Saturday 25 July, 0830–1000
Plenary Session

The New Radiography: Coming out from behind the cloud
M. Fuller
Flinders Medical Centre, Adelaide, Australia

The radiographer I am today is not the same radiographer I was in 1982 – my role has changed. This change did not occur by chance; it may have started out as an organic process but ended up as something that was directed and intentional. This paper reflects on my experiences in driving and advocating cultural change in radiography in my hospital and beyond. My perspective extends back to 1979 when I commenced training as a radiographer in South Australia. I would characterise the profession at that time as ‘apathetic and subservient’. By contrast, I would now characterise the profession as ‘progressive and optimistic’.

In my early years as a radiographer, I did not perceive myself as part of a broader clinical team – I conceived my role as providing an imaging service to the clinical team from outside the team. My objective of providing a quality imaging service to the clinical team remains today – the point of difference is that I now provide this service from within the team. My role has changed from one of imaging anatomy to one of imaging pathology. My thinking is patient-focused. My objective is to provide an accurate diagnosis rather than simply providing an image. I have more confidence in my professional role; professional silos have come down and interprofessional communication is on the rise; there is inter- and intra-professional camaraderie that comes from striving towards a shared objective; professional ‘cringe’ is no longer evident; and importantly, my job satisfaction is very high. I am no longer ‘. . . just the radiographer’.

The key ingredient that has facilitated cultural change in my department is continuing education. You can’t expect to be embraced by the clinical team if you don’t understand the professional language and objectives of the team. Once you achieve this higher level of knowledge and understanding, you don’t need to ask to join the clinical team. . . you are already part of the team.

How Twitter is revolutionising the healthcare landscape – for you and your profession (yes you!)
A. Westerink
Royal Brisbane and Women’s Hospital, Queensland, Australia

Twitter is a social media micro-blogging platform, which allows users to exchange information in portions of 140 characters or less. Since its inception in 2006, Twitter’s growth has been exponential, currently boasting in excess of 280 million active users. In recent times, healthcare professionals have adopted the use of Twitter to drive changes in the way they care, learn, teach, communicate and develop as clinicians.

This presentation will explore the details behind these changes and will outline the tangible impact that a number of international, clinician-led initiatives are having. It will also outline the impact that Twitter is having within the medical radiations profession and how it can deliver a wide range of benefits to the end user (you!). A beginner’s guide to Twitter will also be covered.

‘It’s not just about consuming content, but sharing it, passing it on, and adding to it’ – @ariannahuff

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How Twitter is revolutionising the healthcare landscape – for you and your profession (yes you!)
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‘It’s not just about consuming content, but sharing it, passing it on, and adding to it’ – @ariannahuff
The Australian and New Zealand Medical Radiations Research Network
ANZMRRN Steering Group

In a workshop format the ANZMRRN would like to inform members and potential members of current developments and progress made by ANZMRRN. With the website now available, discussion around the second phase of development is underway and this forum will provide opportunities to discuss what the network is all about, future plans, gain feedback on the website and provide networking opportunities.

Research in the clinical setting
J. Hayes
Journal of Medical Radiation Sciences

This plenary session will start by looking at how the JMRS can help you stave off Alzheimer’s disease and keep your brain sharp. We look at the recent results from both the New Zealand and Australian surveys regarding the JMRS readership. There is some good and not so good news for the profession and we will look at the challenges which we need to address. This will also be your opportunity to find out about how the journal has been progressing since its launch 2 years ago. Online aspects of the journal will be discussed briefly along with how you can get your work published.
Social media
C. Murrell
UCOL Universal College of Learning, Palmerston North, New Zealand

Social media has a large role in today’s society; it links families, friends and work colleagues all on one easy to use platform (the internet). The use of social media allows for easy communication, event management and file sharing between these groups. The social media website ‘Facebook’ has been utilised by UCOL’s past and present cohorts in the above stated fashions. Discussion will be made in depth as to how we make this work in a positive manner with minimal or no issues. Acknowledgement of the fact that anything posted online will have risks involved in relation to the medical profession and confidentiality - these breaches of confidentiality may be patient or professionally related. Also anything posted online is susceptible to hacking, ‘leaking’ and can be exposed to the media or general public. The presentation will include examples of the positive use of social networking sites and include reference to some potentially negative uses.

Seven tips for the unsuspecting interns
H. Do
The Royal Melbourne Hospital, Victoria, Australia

The overused idiom ‘I know all the tricks of the trade’, is commonly used by someone who has learnt all the special skills and techniques that are specific to his profession. Learning all the ‘tricks of the trade’ usually makes everyday tasks easier and allows for fewer mistakes to occur.

‘Tricks of the trade’ is not a new concept to radiography; in fact, it is an integral part of the learning curve and important in a student’s learning. Being able to learn tricks and gather advice from qualified radiographers with many years of experience has been an integral component of my intern year. This presentation was written to pass on some of the things I’ve learnt to hopefully help students become more confident in their radiography skills. Develop a technique that works for them, a platform where students can share ideas and learn from each other.

This presentation will explore the most feared departments inside radiography by students. From theatre radiography to the humble knee x-ray; I will explore things that I have been taught, the rationale behind them and how my radiography skills have changed since I’ve started applying these tricks.
Experiences of adolescent and young adult cancer patients
H. Smith, G. Macilquham
University of Otago, Wellington, New Zealand

Adolescents with cancer are in a unique position, as they are going through a time of physical, social and emotional change. We will present our analysis of these papers, which explore the needs and experiences of these patients and look at interventions to improve their quality of life. We will also address recommendations relating to the radiation therapy field, and implications for further research into this topic. We will be presenting a literature review analysing the four qualitative papers.1-4

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Locally advanced breast cancer and the anxious patient
J. Sloan
William Buckland Radiotherapy Centre – Gippsland Latrobe Regional Hospital, Victoria, Australia

Breast cancer is the most common cancer among women. Despite the current controversies concerning over-diagnosis in breast cancer, patients presenting with locally advanced breast cancer are still seen in radiotherapy departments. These are typically patients who have delayed their time to diagnosis.

Cancer patients face more psychological problems compared to other patients. Anxiety is defined as an unpleasant subjective experience associated with the perception of a real threat; increased anxiety is often typical in patients diagnosed with locally advanced breast cancer.

Anxiety in the context of patients with locally advanced breast cancer is explored and clinical management and supportive care of these patients is discussed. Two patient cases from William Buckland Radiation Oncology Gippsland, Latrobe Regional Hospital are presented and the holistic approach to their treatment in the regional setting is reflected upon.

‘The Cloud’ and open data can facilitate greater sharing of information and experiences improving our learning and growth as health professionals.
Imaging modalities’ role in diagnosing and treating abdominal aortic aneurysms (AAA)
L. Cannell, A. Pearce
Unitec, Auckland, New Zealand

AAA (abdominal aortic aneurysms) are commonly requested in the radiology department – whether it is for pre-screening sessions in ultrasound or CT, initial and follow up presentations of AAA or post EVAR (endovascular aneurysm repair) x-rays. This presentation will cover the importance of discovering AAA and slowing the process, how AAA initially occurs, contributing factors for developing AAA and the treatments available for each patient. The main focus will specifically be on each imaging modality – when they are best used in the AAA process and the pros and cons of each modality. There are many overseas studies included in this presentation to give real life statistics which can be marginally compared to New Zealand (the possibility of doing New Zealand studies are much less compared to overseas studies due to population sample sizes). AAA is still a common cause of death in any country and more awareness of how it affects our practice can help to reduce mortality rates.

Screening practices on Muslim migrant women in Sydney
A. Islam
University of Sydney, NSW, Australia

Background: This study explores the factors that influence breast screening behaviour among Muslim migrant women living in Sydney. Internationally, Muslim women have displayed reluctance towards breast screening participation due to a lack of general breast cancer knowledge and screening awareness. Background (socio-demographic, acculturation and religious) factors have shaped decisions regarding preventative health behaviour (breast screening) and impact on health belief measures; however the influence of these variables in an Australian setting is unknown.

Method: A cross-sectional questionnaire-based study was conducted on a sample of 125 Muslim women aged 35 years and above, recruited from the Western Sydney region. Data on background, knowledge and screening practice variables were analysed using quantitative techniques on SPSS. Significance was set at $P < 0.05$.

Results: Significant links were made between education, employment, levels of religious priority with general knowledge of breast cancer ($P < 0.05$). Breast screening participation was generally low; and was significantly influenced by age ($\chi^2 = 22.6$, $P = 0.001$), migrant residency ($\chi^2 = 13.44$, $P = 0.004$), self-rated English ability ($\chi^2 = 7.975$, $P = 0.047$) and tendency to refuse male practitioners ($\chi^2 = 5.26$, $P = 0.02$). Younger women were significantly more likely to see breast cancer as serious and treatable than older women ($\chi^2 = 15.57$, $P = 0.016$). Notable barriers to breast screening include pain, unnecessary radiation, a lack of GP recommendation and something negative may be discovered.

Conclusion: There is an immediate need to initiate health interventions for Muslim communities in Western Sydney as most women are not following the recommended breast screening guidelines. Background factors play an important part in breast screening behaviour.
Saturday 25 July, 1030–1230
Concurrent Session: Radiation Therapy 1, Education

RT without borders: Taking the plunge into training RTs in Vietnam
J. Cavenagh
Cancer Institute, NSW, Australia

In a sea of close to 90 million people there are currently 35 Linear Accelerators operational in Vietnam at this moment. Due to increased efforts by the local Government, Foreign Aid and corporate investment this expansion of services has been rapid over the last decade. Despite this, currently, there is no specific university level academic course for aspiring Radiation Therapists, rather Diagnostic radiographers are transferred to the Radiation Oncology department and trained within the clinical environment. In 2014, I spent 8 months as the first volunteer in Da Nang General Hospital Radiation Oncology Department supported by the Australian Volunteers for International Development (AVID) program through the Department of Foreign Affairs and Trade (DFAT) and the Hoc Mai Foundation (University of Sydney). Complex cases, little theoretical training, a shortage of resources, lack of image verification and the absence of opportunities for professional development are part of the daily battles faced by RTs in Vietnam. The ingenuity, creativity and sometimes crazy ideas which are utilised are outstanding considering the multiple barriers which are in place and where going back to the drawing board and thinking outside the box happens all too often. Knowledge exchange, capacity building and critical thinking are the basis for the AVID program where small scale changes can make an incredible difference for patients now and into the future whilst challenging us in more comfortable health care circumstances to consider what we can do to assist our colleagues in our regional neighbourhood.

Exploring students’ views about interprofessional learning and what makes it meaningful
K. Coleman, B. Darlow, E. McKinlay, S. Donovan, L. Beckingsale, P. Gallagher, B. Gray, H. Neser, M. Perry, J. Stanley, S. Pullon
University of Otago, Wellington, New Zealand

Objectives: This qualitative study aimed to explore student perceptions and experiences of a 10-h Interprofessional Education (IPE) programme focused on long-term condition management. A secondary aim was to explore the experiences of radiation therapy students who recently joined the programme.

Methods: Three focus groups were conducted. All 41 students who participated in the IPE programme (dietetics; \( n = 4 \), medicine; \( n = 18 \), physiotherapy; \( n = 6 \), radiation therapy; \( n = 13 \)) were invited to attend one of the two interdisciplinary focus groups. Students from radiation therapy were also invited to attend a unidisciplinary focus group. Focus groups were audio-recorded and transcribed verbatim. Data were independently analysed by two researchers within the framework of Thematic Analysis. Themes were determined following parallel coding and research team verification.

Results: Thirty-four students participated in the interprofessional focus groups and 13 radiation therapy students participated in their unidisciplinary focus group. Three key themes emerged related to: 1. learning; 2. perceived long-term professional benefits and; 3. the structure and content of the programme. An additional theme emerged from the radiation therapy focus group related to how they perceived, and considered they were perceived by, the medical students.

Conclusion: Participants considered the programme to be a valuable learning opportunity which had direct relevance to their clinical careers. Listening to the insights of students is an important means of discovering what, for them, constitutes a meaningful and positive learning experience. Providing students with an opportunity to learn about each other should be prioritised within IPE programmes in order to allow them to effectively learn with and from each other.

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Emotional intelligence development in student radiation therapists: A longitudinal study
M.-A. Carmichael
Queensland University of Technology, Brisbane, Queensland, Australia

With increasing technological development potentially distancing medical radiation professionals from patients it is more important than ever to maintain a clear focus on holistic patient-centred care. One of the key underpinning attributes of this approach is emotional intelligence (EI); the ability to recognise emotions in others and respond appropriately. EI is rapidly emerging as one of the most important characteristics of successful health professionals and pre-registration education programmes are tasked with nurturing these skills during training. There is debate in the literature as to whether EI can be improved or whether it is ‘hard-wired’ into individuals. This paper presents the findings from a 3-year longitudinal study that tracked self-rated EI levels in an undergraduate radiation therapy cohort to determine whether EI does develop over time and identify any points in the Course where this is more likely to occur. Students were provided with training in reflection, emotional intelligence theory and expert patient interaction experiences throughout their Course and anonymous data was collected twice a year using a validated Likert-style EI rating tool. Preliminary data analysis at cohort level suggests that EI does improve during training. Further in-depth analysis and discussion of potential factors influencing this will be presented along with recommendations for future research and pedagogical practice.

Refocussing staff development activities ‘in the cloud’
K. Matthews
Peter MacCallum Cancer Centre, Victoria, Australia

Peter MacCallum Cancer Centre (Peter Mac) is a public radiation therapy service operating across five campuses in metropolitan Melbourne and regional Victoria. Providing staff development opportunities to the almost 200 radiation therapists at Peter Mac is challenging, considering numbers, geography, and many part time staff, and has been generally organised in local isolation. A new service model introduced in 2014 with a more global focus towards education provided the opportunity to review staff development across the five campuses with a view to improve opportunities and access. The resulting vision for education was to develop equitable global resources for staff development responsive to their needs, not only to ensure clinical currency but to generate a cultural shift where education is proactively sought. To achieve this vision equitably across geographically separate campuses, staff development opportunities have been refocussed for delivery ‘in the cloud’. Several key activities were undertaken to achieve this goal, including:
- Remodelling the internal ‘Radiotherapy Intranet’ to be professional development focussed, including a daily blog of professional development information and news;
- Development and delivery of workplace training materials in an ‘anytime’ online format;
- Redesigning an electronic journal club using an online platform, and recording in-service presenters as an accessible ‘podcast’; and
- Introducing social media options for professional development activities.

This presentation will discuss the method and outcomes of our redesigned ‘cloud based’ education delivery strategies, and describe the results of the subsequent staff evaluation.
The impact of a virtual reality system on teaching and learning
P. Kane
University of Otago, Wellington, New Zealand

The University of Otago recently acquired a virtual reality radiation therapy simulator (VERT). This study investigated its impact on teaching practice and student learning in one paper of the Bachelor of Radiation Therapy (BRT) programme. Using a constructivist grounded theory approach, data was collected and analysed from students (n = 10) and staff (n = 5) as well as an inventor of the system. Data were collected at time points across the semester. Students and academic staff shared frustrations related to lack of prior training, insufficient time for preparation and system limitations. Staff reported a growing understanding how to use (VERT). Both groups saw the potential of the system. Clinical staff viewed procurement as positive. They strongly identified with the ability of the system to go some way to closing the ‘theory-practice gap’. The inventor, while pleased with the increasing use of (VERT) worldwide, expressed frustration with how it is utilised outside New Zealand. The designed intent of the system seems to align well with the intent of BRT teaching staff. Simulation does not represent a single solution to BRT curriculum delivery but may aid a more integrated approach to delivery. A significant intervention is more likely to succeed when all stakeholders are fully involved in its development. Resource devoted to implementation, not simply procurement can also indicate likely success. There is evidence that, in radiation therapy at least, the axiomatic gap between theory and practice should be re-evaluated. The full potential of (VERT) remains untapped; however areas for future investigation have been identified.

Establishing a sustainable workforce through greater access to collaborative research and education facilities
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4Genesis Cancer Care, Perth, Western Australia
5Department of Physics, University of Western Australia, Perth, Western Australia

In 2012 it was identified that the demand on the radiation oncology workforce in Western Australia (WA) was increasing substantially and at the time it was difficult to attract and retain staff to WA.

Objectives:
1. Understand current workforce issues;
2. Improve education and research opportunities for professionals working in WA.

Methods: A multidisciplinary collaboration between Sir Charles Gairdner Hospital, Genesis Cancer Care, Curtin University and the University of Western Australia was formed. The project consisted of 5 arms: (A) Increasing enrolment and retention of local students. (B) Understanding current workforce patterns, opportunities, career pathways and facilities that attract radiation oncology professionals to Australia and WA. (C) Understand barriers for internationally trained professionals. (D) Increased collaboration between public and private departments and with the universities. (E) Increased professional development opportunities including conducting research. The main research methods used included surveys and interviews. Additionally, thirteen events were held to increase collaboration and provide opportunities for professionals to develop education and research skills.

Results: Apart from gaining valuable workforce data there has been a significant increase in collaborative CPD and research activity. The project also supported the introduction of the Master of Radiation Therapy at Curtin University.

Conclusion: The project group are working towards establishing a framework within which the impetus generated by this project can be sustained into the future. The framework will aim to progress the multidisciplinary activities which have enriched the outcomes of this project.

Acknowledgements: This project was funded by the Australian Government, Department of Health and Ageing.
Retrospective analysis of the correlation between bowel cavity dosimetric parameters and acute GI toxicity in IMRT for anal canal

H. Ho

Radiation Oncology, Victoria, Australia

Aim: Intensity Modulated Radiation Therapy (IMRT) for anal cancer (AC) is now considered the gold standard because of its ability to conform the dose to the target volumes whilst reducing the dose to the surrounding OARs. Dose to the bowel cavity has been correlated to acute gastrointestinal (GI) toxicity.1 We retrospectively reviewed a large cohort of AC patients and reported on the achieved bowel dose constraints and the associated acute GI toxicity.

Method: All AC patients treated with IMRT and concurrent chemotherapy from July 2010 to September 2013 were reviewed. The TROG ANROTAT dose constraints were used for planning. All original bowel cavity contours was adjusted if they did not conform to the Australasian Gastrointestinal Trials Group (AGITG) guidelines. Differences in the mean doses to bowel cavity V30, V35, V45 were analysed and correlated to acute GI toxicity.

Results: 52 patients were eligible. Median target dose was 54.0 Gy. The mean V30, V35 and V45 volumes for bowel cavity were 278.06 cc; 219.06 cc; 78.92 cc respectively. 47 patients experienced toxicity of grade $\leq 2$ with a mean V30 of 256.74 cc. 5 patients experienced clinically significant toxicity of grade $\geq 3$ had a mean V30 of 453.78 cc.

Conclusion: This large series of AC patients confirmed bowel cavity V30 is a clinically relevant dosimetric parameter associated with clinically significant acute GI toxicity and efforts should be made to minimize this OAR dose.

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An assessment of the dosimetric impact of contour change for head and neck VMAT

H. Straker
Radiation Oncology Queensland, Queensland, Australia

Objectives: Treatment position accuracy is of the upmost importance in Volumetric Modulated Arc Therapy (VMAT) for Head and Neck (H&N) cancers due to steep dose gradients and stringent organ at risk tolerances. Daily Cone Beam Computed Tomography (CBCT) for treatment position verification creates the ability to assess daily variations not only in positioning but also systematic changes in patient contour or tumour regression. H&N patients occasionally require resource consuming replanning to account for these changes. The purpose of this study is to establish a guideline for objectively assessing when a patient would require replanning in the setting of VMAT.

Methods: A cohort of H&N patients treated within the last 12 months utilising VMAT with daily CBCT guidance were selected for retrospective analysis of contour change. The change in contour demonstrated by CBCT was modelled within the treatment planning system, scaled and quantified to determine the point at which the plan was no longer clinically acceptable.

Results: Preliminary results have demonstrated the use of VMAT diminishes the impact on dosimetry from contour change when compared to fixed gantry angle techniques such as 3D Conformal and Intensity Modulated Radiation Therapy. Further analysis of the data is required to determine a suitable threshold beyond which replanning is necessary.

Conclusion: Changes in patient contour are rarely uniform and tumour deformation changes will affect the high dose regions to be treated. Evaluation of this cohort will enable our department to establish processes to ensure these changes are detected and actioned upon utilising determined guidelines.

Improvement in head and neck radiotherapy plan quality through implementation of a planning assessment tool

T. Caro
Princess Alexandra Hospital, Brisbane, Queensland, Australia

Objectives: Plan quality is an integral component of effective radiotherapy (RT) in head and neck cancer, contributing to survival and toxicity outcomes. Although the clinical treatment goals may be the same, planning outcomes may differ among planners. We developed a quality assessment (QA) tool for modulated radiation therapy to standardize and improve overall treatment plan quality. We sought to analyse the impact of implementing the QA tool on quantitative metrics of plan quality.

Material and methods: Thirty volumetric modulated arc therapy (VMAT) plans were identified, all for definitive RT of node-positive oropharyngeal carcinoma to a prescription dose of 70 Gy with integrated doses to elective regions of 63 Gy and 56 Gy. Ten consecutive plans were analysed from each of three time points; 3 months before, 1 month after, and 3 months after implementation of the QA tool. Plan parameters from each group were extracted and compared to the goals specified in the QA tool.

Results: Significant improvements were observed in coverage (V66.5 Gy and D98%) of the high-dose planning target volume (PTV70) after implementation of the QA tool. Volume of non-target tissue (NTT) receiving 56 Gy, normalized to PTV volume, was reduced. Consistency between plans improved across other parameters including PTV63 and PTV56 coverage.

Conclusion: Implementation of a QA assessment tool has improved plan quality and has provided consistency in the generation of VMAT head and neck plans in our institution.
Plan of the day approach for post prostatectomy radiation therapy  
C. Lac  
Central Coast Cancer Centre, Gosford, NSW, Australia

**Objectives:** Investigate the feasibility of using smaller margins for post-prostatectomy radiotherapy (RT) in conjunction with daily soft tissue matching. Implement a ‘plan of the day’ treatment approach choosing the appropriate plan on a daily basis to improve local control and reduce rectal and bladder toxicities.

**Methods:** Retrospectively identified 13 post prostatectomy patients treated at the Central Coast Cancer Centre. Soft tissue matching was performed on cone-beam CT (CBCT). The frequency of geographic miss was measured using a planning target volume (PTV) small with 5 mm clinical target volume (CTV) expansion and PTV large with 1 cm (1.5 cm anteriorly) CTV expansion. To implement a ‘plan of the day’ treatment approach a post prostatectomy soft tissue match training module was developed to educate the radiation therapists to choose between the PTV small and PTV large radiation plan on a daily basis.

**Results:** A total of 56 CBCTs were reviewed for the first 6 patients. The PTV small covered the target for 60% of treatments while the PTV large covered the target for 32% of treatments. For 9% of treatments the PTV large would have missed the target; this was the case for only 1 patient.

**Conclusion:** PTV small is suitable for use on most CBCTs with PTV large suitable for the remaining CBCTs in all but 1 patient. This was due to a very different rectum and bladder during treatment from simulation. A ‘plan of the day’ treatment approach for post prostatectomy RT will be implemented once training is complete.

Investigation of isodose prescription level in hypofractionated intracranial treatments using volumetric modulated arc therapy  
R. Hiscock, B. Mzenda, A. Falkov  
Auckland Radiation Oncology, Auckland, New Zealand

**Objective:** To investigate the effects on plan quality metrics of prescribing to different isodose levels for patients treated for intracranial tumours using VMAT.

**Method:** Ten patients originally planned such that 95% of the prescribed dose covers the Planning Target Volume (PTV) were retrospectively replanned to achieve the prescribed dose at PTV surface. This was performed at prescription surface isodose (pSI) levels of 70% and 80%, with each plan normalised to 100% at the geometric isocentre as recommended by other authors.

The target coverage ($Tc$), conformity index ($CI$), homogeneity index ($HI$), gradient index ($GI$), and planning target volume (PTV) coverage were quantified. Doses to the organs at risk (OAR) were evaluated.

**Results:** $Tc$ and $CI$ were comparable between the prescription methods. Reduction in pSI was seen to produce an increase in monitor units, $D2\%$ and $HI$. In all cases $GI$ reduced with decreasing pSI and OAR doses were equivalent or lower than the standard plans.

**Conclusion:** When dose escalation within the target is highly desirable whilst keeping normal tissue doses as low as possible, our results indicate that prescribing at the 70% pSI is preferable in most cases.

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Reshaping the future of breast and chest wall treatments
M. Lathouras
Royal Brisbane and Women’s Hospital Cancer Care Services Radiation Oncology, Queensland, Australia

With increasing awareness of late effects to heart and lungs from breast and chest wall radiation, new and innovative techniques and technologies have to provide conformal homogenous Planning Target Volume (PTV) dosing, while minimising doses to lungs and hearts, and meeting acceptable organs at risk (OAR) dose constraints and tolerances. Royal Brisbane and Women’s Hospital Cancer Care Services have 2 Hi-Art Tomo-therapy machines which have the capability to deliver very conformal doses to breast and chest wall PTVs, while achieving very conservative (OAR) tolerances. Tomo therapy also allows narrow chest wall PTVs which include Internal Mammary Glands (IMs) to be treated. Double mastectomy surgery and immediate insertion of large breast tissue expanders has also created treatment problems and issues using conventional 3 Dimensional (3D) planning and treatment techniques, due to the very steep angles that would have to be used to avoid treating the contra-lateral breast. Tomo therapy has allowed these patients to be treated to conformal PTV coverage with acceptable OAR tolerances whilst minimising the dose to the contra-lateral breast. Risk assessment of this innovative helical treatment modality to treat breast and chest wall patients involved much discussion and research into the viability of this treatment due to the ‘low dose cloud’ which is delivered to the rest of the body outside of the PTV and the main OARs. This presentation will discuss these treatment situations and the strategies used to affect a satisfactory treatment outcome.

Investigating the radiation therapy boost modality for left sided breast patients: Photons versus electrons
A. Sen
Central Coast Cancer Centre, NSW, Australia

Objectives: Deep inspiration breath hold (DIBH) for breast boost requires photons due to the limitations of the DIBH monitoring equipment. However, the dose distribution of electrons allows for a fast fall off of dose, while also resulting in a quicker treatment time for the patient. The aim of this project is to compare photons at DIBH to electrons at free breathing for breast boost radiation therapy to patients who have had DIBH breast radiation therapy.
Methods: Twenty patients will have a boost treatment retrospectively planned with electrons on a free breathing scan and photons on a DIBH scan to a prescription on 10 Gy in 5 fractions. Comparisons will be made between the plans based on doses to the lung, heart and target coverage.
Results: The first five patients have been planned with electrons at free breathing and photons at DIBH. Doses to the planning target volume (PTV) are comparable; however, doses to the heart, left anterior descending artery (LAD) and left lung are increased using electrons at free breathing. Maximum heart and LAD dose increases from 71 cGy to 381 cGy and 56 cGy to 313 cGy respectively using electrons while mean left lung dose increases from 49 cGy to 124 cGy.
Conclusion: Further comparisons into the clinical significance of the doses homogeneity and conformity of the different techniques, time taken for treatment and patient experience will be investigated.
Creating an evidence-based guideline for the administration of oral contrast in CT at a regional teaching hospital in Australia: A literature review
A. Reiss
Darling Downs Hospital and Health Service Toowoomba, Queensland, Australia

Objectives: Positive oral contrast (POC) has been used in CT of the abdomen and pelvis since the inception of this imaging modality. Partly due to technological advances such as isotropic resolution, the most effective use of POC in multi detector-row computed tomography (MDCT) of the abdomen and pelvis is not always well understood. Many departments now perform examinations without POC or utilize a neutral contrast agent such as water. This study aims to create an evidence-based guideline to inform best practice in POC administration for specific clinical indications.

Methods: A literature search and review was performed to define best practice in the administration of POC for MDCT of the abdomen and pelvis. The results were described and an evidence-based guideline was produced. Confounding factors and possible limitations were noted.

Results: When compared to neutral or no contrast, current literature suggests POC does not increase the diagnostic yield for appendicitis and mechanisms of blunt trauma in MDCT. For clinical indications such as urolithiasis POC is unnecessary. The effective administration of POC is therefore dependent on specific clinical indications.

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Developing the Man-O-Gram: The role of magnetic resonance imaging for the detection, diagnosis and treatment of prostate cancer
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The current gold standard for prostate cancer detection is a transrectal ultrasound guided biopsy (TRUSBx) on patients who present with elevated prostate specific antigen levels. Less than half of cancers can be visualised on ultrasound; therefore, the biopsies taken are a random sampling of the organ. This leads to poor sensitivity, with up to 38% of cancers missed in the initial biopsy. Developments in functional Magnetic Resonance Imaging (MRI) techniques have led to MRI being examined as an alternative to TRUSBx. Prostate MRI involves anatomical sequences in combination with one or more functional imaging technique. Literature, which has been reviewed for this presentation, has clearly shown that multiparametric techniques have excellent sensitivity (96%) and moderate specificity (71%). Magnetic resonance imaging guided biopsy techniques have been examined as an alternate to the standard TRUSBx. These techniques are ideal as less core biopsies are required, the biopsies are targeted to the lesion, and the pathological information strongly correlates to the post prostatectomy specimens. Unlike TRUSBx, indolent cancers can be classified as clinically insignificant using MRI, thus leading to a decrease in the number of patients receiving radical treatment. It was concluded that a combination of triplanar T2 weighted, diffusion weighted, dynamic contrast enhanced and spectroscopic imaging are the ideal sequences for the detection of prostate cancer. MR guided in bore biopsy also has shown to be an applicable alternative to TRUS biopsy and has shown improved patient outcomes, and should be employed at the discretion of the urologist.
How to see the invisible cancer? 18F-FDG PET/CT case study
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3Department of Anaesthesia, Auckland City Hospital, Auckland, New Zealand

Cancer survival depends upon timely diagnosis and prompt treatment.
Objectives: Literature review suggests that current knowledge of paraneoplastic syndromes (PNSs), in combination with cancer related haematological parameters, anticancer antibodies, chromosomal mutations and PET/CT facilitate the diagnosis of neoplastic disorders. Our goal is to improve early cancer diagnosis by:
• Active search and identification of PNSs;
• Recognition of diagnostic patterns of early cancer;
• Developing an algorithm for early and express diagnosis.

Method:
• Retrospective review of case reports of cancer patients (with PNSs) in whom the diagnosis was missed;
• Observation of disease progression using serial PET/CT in combination with haematological, immunological, histological, etc. examinations.

Results:
• A number of missed PNS were identified; this presentation concentrates on one of them;
• Fluctuations of platelet levels and 18F-FDG bone marrow uptake were linked to the stage of cancer.

Discussion:
• Proposal of a diagnostic algorithm for screening, diagnosis, and re-staging of cancer.

Conclusion:
• Thrombocytosis and bone marrow 18F-FDG uptake can be used as markers of disease progression;
• Early cancer diagnosis requires exploration in four steps:
  1. Identify PNSs;
  2. Measure anticancer antibodies;
  3. Serial PET/CT and;
  4. Biopsy.

The authors suggest that new terms such as ‘Paraneoplastic thrombocythaemia’ and ‘Paraneoplastic 18F-FDG uptake’ add clarity and imply prompt cancer screening.

The use of computer tomography (CT) in computer assisted surgery in the veterinary world
S. Bray
Veterinary Teaching Hospital, Massey University, New Zealand

Computed Tomography is used regularly in animal cases at Massey University Veterinary Teaching Hospital. Specialised orthopaedic and soft tissue surgeons have been using our CT scans to plan their surgeries. With the advent of 3D printers they are able to have titanium implants printed specific to a patient’s size and anatomic structure using the CT images that have been taken. Computer assisted surgery allows implants to be designed to enable accurate correction of complex angular limb deformities; create implants to replace skeletal defects following cancer surgery of the mandible and forelimb; and to precisely orientate and stabilise dynamic spinal instability abnormalities. Many pets in New Zealand are part of the family or indeed are the family so many owners want to give their animals a full and happy life with these types of surgeries. This talk will show a few of the cases where we have used CT for planning purposes.
EDCT: The utilisation of a dedicated Emergency Department CT scanner in a spinal hospital
M. Lombardo
Princess Alexandra Hospital, Brisbane, Queensland, Australia

Objectives: To investigate the number of cervical spine Computed Tomography (CT) scans and the diagnostic yield of these examinations performed on patients presenting to the Emergency Department (ED) before and after the introduction of a dedicated CT scanner within the ED of the Princess Alexandra Hospital (PAH).

Methods: Using Radiology Information System (RIS) and Picture Archiving Communication System (PACS) the total number of EDCT cervical spine scans were determined from a 6 month period in 2009 (pre EDCT installation) and the same 6 month period in 2013 (post EDCT installation). These totals were then compared to the total number of patients entering the ED in these two time periods. The radiologist’s reports of these CT scans were evaluated as positive, negative or inconclusive for acute bony injury.

Results: The results of this study found a 31% increase in patient encounters in the PAH ED between the two time periods with an 80% increase in CT cervical spines performed. Consistent with literature, the diagnostic yield of these examinations remained roughly the same in the two time periods.

Conclusion: It can be concluded from these results that since the installation of the EDCT scanner at the PAH there has been a significant increase in CT cervical spines performed when compared to the background increase in patient encounters. However, there has been little change to the diagnostic yield of scans since the EDCT scanner’s introduction.

Cardiac MRI – the past, present and future
B. Pontre
University of Auckland, Auckland, New Zealand

The complex and dynamic nature of the heart makes it a difficult organ to assess using imaging techniques. In particular, a number of technological advancements were required over the years to make cardiac magnetic resonance imaging (MRI) both possible and clinically useful. Early developments in the hardware of MRI scanners were focussed on the speeding up of scanning protocols, making the imaging of the constantly moving heart a possibility. Subsequently, advancements in the imaging protocols themselves along with further hardware developments resulted in improved image quality and diagnostic value. Today, MRI is frequently used as a tool to assess cardiac dysfunction and disease. Even though the use of cardiac MRI is now widespread, advances in technology and applications have not stagnated. New techniques that may in future form part of the landscape of clinical imaging are currently being developed and investigated. Such techniques include diffusion tensor imaging for visualising and assessing myocardial fibre structure, compressed sensing that allows for the rapid acquisition of cardiac MRI data, and 4D computer modelling techniques that provide detailed visualisation and quantification of overall cardiac structure and function. This presentation will look at the technological advancements that have allowed cardiac MRI to become the indispensable diagnostic tool it is today as well as some current research into these novel cardiac MRI techniques.
Practitioner perspectives on fostering communication skills for preclinical radiography students in a simulated learning environment (SLE)
R. Druva
Monash University, Victoria, Australia

Introduction: Healthcare practitioners require excellent communication skills for effective interactions with patients. This is crucial for a variety of reasons including preventing unintentional medical error or maintaining patient safety whilst enhancing the communication exchange between practitioner and client/patient. A funded Health Work Australia project was conducted in 2014 using a 3D virtual environment for a communication module with medical imaging students in a multidiscipline, multi-university collaboration. The project aimed to develop and enhance communication skills of professional entry students in radiation sciences, nursing and chiropractics. This presentation focusses on the practitioner perspective covering benefits and enablers of the simulated 3D environment, delivery ease alongside limitations.

Method: The module was delivered in a structured workshop format to provide students with core communication theory and interactive skills practice within the simulated setting. Following the workshop, students completed a 1:1 interactive session with a health practitioner. Clinical educators with expertise were recruited for this level of individual tailored learning for the preclinical students. These practitioners completed a feedback survey with additional data sought as semi-structured interviews across a small sample group.

Discussion/Conclusion: The module format enabled recognition and application of communication theory across a variety of simple to more complex scenarios in a safe learning environment. Initial feedback indicates the engagement of current health practitioners for 1:1 sessions as one project strength. Practitioners were able to support their allocated students with real practical guidance and advice. Due to this approach reflection opportunities to identify areas for improvement after practising prior to real patient encounters in the clinical setting were possible.

Clinical supervision practices in medical imaging in the spotlight via SuperSIM
T. Smith
University of Newcastle, NSW, Australia

The quality of the students’ work integrated learning is heavily dependent on the standard of supervision they receive. There is a perceived need to improve the quality of students’ experiences by providing clinical supervisors with education and training that improves their ability to provide effective and supportive supervision. This is as true in radiography education as it is in most other health professional education programs. The University of Newcastle Department of Rural Health and University of New England collaborated to create a flexible, multidisciplinary clinical supervisor education resource, particularly for rural and remote practitioners. The project, titled SuperSIM, used simulation education methods to create a variety of video-recorded, case-oriented clinical supervision scenarios, based on Health Workforce Australia’s National Clinical Competency Resource (NCCR). The SuperSIM project resulted in the production of 12 simulation scenarios embedded in a PowerPoint-based framework. While they have generic relevance, several are based in the medical imaging environment and demonstrate radiographer-student interaction, such as in ‘Teaching and Learning Opportunity’, ‘New Student Orientation’ and ‘Shared Supervision’. Videos range between 2 and 4 min and prompt users to consider reflective questions, targeting specific learning objectives. With videos hosted remotely, the PowerPoint files can be emailed to prospective users or made available via iCloud technology. While not the only answer to improving clinical supervision, SuperSIM can be integrated into existing, or used to create new approaches to clinical supervision education. The flexible and accessible format means it is suitable for individual or small group learning, or for stimulating interactive workshops.
Documenting the clinical studies journey of medical imaging students by developing ePortfolios
R. Druva
Monash University, Victoria, Australia

In 2014 an Australian University invested in an online hosted web based licensed UK system (Pebble Pad™) for use within clinical placements. This system uses two different interlinked workspaces. One is a personal one to support individual personal learning whilst the other is an institutional workspace to support institutional teaching, learning and assessment. The scope of this initiative seemed a natural tool for radiation sciences courses because these disciplines interact in daily practice with high end technology. This presentation focuses on the achievements alongside the lessons learnt along the way of a phased implementation approach in the transition from printed clinical workbooks to an eportfolio showcase for medical imaging undergraduate students. Only a very short time frame from conceptualisation to implementation and engagement with students, academics and clinical partners was available; requiring strategic management. An action research framework was the chosen method for quality assurance purposes by the small project team. This framework supports the maintenance of a longitudinal viewpoint across the project guiding the monitoring and evaluation of encountered challenges whilst simultaneously responding to valuable user feedback. Early indications are that this system (Pebble Pad™) appears to bridge some of the existing tension between theoretical learning and learning that happens within clinical practice in an applied practical way. Demonstration of higher order learning occurred through documenting a diversity of elements beyond what is possible in a traditional format.

‘Do you see what I see?’ The importance of visual spatial ability for Medical Imaging Technologists
R.-J. Sweeney
University of Auckland, Auckland, New Zealand

Visual spatial ability describes the ability to mentally rotate a two dimensional object in three dimensions. This ability to ‘see’ three dimensional structures and positions of objects from two dimensional information, and to further visualise their rotation following manipulation, has practical and clinical implications for the medical imaging technologist (MIT) and other health science professionals. What might the implications be for a student MIT for whom a low visual spatial ability has not been considered and who does not receive further assistance to improve in his/her ability? What impact would that have on the student’s subsequent competency in academic and clinical practice? Do they eventually fail, choose to leave their chosen career, or do they manage to continue within medical imaging but perform at a lower level of competency? An awareness and understanding of the implications of a lack of visual spatial ability amongst MIT students should be encouraged. Educationalists might consider pre-testing students, with the provision of new or additional methods of educational assistance and subsequent re-assessment where necessary, to assist in improving this ability. Research and commentary describing methods of establishing visual spatial ability in student populations, educational opportunities, and recommendations and observations arising from these studies, is discussed. Learning and experience can improve low visual spatial ability,1 so we can look to reducing ‘cloud illusions’ amongst our student population.

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Creating a student-friendly department – lessons from our first year as clinical educators
L. Weterings, S. Peska
St Vincent’s Hospital, Melbourne, Victoria, Australia

Clinical education is a term used to describe the exercise of helping students to gain the necessary knowledge, skills and attitudes in a clinical practice setting. Throughout our first year as Assistant Clinical Educators, our focus has been on enhancing our students’ learning experiences at St Vincent’s Hospital, Melbourne. Throughout this presentation, we will share some of our experiences of helping students to get the most out of their clinical placement. This presentation will also offer practical suggestions on how to prepare your clinical centre for the arrival of students, how to increase the students’ contributions to the clinical centre, how to identify the students’ learning styles and how to provide constructive feedback. Finally, our presentation will discuss some of the benefits that we have experienced with taking on students in our medical imaging department.

Saturday 25 July, 1030–1230
Concurrent Session: Student

Paediatric pelvis pathologies that cause asymmetric gait
H. Do
The Royal Melbourne Hospital, Victoria, Australia

Asymmetrical gait or limping occurs in about 2–4 paediatric patients per 1000.1 The presentation of limping can be a clinical and diagnostic challenge because there are many differentials that vary between different age groups.

The focus of this presentation is to discuss the three main hip pathologies that current literature suggests will result in the clinical presentation of asymmetric gait. Slipped upper femoral epiphysis (SUFE) is a hip pathology that requires immediate medical attention because it can lead to avascular necrosis and permanent joint deformity. It often manifests over several months and can mimic a pulled muscle, leading to delayed diagnosis. Patients who present with knee or thigh pain and reduced hip movement should raise clinical suspicion for SUFE.2 Perthe’s disease is an idiopathic avascular necrosis of the proximal femoral epiphysis in children. Inadequate blood supply to the femoral head results in remodelling of the bone; consequently, patients will often present with a limp.3 The symptoms are usually unilateral but may progress to the contralateral side if there is no adequate containment of the femoral head within the acetabulum to maintain a congruent joint.4 Early detection of developmental dysphasia of the hip (DDH) is critical because delay in diagnosis can lead to instability, dislocation or acetabular dysplasia of the hip.5 Literature suggests that plain film radiography is a useful diagnostic tool when the femoral head begins to ossify, prior to this ultrasound should be use.6

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Evaluation of routine paediatric MSCT protocols from a major tertiary hospital in Oman
K. Al Mahrooqi
Institute of Health and Science Oman, Post graduate research student, Curtin University, Western Australia, Australia

Background: Since its introduction, the use of multi-slice computed tomography (MSCT) has increased, including imaging of children, which has raised great concern because children have rapidly dividing cells that are more sensitive to radiation, as well as a long remaining life span to manifest the effect.

Objectives: This study is the first of its kind in the region that aims to provide a snapshot of the current clinical practice of routine paediatric CT procedures and to investigate the influence of acquisition parameters on dose-reading across different age groups for the purpose of optimization.

Material and methods: A comprehensive literature review was conducted, followed by multi-center retrospective data collection, which included acquisition parameters and their corresponding diagnostic reference levels (DRLs).

Results: Of the paediatric patients studied, 60% were male. Brain examinations represent an average of 62% of the scans. In general, large variations in mean dose values appear between centers for the same examinations of the same age group, ranging from factor 3-4 for volume CT index (CTDivol) and 7–13 for dose length product (DLP), with the highest variation being in the age group of 6-10 years.

Conclusion: Dose saving can be achieved while maintaining the diagnostic task for routine examination. This requires a rigorous ongoing process to keep pace with the uncertainty of advanced technology. Although advanced CT technology has introduced new dosing software, such as iterative reconstructions and modulation techniques, some institutions are still scanning paediatric patients with adult protocols.

Work the World – Dar Es Salaam
L. Murray
Queensland Health, Redcliffe Hospital, Redcliffe, Queensland, Australia

Work the World is an organisation providing elective placements and projects abroad for student doctors, nurses, midwives, dentists, pharmacists, radiographers and physiotherapists. Staff work closely with numerous organisations and charities to allow programs to be tailored for each individual. In 2013 I undertook a 4-week placement with Work the World in Dar Es Salaam, Tanzania. I completed 3 weeks of my placement at the Muhimbili National Hospital, and 1 week in the Healthcare Centre in Melela village. The Muhimbili National Hospital Radiology department deals with around 100 patients per day referred from the general wards, casualty, the specialist Orthopaedic Institute and other smaller hospitals in Dar Es Salaam. They provide results to assist in diagnosis and treatment for fractures, trauma, road traffic accidents and various chest infections, including tuberculosis and HIV related cases. As a student radiographer I was still developing my own set of radiographic techniques and values with respect to patient care. My placement at Muhimbili National Hospital was a very eye opening experience and allowed me to expand on these techniques and values. The 5 weeks of my trip were both the most challenging and the most rewarding weeks of my life. I am so grateful to the staff in the hospital and Work the World for providing me with this opportunity that I can now share.
Hereditary multiple exostoses

E. Webb
Healthcare Imaging Services, The Northern Hospital, Victoria, Australia

Exostoses are newly formed, benign bone growths extending outwards from pre-existing bone. Exostoses can cause chronic pain, as they can decrease a person’s range of movement and sometimes impinge upon the surrounding nerves, vessels and musculature. Hereditary Multiple Exostoses is the name given to a condition most commonly found in children, where exostoses grow around active bone growth, predominantly the metaphases of long bones. This condition is almost always diagnosed by the age of 12 and there is risk of malignant degeneration. Some common symptoms are reduced growth, deformity, restricted joint motion, short stature and premature osteoarthritis. The estimated incidence is quite rare, with only 1 in 50,000 people being diagnosed. As it is a hereditary disease, these estimates are much higher in isolated populations such as the Ojibway Indian population of Manitoba, Canada and the Chamorro population in Guam. It is not known why Multiple Exostoses form, however there have been links to mutated genes that are thought to be involved. There is no cure for this ailment. Treatment is commonly of a surgical nature, such as bone excisions or corrective osteotomies. A 26-year-old male presented to Western Health with known Hereditary Multiple Exostoses and deformity. He had come for a review by Dr. Chris Harris, one of the consultant orthopaedic surgeons. The case study of this patient will be demonstrated in this presentation.

Acknowledgements: Western Health tutor Adam Steward. Christopher Harris Case study images provided by Western Health.

Giving patients a leg up – intensity modulated radiotherapy for lower limbs

J. Sloan
William Buckland Radiotherapy Centre – Gippsland Latrobe Regional Hospital, Victoria, Australia

Aim: A case study of a patient with liposarcoma extending from the pelvis down to the right thigh. The treatment technique and process are presented.

Method: An overview of the patient’s background is described. This was a large field size that presented a challenge in delivering a high dose to the tumour bed. The application of IMRT as an adjuvant treatment post-surgery for this patient is analysed and the rationale for clinical management and patient care evaluated with reference to the evidence base. Volumetric Modulated Arc Therapy, Brachytherapy and Neoadjuvant Radiotherapy as possible alternatives are explored.

Results: IMRT resulted in favourable dosimetry with sparing of healthy tissue. Delivering this treatment to the patient was compromised by lengthy treatment time and issues with reproducible set up. Image guidance was critical in this case.

Conclusion: The efficacy of IMRT for the treatment of sarcomas in the lower limb is supported by the evidence base to offer low chances of tumour recurrence and excellent outcomes for patient quality of life.
Cost-benefit of Intensity Modulated Radiation Therapy (IMRT) treatments for palliative patients
A. Harriman
Radiation Oncology Mater Centre, Brisbane, Queensland, Australia

Aim: The aim of this study was to examine the cost-benefit of IMRT treatments for palliative patients in relation to a case study.

Method: Current literature was reviewed in relation to a case study involving a patient with unknown primary cancer who received a highly-conformal palliative IMRT treatment for a mediastinal tumour.

Results: Although palliative radiotherapy treatments typically involve large treatment fields, more conformal and technological approaches such as IMRT often yield superior outcomes for patients, particularly when dose escalation is indicated, or the treatment volume is in close proximity to critical structures. Departmental costs are a significant consideration when providing IMRT treatments however, since extra time and resources are typically required. Suitability requirements must also be considered as there is a greater need for rigid immobilisation devices, precise image-guidance, and patient compliance.

Conclusion: IMRT is effective for palliation and produces better quality of life outcomes compared with conventional techniques; however the extra time and resource costs incurred by the department must also be considered, which is why this remains a controversial issue.

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How to optimize image quality for paediatric patients using digital radiography
A. McKenzie, A. Marsh
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Digital radiography is the most recent development in radiography and has significant changes from previous computed radiography systems. This needs to be considered when imaging paediatric patients due to their increased sensitivity to radiation compared to adults. This highlights the importance of optimizing image quality by selecting correct exposures and equipment. Medical radiation technologists effectively need to adapt current practice to produce images of diagnostic quality while maintaining a low patient dose. Although digital radiography has the ability to produce images of higher quality, medical radiation technologists need to be aware of methods which will repeatedly produce images of diagnostic quality. The methods used to achieve images of this standard differ from computed radiography techniques and need to be employed for all paediatric patients to ensure diagnostic x-rays with the lowest patient dose.
Lung cancer changes during radiotherapy: assessment of functional and motion changes at 3T
S. Kumar
Liverpool Cancer Therapy Centre, NSW, Australia

Purpose: MRI data is increasingly incorporated into radiotherapy planning. The purpose of this study was to investigate the use of MRI in assessing functional and motion changes in lung cancer during RT.

Methods: 4 patients were scanned on a 3T Siemens scanner, prior to the start of their treatment and on days 1, 11 and 21 during treatment. For motion analysis free breathing TrueFisp scans were acquired. Manual motion analysis was based on tumour edge delineation at end tidal inspiration and expiration. Semi-automated analysis of tumour and diaphragm motion was performed using in-house software (MATLAB). Diffusion weighted imaging was acquired using an EPI sequence. The tumour was then segmented by a thoracic radiologist, and ADC histograms were calculated using additional software (ImageJ).

Results: Tumour motion varied during treatment from baseline measurement in all cases. The mean ADC value of all tumours stayed constant or decreased slightly between the baseline and day 1 and increased between day 1 and day 11 by approximately $0.2 \times 10^{-3}$ mm$^2$ sec$^{-1}$. Histogram analysis showed the percentage of voxels with moderately low ADC (i.e., $<1.0 \times 10^{-3}$ mm$^2$ sec$^{-1}$) increased between day 0 and day 1 and then decreased progressively from day 1 to day 21 in all cases.

Discussion: For this small cohort of patients, variation in motion and diffusion was shown over the course of RT. Histograms rather than mean ADC value is a promising approach for ADC analysis.

Conclusion: These preliminary results suggest real time tracking with MRI guidance on an MR-Linac is desirable.
Introduction of image-guided breast radiation therapy
C. Anderson
Radiation Oncology Queensland, Gold Coast, Australia

Objectives: Breast radiation therapy techniques have become more conformal over recent years however imaging techniques have not adapted at the same rate. Traditionally, coverage of visible breast tissue has been assessed using the light field. Images are taken during treatment and verified offline. With an increase in the use of cardiac shielding and tissue compensation techniques, this may no longer be best practice. The aim of this study is to investigate the benefit of daily pre-treatment imaging for breast radiation therapy.

Methods: A literature review was conducted to review current best practice for breast Image Guided Radiation Therapy (IGRT) which did not find conclusive results. Our current practice for IGRT for the treatment of breast photon boosts was introduced to a subset of patients receiving radiation therapy to the whole breast or chestwall. The imaging process involves paired Kilovoltage (kV) imaging along the tangent angle and in the Anterior-Posterior (AP) direction. After 3 months the process was evaluated for feasibility with implementation to follow across all breast patients.

Results: The change in practice was phased in over an initial cohort of patients with little effect on workflow. It was found that daily online shifts were often required to achieve appropriate coverage most notably in the AP direction, along the breast tissue-lung interface.

Conclusion: The process was found to be feasible and easily implemented. Incorporating this pre-imaging technique for breast radiation therapy increases confidence the dosimetry is reproducible whilst maintaining adequate target tissue coverage.

Analysis of inter-user variation for prostate soft tissue image registration on Tomotherapy\textsuperscript{HD} at the Radiation Oncology Institute Gosford clinic
M. Tonks, K. Fletcher
Radiation Oncology Institute, Gosford, NSW, Australia

Daily image guidance provides the added confidence required when delivering highly conformal treatment plans or using highly modulated delivery methods. However, in order to gain maximum benefit from daily imaging, the accuracy of image registration must be assured. Gold seeds have previously been used as a surrogate for the prostate gland where treatment images have lacked soft tissue definition. However the fiducial markers still introduce a degree of uncertainty due to prostate deformation and seed migration.

At ROI, we have access to both a conventional linac (Elekta Synergy with CBCT) and a Tomotherapy\textsuperscript{HD} unit (MVCT). After the installation of the Tomotherapy\textsuperscript{HD} unit and a visual review of the acquired MV image quality, it was decided to move towards soft tissue registration for prostate patients.

Soft tissue matching potentially leads to an increase in inter-user variation compared to a seed match, due to the amount of 3D data being assessed. With this in mind, a review of current procedures for soft tissue matching was required to assess the variation amongst users.

Tomotherapy trained RTs from our Gosford clinic were asked to review 3 randomly selected treatment images from each of 7 different prostate patients (21 images in total). One of our Tomotherapy trained Radiation Oncologists completed the same registrations which became the control data to be used for our comparison.

The results will be discussed during this talk.
Outcomes of daily soft-tissue matching for synchronous integrated boost intensity modulated radiation therapy (SIB-IMRT) for bladder cancer

H. Caine, D. Whalley, A. Kneebone, J. Cox, T. Eade
Northern Sydney Cancer Centre, Royal North Shore Hospital, NSW, Australia

**Aim:** To assess Image Guided Radiation Therapy (IGRT) outcomes of daily online soft-tissue matching for bladder cancer SIB-IMRT.

**Methods:** Daily Cone Beam CT (CBCT) images from 15 consecutive bladder cancer patients were reviewed. The protocol required gross tumour volume (GTV) delineation using CT, MRI and cystoscopy. The GTV was expanded 5 mm to form the clinical target volume (edited to the bladder wall) and an additional 5 mm to create the high dose planning target volume (PTVHD). The intermediate dose PTV (PTVID) was defined as the whole bladder with a 1 cm margin. The PTVHD/PTVID received either 66 Gy/60 Gy in 30 fractions \( (n=3) \) or 55 Gy/50 Gy in 20 fractions \( (n=12) \). All patients were aligned by the treating therapists with CBCT matched primarily to the GTV. For each CBCT the treated GTV and bladder were reviewed for coverage using the planned PTVHD and PTVID. This was conducted for both soft-tissue matching (SM) and offline bone matching (BM). An offline audit of the soft-tissue matching was also performed.

**Results:** In the 15 patients, all fractions were available for analysis (330 images). For SM versus BM respectively, the GTV was covered by the PTVHD in 100% versus 86% of fractions and the bladder was covered by 92% versus 81% of fractions. An audit of online versus offline soft-tissue matching showed negligible differences with no impact on the GTV coverage.

**Conclusion:** Radiation therapists can perform daily GTV matching using online CBCT, with 100% of fractions successful. Soft-tissue matching was superior to bone matching for coverage of both the GTV and bladder.

A feasibility study into reducing treatment delivery times for left sided breast patients receiving deep inspiration breath hold (DIBH) radiotherapy

M. Le Mottee
Central Coast Cancer Centre, NSW, Australia

**Objectives:** To compare treatment delivery times of four different techniques for deep inspiration breath hold (DIBH) whole breast radiotherapy (RT) to minimise the treatment delivery time without compromising the target coverage.

**Methods:** Ten left sided DIBH RT patients were selected. Four separate plans were created for each patient. The treatment techniques used were:
- conventional tangents comprising of open wedged fields (two to four beams);
- forward planned segmentation (two beams);
- hybrid inverse planned intensity modulated radiation therapy (IMRT) (four beams); and
- volumetric modulated arc therapy (VMAT) (two partial arcs).

All plans were optimised to Central Coast Cancer Centre’s current breast protocols. Plans were then delivered on a Varian21iX linear accelerator (Varian Medical Systems, CA, USA) using Millennium 120 leaf MLC. The maximum dose rate was 600 monitor units per minute. Each plan was delivered three times with the beam on time recorded for each beam. A further three patients were planned using forward planned segmentation and inverse planned IMRT using flattening filter free (FFF) beams.

**Results:** Plans using FFF have not yet gone through statistical analysis or timing. All plans using filtered beams achieved adequate dose coverage. Average beam on time per beam for tangents was 20.50s \( (\pm 3.43) \), segments 14.14s \( (\pm 4.26) \), hybrid IMRT 10.21s \( (\pm 3.7) \) and VMAT 48.76s \( (\pm 1.28) \).

**Conclusion:** Hybrid IMRT has the shortest beam on times, while still providing target coverage without compromising on doses to OAR. This project will be pursued until FFF data for ten patients is gathered and analysed as initial results are promising.
Choroidal melanoma is the most common primary intra-ocular malignant tumour.\textsuperscript{1} For many years the Peter MacCallum Cancer Centre (Peter Mac) has offered patients affected by this disease stereotactic radiation therapy as an effective treatment option for their disease. To deliver stereotactic radiation therapy it is imperative to employ a patient fixation system that is highly reproducible and achieves the accuracy required for high precision treatments. Additionally, for treatment of ocular tumours it is not sufficient to fix the patient’s head: the eye itself has to be fixed in the same position during imaging for treatment planning and during treatment delivery for all treatment fractions.\textsuperscript{2} Peter Mac recently installed a Varian STX TrueBeam linear accelerator equipped with Brainlab ExacTrac software and 6D freedom robotic couch, which has transformed radiation therapy treatment of choroidal melanoma. In addition, Peter Mac has developed the ‘Eye Tracker’, a new piece of equipment that is compatible with ExacTrac’s infra-red positioning system. The eye tracker monitors the patient’s eye during their treatment, ensuring that it remains in the correct position for the duration of their treatment. This presentation will describe Peter Mac’s treatment technique of choroidal melanoma, detailing the advances provided by the TrueBeam, ExacTrac, 6D freedom couch and eye tracker. Advances that include: reduced treatment times, greater dose conformity and superior positioning accuracy.

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Prone positioning with bellyboard versus supine positioning in the treatment of anal canal cancer with IMRT: A dosimetric analysis
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Objectives: To assess whether there is a statistically significant reduction in the volume(s) of irradiated small bowel with the use of prone position and bowel displacement device or ‘Belly Board’ (BB), in patients with anal cancer treated with IMRT, in comparison to the supine position.

Method: Both prone and supine CT data sets were acquired for 7 eligible prospective patients. A single clinician delineated PTVs and OARs based upon the Australian Gastrointestinal Trials Group (AGITG) Atlas. Additional irradiated bowel volumes (IBVs) including bowel cavity, small bowel loops, other bowel loops and all bowel loops were contoured. IMRT plans were generated. IBVs for both supine and prone plans were recorded in cc and percentage of total volume and analysed in 5 Gy increments from 5–45 Gy using data derived from dose volume histograms. The influence of other factors including gender, staging, body habitus and bladder filling upon IBVs were investigated.

Results: Independent-samples t-test indicated no significant difference in the V30 Bowel Cavity recorded in cc between the Supine (M = 360.37, SD = 158.31) and Prone groups (M = 289.53, SD = 225.96; P = 0.53). A strong negative correlation (r = −0.9) was observed between bladder filling and IBV for bowel cavity V30 cc. No statistically significant reductions in the means of the other IBVs were observed when comparing the two set-up positions.

Conclusion: Our results suggest there is no statistically significant reduction in the IBVs based upon the treatment position and the use of a bowel displacement device in patients undergoing IMRT for anal cancer.

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A review of the use of tattoos in prostate radiotherapy
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Introduction: Tattoos have long been used in radiotherapy to aid with patient alignment, and accuracy of treatment. Many studies have looked into alternatives to tattoos to minimise the psychosocial impact these can cause to patients. This study investigated whether tattoos are required at all due to the use of better imaging to target tumours accurately.

Method: A total of thirty patients receiving radiotherapy to their prostate and prostate beds were selected to be part of a no-tattoo study group. These patients were visually straightened and aligned using bony landmarks; the isocentre placement was corrected before treatment using a daily CBCT. The set-up rotations and translations were recorded, and compared with thirty similar patients who were set-up using tattoos.

Results: The set-up rotations were consistently within a five degree tolerance, with an overall reduction of pelvic tilt. The translations showed a greater variation but were corrected for daily before treatment. The average set-up time of these patients was reduced to 3 min.

Conclusion: Patients receiving treatment to their prostate or prostate bed at ARO no longer need to be tattooed, due to the use of daily imaging, and soft tissue matching. This has been proven to decrease patient set-up time whilst preserving accuracy of treatment.
Prostate motion in 6 degrees
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William Buckland Radiotherapy Centre, Alfred Hospital, Victoria, Australia

Intrafraction prostate motion has been assessed using daily kV imaging with ExacTrac. The first 16 patients treated were assessed to evaluate the range of prostate motion during treatment ExacTrac kV imaging has been used for prostate patients at the William Buckland Radiotherapy Centre since May 2014. ExacTrac is a kV imaging system linked with a robotic couch allowing 6 degrees of freedom. Images are acquired prior to treatment and a correction in 6° is applied, images are repeated to confirm the shifts. Halfway through treatment ExacTrac imaging is repeated, if variation of more than 2 mm or 2° is detected corrections are applied. The correction to pitch and roll is limited by the robotic couch. A residual pitch of up to 8° is accepted. Patients have three gold fiducial seeds implanted in their prostate and these are used to align to the prostate for treatment. An IMRT technique is usually used. Patients are given specific instructions for bowel and bladder preparation prior to the planning CT and the same procedure is followed for each treatment day. Substantial intrafraction variation was seen in pitch in some patients (range 0.5°–7.6°). Intrafraction variation in the roll was much less (<1.5°) as was the yaw (<1°). Day to day position of the prostate varied greatly with nearly all patients having a residual pitch of over 7°. Distortion of the prostate was also seen due to the relationship of the fiducial markers changing day to day for some patients.

Bowel and bladder preparation and prostate treatment
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Changes to patient information and imaging radiation therapy patients using cone beam CT prior to treatment have made significant changes to practice, patient education and the patient experience at Auckland DHB radiation therapy department. This presentation reviews side effects patients had in the past and benefits of patient instructions prior to planning CT appointment which have resulted in less repeat CT scans, more accurate treatment, higher doses deliverable, less side effects.
How can radiographers mitigate diagnostic errors in the emergency department?
M. Fuller
Flinders Medical Centre, Adelaide, Australia

This paper considers the types of radiographic diagnostic errors which are known to occur in emergency departments. To what extent do radiographers contribute to these errors and what is our potential to reduce them?

The emergency department radiographer is in the unique position of both performing the initial X-ray examination and initiating supplementary imaging following consideration of everything that is known about the patient. Important considerations for the radiographer are as follows:

- What is the mechanism of injury?
- What are the patient’s clinical signs? (pain, swelling, deformity, limitation of movement etc.)
- What are the common injuries associated with this patient’s demographic?
- Is there a radiographic soft tissue sign of injury demonstrated on the initial imaging?
- Does the old imaging clarify any equivocal appearances?
- Will further imaging potentially clarify an equivocal appearance?
- How will this injury be treated?

The radiographer who considers these questions is practising ‘clinical thinking’ which is patient-focused rather than purely technical thinking which is picture-focused. This paper provides examples of the benefits of clinical thinking and the diagnostic risks of a purely technical approach to the radiography in the emergency department.

An assessment of the positioning of pelvic binders for trauma patients
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Objectives: Pelvic fractures result from high-energy trauma and are associated with high mortality and morbidity.1,2 Unstable fractures are associated with an increased mortality rate, with haemorrhage as the primary cause of death.3 The role of pelvic stabilisation and immobilisation is to decrease the pelvic volume and minimise movement.4 The aim of my study was to assess the accuracy of positioning of pelvic binders on patients presenting to a tertiary trauma centre in Queensland, Australia.

Method: Appropriate ethical approval obtained. A retrospective review of pelvic radiographs was undertaken over a 12-month period by utilising the PACS. Two ED Consultants selected as assessors, with a third Consultant selected to act as an arbiter should there be any discrepancies in the assessments of positioning. Positioning guidelines state that optimal positioning of the pelvic binder is across the level of the trochanters. The four grading criteria for assessing the binder position were: optimal, sub-optimal above, sub-optimal below and sub-optimal skewed. A data collection sheet with instructions was generated and a small cohort pilot study carried out with two senior radiographers to test the instructions and grading criteria.

Results: 20/37 were optimal (~54%), 15/37 were sub-optimal above (~41%), 2/37 were sub-optimal below (~5%) and 0 were sub-optimal skewed (0%).

Conclusion: This project achieved its intended aim to assess the accuracy of positioning of pelvic binders on patients presenting to a tertiary trauma centre in Queensland. Approximately 54% of the sample was optimally positioned, with 46% sub-optimally positioned.

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‘Not a lung cloud in sight’ – A clinical audit investigating the diagnostic yield of chest radiography when screening for sepsis in the Emergency Department
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Introduction: Recent studies have supported the standardisation of protocols for the rapid diagnosis and treatment of sepsis in the Emergency Department. The Flinders Medical Centre (FMC) Emergency Department (ED) utilises chest radiography as part of the protocol in identifying and localising infection and inflammation. While structured clinical pathways may improve the prognosis of the septic patient1 the diagnostic yield of chest radiography when screening for sepsis at FMC remained undefined.

Objective: Perform a clinical audit investigating the diagnostic yield of chest radiography as part of septic screening procedures.

Method:
1. Retrospective data extraction acquired using the FMC Radiology information system.
2. Reviewed ED chest radiographs performed over a period of 3 months.
3. Documented relevant clinical details and radiologic findings for each examination.
4. Calculated proportion of which resulted in radiologic identification of acute inflammation or infection.

Results: A total of 349 chest radiographs were requested during this period. Of these, 305 were adult chest examinations, of which only 15.4% resulted in radiologic identification of inflammation or infection. The remaining 44 were paediatric chest examinations, of which 79.5% resulted in radiologic identification of inflammation or infection.

Conclusion: The results suggest that a low percentage of chest radiographs in the adult population identify chest infection as a septic source. In comparison, a majority of paediatric chest examinations identified infective pathology. Further research is required to assess whether increased selectivity amongst referring clinicians could increase the diagnostic yield of chest radiography when screening for sepsis, particularly in the adult population.

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Radiography of the wrist: Basic imaging and advanced techniques
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The wrist is a complex joint bridging the hand and forearm, comprising an extensive number of bones and intricate articulations allowing compound movements including thumb apposition differentiating us from our closest relative, the ape. Extremity radiography is generally taught to students during the early stages of first year given the seemingly straightforward nature of the examination. However, the complex series of articulations requires a sophisticated understanding of anatomy and applied radiographic techniques in order to appropriately demonstrate pathology. This presentation aims to re-focus and instruct on appropriate imaging of the wrist applying basic radiographic principles to ensure reproducible images of high quality. An outline of important pathologies and supplementary projections critical to their assessment will also be discussed.
Concurrent Session: Radiation Therapy 3, Management

The changing face of communication – how the cloud assists our learning and growth
J. Harris
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Communication is traditionally perceived as individuals speaking to each other, or writing to each other in order to convey a message. The modern Radiation Therapy department however, creates and stores an enormous amount of data which may be classified as a form of communication. If this communication is examined, analysed and effectively disseminated, it has the ability to change our work practices to improve patient care. This paper will examine the model used by CPMCC radiation therapists when undertaking process improvement projects in particular the quarterly treatment verification imaging audit and the duration of prostate patient’s treatment project. The model identifies the importance of implementing the appropriate management style, communication tools and training dependent on the project. Additionally the possible model outcomes will be shared examining the influence this has had on leadership skills and facilitating growth and learning within the department.

Evaluating the impact of a clinical leadership team within a large multi-campus Radiation Oncology service
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Peter MacCallum Cancer Centre, Victoria, Australia

Modern radiation oncology practice evolves at a rapid pace. The need to ensure prompt integration of cutting edge technology is essential to provide optimal patient care. Safe and timely implementation of new practice can be particularly challenging in the context of a large, multi-campus radiation oncology service. Peter MacCallum Cancer Centre is comprised of five campuses, including four metropolitan campuses and one rural campus in Bendigo. The seamless integration of clinical activity across all campuses is paramount to being globally responsive to patient needs. To achieve this outcome and support delivery of a high quality service, the centre recently implemented an innovative clinical leadership team within the organisational structure. The team comprises eight senior radiation therapists appointed as Clinical Leads across the five campuses. Oversight and co-ordination of the group is provided by an appointed global position entitled Clinical Coordinator. To evaluate the impact of the clinical leadership team, service deliverables were defined in accordance with the organisational strategic direction, with pre-defined measures to evaluate success. To date the clinical leadership team has provided a platform to standardise core practice across campuses and enhance service efficiency. Cross-campus collaboration, mediated through the Clinical Coordinator, has provided opportunity for campuses to leverage off global expertise and endeavour to deliver clinical innovation, and enhance outcomes for our patients. This presentation will outline the functions of the clinical leadership team, and measure the impact of this model on a large, multi-campus Radiation Oncology service.
Background: The first radiotherapy centre in Western NSW Local Health District (WNSWLHD) was opened at Orange in 2011. Prior to this patients travelled outside the health service, primarily to Sydney, to receive treatment.

Aim: To investigate if the establishment of a ‘local’ radiotherapy service in a geographically sparse rural area has impacted on the number of patients accessing treatment. In particular to investigate if change has been widespread and if patients’ demographics, cancer and treatment intent changed significantly with the introduction of the new service.

Method: Data were collected on every WNSWLHD patient 17 years of age and above who received radiotherapy in either 2010 or 2012 in NSW or ACT. The age, gender, treatment intent, cancer type and residential town were recorded.

Results: The number of patients who accessed radiation increased from 573 to 667 between 2010 and 2012 ($\chi^2(1) = 6.0, P = 0.014$). The corresponding radiotherapy utilisation rates were 29.3% in 2010 and 33.4% in 2012, an improvement of 4.1%. The change in the number of patients accessing radiotherapy became significant for those living within 150 km of the new service ($\chi^2(1) = 5.1, P = 0.02$). There was some improvement outside this area until a distance of 300 km from the new service, at which radiation treatments decreased. The number of palliative treatments increased significantly only within the Orange region (95% CI 1.2–3.0, $P = 0.004$), with minimal change in the other regions. Male treatments also significantly increased as there were 81 new treatments (292 vs. 373, $\chi^2(1) = 9.6, P = 0.002$) as did patients with a respiratory cancer (66 vs. 97, $\chi^2(1) = 8.7, P = 0.003$).

Conclusion: A new radiotherapy service in a sparsely populated health district significantly changed the pattern of radiotherapy use by those who lived in the Orange region, particularly those living within 150 km of the new service.

At our rural and remote Radiotherapy Departments, Oceania Oncology has been looking at new ways to help efficiency and make the best use of resources. To expand our planning capabilities the idea of a ‘virtual planning room’ was introduced. Across our two remote centres our planning requirements have considerably expanded and at times one department might have a larger workload than the other. Using Citrix to access our floating planning software licences, it is easy to have access to a planning system. We have created a spreadsheet that is accessible to both sites to see all patients in the planning stage and where they are up to. This way, regardless of where the patient will end up having treatment, all patients can be planned according to their start date. Skype has also been implemented to create essentially, one room whereby Planners can still converse with one another and even discuss plans with the Radiation Oncologists who might be offsite. This system also has the potential for reduction in travelling for Therapists. Staff are sometimes needed at the other site due to shortages (i.e., holidays, sick days). Using the ‘virtual planning room’, staff resources can be shared amongst the sites virtually rather than physically and in an instant. At the time of this abstract submission, the concept was still in its infancy, by the time of NZIMRT we will be able to present how we have found the whole experience based on patient throughput and Radiation Therapist satisfaction.
Radiation therapy service remodelling to enhance collaborative working
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Peter MacCallum Cancer Centre (Peter Mac) has been delivering radiation therapy services for sixty years. From humble beginnings the public service has evolved to a five campus organisation across metropolitan and regional areas, and employs almost 200 radiation therapy staff. With the accelerated growth in more recent years, it soon became apparent that the ‘hub and spoke’ structure traditionally used to manage the radiation therapy department was not working efficiently or effectively, and change was necessary. Over the last 3 years, Peter Mac radiation therapy has engaged in an extensive review period. The review process engaged external consultants and established internal working parties to address the key issues identified by staff to improve our way of working. The final result was a remodelled service with clear lines of responsibilities across the site management team; campus based clinical experts to drive local service enhancement; and devolved campus wide coordinators to manage global clinical, education, research, and quality and risk portfolios. The new service model has now been in operation for 6 months and has demonstrated positive outcomes in clinical service advances and enhanced collaborative working across campuses and multi-disciplinary groups. This paper will present the process undertaken to remodel our service, including the successes and challenges experienced, and what has been achieved with the final outcome.

Utilisation of a telecommunications platform for cross-campus collaboration in radiation therapy
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In 2014 a new structure was implemented across the five campuses of the Peter MacCallum Cancer Centre. A team of Clinical Lead Radiation Therapists was installed with the goal of driving continuous innovation. The geographic distribution of the four metropolitan and one regional campus of Peter Mac creates challenges and the need for close collaboration between members of this group was required. Each member of the Clinical Lead team was tasked with both local campus and organisation-wide strategic projects with varying collaborators. It was identified that traditional methods of working over telephone, email and occasional enterprise videoconferencing would not fit with these roles and the combined clinical/innovation responsibilities. The use of a free videoconferencing software platform (Skype™) was trialled to enable instantaneous teleconferencing, videoconferencing, screen-sharing, file-sharing and instant messaging from the desktop or mobile device of each Clinical Lead. This has shown improved efficiencies in communication and collaboration as there has been a reduction in the need to access meeting rooms with enterprise videoconferencing or travel to face-to-face meetings. This presentation describes the setup, implementation and ongoing use of the platform as well as the benefits and challenges to its application in radiation therapy and the wider healthcare setting.
Towards molecular driven treatment: a systematic review into the feasibility of hypoxia-derived dose painting in the treatment of head and neck cancer

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Objectives: Tumour hypoxia in head and neck cancer is attributed to poor response to radiation therapy treatment, and in turn contributes to a decrease in loco-regional control and overall survival.1 A prospective strategy to overcome these deleterious effects is to utilize 18F-fluoromisonidazole positron emission tomography to delineate regions within the tumour showcasing hypoxic cells.2–6 These hypoxic regions are then subjected to a boost dose, to overcome the radio-resistant effects known to permeate in these oxygen-deprived regions.2–6 This strategy is known as dose painting. Therefore, the aim of this review is to examine the feasibility of dose painting using intensity modulated radiation therapy (IMRT) in comparison to conventional IMRT.

Method: This review examined whether dose painting IMRT plans have the capacity to:
(a) deliver a boost dose to hypoxia-delineated regions within acceptable organ at risk (OAR) constraints,
(b) potentially increase tumour control probability (TCP) via biological modelling statistics.

Results: Five planning studies were included in this review. The boost dose achieved in all five studies ranged from 77 Gy to 108 Gy.2–6 All studies unanimously demonstrated dose painting IMRT plans to achieve acceptable OAR values whilst attaining higher TCPs in comparison to conventional IMRT.2–6

Conclusion: The results indicated IMRT dose painting as a technically feasible strategy. Future clinical trials need to be conducted to confirm clinical outcomes align with the mentioned planning studies, in terms of improved loco-regional control and overall survival.

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Development and evaluation of the psychosocial guidelines for male HPV-positive oropharyngeal cancer patients
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Objectives: The purpose of this study was to develop evidence-based guidelines and evaluate them using a group of patients from the Princess Alexandra Radiation Oncology Department to determine their applicability in helping these patients cope with the dual diagnosis of oropharyngeal cancer along with a sexually transmitted infection.

Method: A literature search was conducted across a variety of databases, including Science Direct, PubMed and Google Scholar. Keywords used included psychosocial issues, human papilloma virus (HPV), oropharyngeal cancer and HPV positive. A randomized group of 10 patients was examined within the department to identify the current psychosocial issues suffered by this group, to investigate what current methods are used to help these patients and their families cope and evaluate whether the developed guidelines would be useful.

Results: The articles reviewed acknowledged the psychosocial issues that these patients suffer from however they note the lack of research within this area. Initial evidence was gained from literature regarding guidelines used for female HPV-positive cervical cancer patients to formulate a questionnaire and brochure for males suffering with psychosocial issues upon diagnosis. Clinically it was noted that there was a lack of psychosocial assessment and support available for these patients and that the resources developed would be highly beneficial.

Conclusion: Due to the increased prevalence of this disease it is increasingly important that these psychosocial issues are addressed. This study provides practitioners with the tools and resources to assess and support these patients suffering from the psychosocial issues that are associated with sexually transmitted infections and cancer.

Adaptive radiation therapy for head and neck cancer
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Aim: To investigate the use of adaptive radiation therapy (ART) for head and neck cancer.

Method: A literature analysis of four head-and-neck quantitative studies were analysed focusing on reducing the high dose received by the parotid glands in head and neck treatments.

Findings: The key findings indicate that significant interfractional changes can occur throughout the course of radiation therapy treatment, and using ART can be an effective way of reducing high dose to parotid glands. However, this is not without complications for departments.

Conclusion: The effect of ART on the reduction of high dose to the parotid glands and their impact on the treatment of radiation therapy patients is significant. Further research could focus around the implications of this for RT departments in New Zealand.
Use of Nimorazole in head and neck patients
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Hypoxia plays a major role in the tumour response to radiation in patients with head and neck cancer. It has been demonstrated in major randomised clinical trials and meta-analyses that the modification of hypoxia during radiation therapy can enhance the efficacy of radiation, therefore, in better loco-regional tumour control (49% vs. 33% in the placebo group) and overall survival. Nimorazole is a drug that gets into the cells with a low oxygen content and sensitises them, resulting in better cell kill from the radiation. The addition of nimorazole as a commitment drug with radiotherapy significantly improves the effect of radio therapeutic management of tumours (46% with nimorazole to 32% with placebo) without any major side effects. A retrospective study carried out in Denmark 1990-2013 with head and neck squamous cell carcinomas (HNSCC) looked at compliance and tolerance. There are further studies being conducted at the moment to include more European countries. I hope that in further studies similar results are achieved and this drug can be utilised in New Zealand practice in the future.

The experience of head and neck cancer
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Head and neck cancers are often described as immensely debilitating with patients experiencing an array of physical and emotional challenges along the illness trajectory from diagnosis to post treatment care. In New Zealand the incidence of head and neck cancer is increasing, resulting in a need for greater understanding of the experiences of these patients. The head and neck region is an area of great complexity, where treatments may alter swallowing, speech, communication, sight and hearing. Body image and psychosocial effects from treatments to the head and neck area can also be significant. The side effects from combined treatments greatly affect patients’ experiences. In addition to increased recognition of symptoms and psychosocial experiences, the demographics of head and neck cancer patients are changing, as a result of the human papillomavirus (HPV), leading to further research in this field. To facilitate a greater understanding of patients diagnosed with a head and neck cancer three studies explored their lived experience. From the key findings, there were aspects of each study that stood out. Radiation Therapists are not involved in a patient’s care when late effects from treatment occur. This is not only the physical side effects but also the psychosocial effects. Both the physical and psychosocial effects play a large role in the patient experience and it is vital that Radiation Therapists attempt to address them during treatment to improve the overall patient experience.

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Palliative care in cancer: Managing patients’ expectations
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Patients suffering from advanced or incurable cancers commonly have misunderstandings about their illness, intentions of treatment and overall prognosis. Several studies have shown that large numbers of patients receiving palliative radiation or chemotherapy, hold unrealistic hopes of their cancer being cured.\textsuperscript{1,2} Without fully understanding their prognosis and the limitations of treatment, patients cannot make well-informed decisions about their treatment choices. This review explores the discrepancy between oncologists’ and patients’ expectations from palliative treatments and factors associated with the development of such beliefs. Also, importance of complete disclosure of prognostic information, and patients’ preferences on how such information should be revealed will be presented.

Studies have shown that as many as 64\% of palliative patients did not understand that RT was not likely to cure them; with 92\% of these patients also having inaccurate beliefs about chemotherapy.\textsuperscript{1,6} One of the factors linked to such inaccurate expectations included oncologists’ hesitation to disclose prognostic information, especially when it is bad. This was mainly due to fear of causing distress, destroying hope or compromising the patient-doctor relationship.\textsuperscript{3}

Another contributing factor was that oncologists sometimes provide an overestimated or ambiguous prognosis.\textsuperscript{4} Even when a clear and realistic prognosis was given, patients continued to hold such expectations, suggesting that some patients use denial as a coping mechanism.\textsuperscript{5}

Patients who overestimate their prognosis are more likely to choose undergoing more aggressive therapies near their end of life.\textsuperscript{6} The importance of full disclosure lies in empowering patients to make well-informed decisions, and avoid options that contradict their needs; for instance, undergoing a futile life-prolonging treatment at the expense of quality of life. When surveyed, the majority of patients and caregivers expressed a desire for detailed information about the illness and its prognosis.\textsuperscript{7} However, preferences about when and how such information is revealed varied amongst patients, depending on different cultural backgrounds, belief systems and personal preferences.\textsuperscript{8} Oncologists, therefore, need to consider individuals’ needs when disclosing prognostic information.

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Stener lesion imaging
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Stener lesions involve a complete tear of the ulnar collateral ligament (UCL) of the first metacarpophalangeal (MCP) joint. Commonly referred to as ‘Gamekeeper’s Thumb’ or ‘Skier’s Thumb’, Stener lesions require surgical intervention to correct the anatomical displacement of the torn UCL as the adductor aponeurosis separates the torn ligament from the insertion site on the proximal phalanx. Comparatively, partial UCL tears will often be treated conservatively with a splint. It is important to rule out the possibility of a Stener lesion as incorrect treatment may ultimately reduce functionality of the MCP joint. A variety of imaging methods can be used to assist in determining the presence of a UCL tear as well as associated fractures, which will assist in the diagnosis of a Stener lesion. This case study aims to inform and educate radiographers of the common symptoms of Stener lesions and other UCL tears, the history of this pathology, the importance of early diagnosis, best imaging options available, clinical testing and the treatment options.

Pushing to the front of the queue: Does delayed radiotherapy treatment for high grade glioma affect survival?
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Objectives: High grade glioma (HGG) patients are managed with surgery, radiotherapy (RT) and chemotherapy. Despite improvements in treatment, survival rates are still poor. Previous studies exploring the effect of waiting time from surgery to start of RT for HGG patients were inconclusive and irrelevant due to outmoded regimes. We investigated whether the time between surgery and start of RT affects survival of HGG patients who received contemporary adjuvant treatment.

Methods: HGG patients treated at the Royal Adelaide Hospital from 2006 to 2012 were retrospectively reviewed. Data was collected from medical records and hospital databases. Delay to RT was defined as time from surgery to first RT fraction and overall survival (OS) as time from surgery to death. The Kaplan-Meier method was used to estimate survival.

Results: 224 HGG patients (Grade 3 n = 32, Grade 4 n = 192) with a median age of 60 years were reviewed. Delay to RT ranged from 8 to 90 days (median = 28 days). Initial findings show median OS of 30.7 months (95% CI 12.57–58.63) and 11.4 months (10.03–12.8) for Grade 3 and Grade 4 patients, respectively. The OS for the whole cohort was 48.5%, 22.9%, 12.3%, 7.8% and 3.0% at 1, 2, 3, 4 and 5 years.

Conclusion: Statistical analysis is continuing, but overall findings and conclusions will be presented at the conference.
**Digital tomosynthesis**

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**Objective:** To compare Digital Tomosynthesis (DT) to x-ray and CT and demonstrate areas where DT may serve as a low dose alternative.  

**Methods:** In-depth analysis of research and studies over last 5 years.  

**Results:** Notable advantages of DT over conventional radiography include vastly improved sensitivity, brought about by a reduction in anatomical noise. Because DT creates many images at different depths, the need for a lateral x-ray image is reduced as pathology can be triangulated from DT coronal slices. However, conventional radiographs are completed in milliseconds; DT is done over several seconds, making this modality unsuitable for many patients, including young children. While DT images are generally inferior to CT images, DT may be appropriate for some patients, that is, nodule detection in smokers and check-ups for CF patients. While DT images are generally inferior to CT images, DT does not produce metallic artefacts and does not suffer from PVE.  

**Conclusion:** DT is a valuable modality and should be accepted as an alternative to CT to image various pathologies, especially lung nodules, based on its strengths, expert opinions and overwhelmingly favourable results generated from studies.

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**The role of radiography in the diagnosis of pulmonary tuberculosis in the developing world**

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Despite significant advances in treatment, the global burden of disease caused by tuberculosis (TB) remains immense. Advances in health care standards have led to a low incidence of TB within high-income countries such as Australia, which is estimated by the World Health Organization (WHO) as having fewer than 10 cases per 100,000 population (World Health Organization, 2013). However, globally the WHO estimated that there were 8.6 million new cases and 1.3 million deaths in 2012. This places TB as the second leading cause of death by infectious disease, after the Human Immunodeficiency Virus (HIV). The Postero-Anterior chest radiograph has long been, and remains, a mainstay in the diagnosis of pulmonary tuberculosis (PTB). Early chest radiography when TB infection is suspected has been linked to improved patient outcomes. The ‘typical’ radiographic presentation of TB has been demonstrated to vary with factors such as patient age, state of infection and immunological status. The increase of Multi-Drug Resistant strains have ensured the continued potency of this disease and are presenting new challenges for radiographers working in this area. The sixth of the Millennium Development Goals, in conjunction with the Stop TB Strategy conducted by the WHO, has set the target of achieving a 50% reduction in mortality caused by TB by 2015. It is timely to review the role of radiography in the diagnosis and management of PTB, and to explore the areas in which it may further contribute to the global fight against this disease.

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Integrating bladder scanners into radiotherapy
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Radiation-induced enteritis is an acute side effect patients may experience when receiving radiation therapy to the pelvis, due to radiation damage to the small bowel. This unwanted effect can be significantly reduced for some patients if their bladder is full when they have treatment, which pushes the small bowel superiorly out of the treatment area. However, bladder volume is hugely variable, and so CBCTs (cone-beam computer tomography) are often used to ensure a full bladder (and often empty rectum) but this does involve the delivery of a small amount of radiation. Bladder scanners are portable ultrasound devices that can measure urinary bladder volume in a fast, accurate, and non-invasive manner and these are beginning to be trialled in the radiation therapy setting, especially in countries such as Canada. They can be used in addition to, or without the use of CBCT, to reduce the number of repeat CBCTs done due to the bladder being too small for treatment. I will examine the benefits and limitations of integrating such a tool in the radiotherapy setting in New Zealand.

Radiographers and radiological technologists’ roles in patient dose reduction: ISRRT perspectives
N. Pongnapang
The International Society of Radiographers and Radiological Technologists (ISRRT)

Radiographers and Radiological Technologists have important roles in delivering quality images with lowest possible dose. Radiographers are required to take certain steps to protect patients from unnecessary exposures. The International Society of Radiographers and Radiological Technologists (ISRRT) was founded in 1962. The society represents more than 500,000 radiographers and radiological technologists from more than 80 countries. The main mission of the ISRRT is to improve the standards of delivery and practice of medical imaging and radiation therapy throughout the world by acting as the international liaison organization for medical radiation technology and by promoting quality patient care, education and research in the radiation medicine sciences. The ISRRT also provides consultation for other international organizations namely, World Health Organization (WHO), International Atomic Energy Agency (IAEA), Commission of European Communities (CEC) and International Commission for Radiological Protection (ICRP). The ISRRT has established numbers of projects and activities regarding patient dose optimization and reduction. Those include ‘ISRRT/Philips dose wise radiographers’ project, research grant related to professional practice in dose reduction. In 2014, the ISRRT has initiated a new theme for research funding namely, ‘Roles of radiographers and radiological technologists in justification of medical exposures’.