8 of 9 patients (4 Gastric, 5 P/A) were 4DCT scanned and planned utilising a 3DCRT, IMRT and VMAT technique (Eclipse v13.6, Varian Medical Systems). Dose analysis occurred on both the maximum and minimum respiration datasets derived from 4DCT to ensure plan viability across a normal breathing cycle. Target coverage, OAR dose and plan conformity were compared across each technique.

Results: Clinically optimal plans were chosen for each of the 9 patients. 3 plans were derived with 3DCRT (3 P/A), 4 with IMRT (3 Gastric, 1 P/A) and 2 with VMAT (1 Gastric, 1 P/A). As expected, 3DCRT plans delivered reduced conformity with significantly greater V95% extending beyond PTV (3DCRT v IMRT, $P < 0.002$; 3DCRT v VMAT, $P < 0.001$) and V50% into healthy tissue (3DCRT v IMRT, $P = 0.002$; 3DCRT v VMAT, $P = 0.006$). IMRT and VMAT delivered kidney and liver avoidance improvements. VMAT plans reported higher low dose (V5 Gy) wash compared to IMRT ($P = 0.0053$).

Conclusion: Preliminary findings report a dosimetric benefit when utilising IMRT and VMAT for gastric treatment. However, negligible advantage was witnessed in the P/A group, suggesting 3DCRT may be acceptable. Further analysis is warranted as numbers increase in this unique patient cohort.

Lung SABR with variable dose rate dynamic conformal arc therapy

William Starbuck, Anna Seeley, Benjamin Harris, Adeline Lim
Austin Health, Melbourne, Australia

Stereotactic Ablative Body Radiotherapy (SABR) is an established treatment for lung cancer. While various techniques can be applied, the use of Volumetric Modulated Arc Therapy has been limited due to concerns about treating a moving target with highly modulated beams.

Dynamic Conformal Arc Therapy (DCAT) restricts modulation to the field aperture, offering potentially more consistent dosimetry to the tumour over the full breathing cycle. The arc technique assists in achieving the steep dose fall off required for SABR.

In the Elekta Monaco® 5.1 treatment planning system DCAT can be inversed planned. After defining arc parameters and planning constraints the planning system optimises the arc aperture to the target. The variable dose rate allows greater dose shaping than for a consistent dose rate arc.

At the ONJ Centre, a planning study was undertaken prior to the technique being used clinically. The existing static field technique was compared to DCAT for 5 patients. DCAT showed comparable dosimetric results whilst creating significant savings in planning and treatment time.

Dosimetry and treatment delivery efficiency comparison of 3D-conformal, IMRT and RapidArc in pelvis cancer patients

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Objectives: Comparisons of existing radiotherapy techniques have always been essential in improving efficiency and effectiveness in radiotherapy facilities. Three techniques for treating pelvic cancers were analysed; 3D-conformal, Intensity Modulated Radiation Therapy (IMRT) and Volumetric Modulated Arc Therapy (VMAT).
Method: A total of 19 research articles were collected through a combination of online databases and electronic journals. The treatment delivery time, planning time and preferred techniques were extracted from the studies and tabulated.
Results: It was found that the average delivery treatment time for 3D conformal, IMRT and VMAT are; 2, 7.6, and 2.2 min respectively. The average planning time for the techniques of the same order are; 0.5, 1.2 and 2.7 h correspondingly. The best dose conformity and healthy tissue sparing was found with VMAT.
Conclusion: Although VMAT was concluded to be the more superior technique, there are major limitations within the research articles which have influenced the results. Different organs at risks were assessed and different numbers of beams were utilised within the plans between the articles. Thus, future studies are required to obtain a stronger and more confident comparison.

Quantifiable dosimetric benefits of proton radiotherapy

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Objectives: It is widely acknowledged that Intensity Modulated Proton Therapy (IMPT) is becoming the gold standard treatment for many difficult to treat cancer sites.[1] The characteristic beam profile is ideal for challenging target volumes adjacent to critical structures and organs at risk (OAR),[2] yet practical exposure in Australia has until recently been limited. Circa 2015, the Royal Adelaide Hospital implemented a preliminary study to analyse and compare dosimetric quality of Intensity Modulated Radiation Therapy (IMRT), Volumetric Arc Therapy (VMAT) and IMPT techniques. This presentation aims to provide an in depth focus on a small cohort of plans, which were particularly interesting due to the location of their tumor volumes.
Method: Phillips Pinnacle 9.100, (a trial version of Proton planning software), was used to generate and dosimetrically evaluate IMRT, VMAT and IMPT plans. As of August 2016, 41 data-sets have been analysed, and were considered highly challenging using traditional planning methods. The subjectivity apparent in planning was removed from this study, with data-set specific plan-quality metrics. These were designed using Sun Nuclear PlanIQ software and was utilized in plan quality analysis.
Results: The results of this study highlighted apparent dosimetric benefits of Proton Therapy. The analysis observed substantial decreases in OAR dose, while adequately maintaining target coverage in most cases.
Conclusion: From the results shown in this preliminary analysis, it can be extrapolated that IMPT treatments lead to clinical benefits for patients. Currently, patient recruitment for the study is ongoing, with plan analysis continuing for patients with appropriate disease sites.

References

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