Plenary Session

Personalised medicine and the role of radiomics and artificial intelligence in diagnostic imaging and radiation therapy applications

Annette Haworth
Invited Speaker

The medical community has access to a wide range of medical tests and imaging studies. However, for diagnosis and radiation therapy treatment planning, standard tests, typically governed by outdated funding guidelines, lead to decisions in treatment approaches that are based on ‘population average’ data leading to a one-size fits all approach to diagnosis and treatment. Radiomics is a rapidly growing field that leverages quantitative features in medical images that can be incorporated into diagnostic, prognostic and predictive models to aid decision making and personalised patient care. These models are built by accumulating masses of imaging data and correlating with ground truth information (such as tissue specimens) or treatment outcomes. Going well beyond identifying the location of a tumour for targeted radiotherapy, radiomics has the ability to identify biological features and heterogeneity within the tumour to facilitate a voxelwise approach to treatment.

In this presentation we will look at the basic principles of machine learning techniques that are used for deriving the mathematical models, some clinical applications, limitations of current approaches and future opportunities.

Empathy in action: testing, treating, caring

Julie McCrossin, Sandra Turner
Invited Speakers

Aims: To share practical examples of empathy in action for patients and family; to inspire participants to take action to advocate for the emotional wellbeing and care of patients, as well as technical excellence, in our work; and to enjoy a lively interactive panel discussion with audience participation.

Trigger questions:

- In a nutshell, why is it important to nurture the emotional wellbeing of patients? Isn’t technical excellence the most important thing?
- Please describe two or three brief examples of what you do to nurture and promote empathy in action for patients in the context of our treatment and testing? It can be either for individual patients or advocacy for groups, or both.
- What do you think are the one or two priorities for action to improve our care and focus on the patient as a whole person in your field?
Quality improvement leads to communication, collaboration and care – case studies
Vanathy Manivasahan
WSLHD Radiation Oncology Network, Westmead/Blacktown, Australia

Quality improvement (QI) concepts and techniques have dramatically improved the health care industry. The QI projects at Westmead and Blacktown hospitals have focused on improving the recurring issues that affect the care, efficiency and service to patients and their families. This presentation will outline how these projects led to improving communication, collaboration and care.

The clinical practice improvement model recommended by the Clinical Excellence Commission was used to identify practice changes required to reduce the rate of unnecessary cancellations of breast cancer simulation. Various QI tools and techniques were used to identify the causes and establish potential solutions to the problem. Communication was identified to be the process that needed improvement in order to achieve the desired outcome. A potential solution was implemented to improve the communication process, which resulted in reducing the cancellation rates from 10–22% to 2%.

Due to increased referrals and staffing restrictions the waiting list for skin cancer treatment increased to 8 weeks. A solution needed to be identified to reduce the waiting list and improve patient care. The QI process identified a workflow redesign. A collaboration of CT, mould room and DXR work areas were implemented. Along with rostering and adjustments to booking criteria, the waiting list was reduced to 2 weeks.

The various QI projects at Westmead and Blacktown hospitals have resulted in improved services and care provided to the patients and their families.

Enhancing organisational culture to build capacity for change
Kristie Matthews, Anne Collins, Glenn Osbourne, Sarah Artmanni
Peter MacCallum Cancer Centre, Melbourne, Australia

Radiation therapy services (RTS) at the Peter MacCallum Cancer Centre (Peter Mac) have recently undergone a period of significant change with major redevelopment activities leading to the relocation of clinical services and modified service delivery models. Equally, further change is anticipated with equipment procurement activities occurring across all five campuses during the next 12 months, which will likely result in multiple clinical innovation activities. It is recognised that organisational culture can have a direct influence on the ability of teams to cope with change. As a result, RTS have initiated a strategy to enhance organisational culture across the service as an effective way to better support readiness for change.

Working with co-facilitators from People and Change at Peter Mac, RTS have implemented a program to enable an enhanced organisational culture across the service. This has included the following activities:

- Implementing a redesigned performance development process
- Facilitating workshops with teams to define values expectations behaviours within each campus
- Providing training for teams on ‘preventing bullying and harassment’, ‘fiversity and inclusion’, and ‘giving and receiving feedback’
- Integrating workplace strategies to visibly acknowledge and practise within defined values expectations
- Implementing locally supported reward and recognition activities

Preliminary evaluation data indicate cultural change activities have had a positive impact on team engagement across campuses. Using the Peter Mac RTS Moorabbin Campus as a case study, this presentation will outline the strategy used for enhancing organisational culture, describe the activities provided, and present the outcomes achieved as a result.

Reference
1. Jones RA, Jimmieson NL, Griffiths A. The impact of organizational culture and reshaping capabilities on change implementation success: the mediating role of readiness for change. Journal of Management Studies 2005;42(2):361–386.
Failure mode and effects analysis in a paperless radiotherapy department
Helen Frewen,1,2 Elizabeth Brown,1 Anita O'Donovan,2 Michael Jenkins1
1Princess Alexandra Hospital, Brisbane, Australia 2Trinity College Dublin, Dublin, Ireland

Objectives: The increase in sophistication of radiotherapy treatment processes and computer software may lead to more computer related incidents.1 With the recent transition to a paperless radiation oncology framework at the Princess Alexandra Hospital, it was crucial to perform a prospective risk assessment to quantify the most significant sources of risk in the electronic environment.

Methods: A failure mode and effects analysis (FMEA) was performed using a web based three-round Delphi technique. Participants included radiation therapists and radiation oncologists. A detailed process map was created of all process steps and their sub-processes from patient booking to treatment. The first round was an open qualitative round to identify failure modes. In the subsequent rounds, all 83 failure modes were scored using the risk priority number (RPN) method, based on the product of occurrence, severity and detectability scoring. The final round was also used to identify risk mitigation strategies.

Results: The process map consisted of 61 process steps and 141 sub-processes. A list of 83 failure modes was identified and consensus was achieved regarding the risk scoring for a prioritised list of 20. Four of the top five failure modes were related to communication errors. Eighteen feasible solutions were recommended for incorporating into clinical practice to increase patient safety.

Conclusion: The FMEA application proved a valuable systematic method of prospectively identifying vulnerabilities in a paperless radiotherapy department. In particular, this FMEA identified numerous failure modes concerning communication and documentation, highlighting the need for sustained vigilance when performing all electronic processes.

Reference
1. Ortiz Lopez P, Cosset JM, Dunscombe P, et al. ICRP publication 112. A report of preventing accidental exposures from new external beam radiation therapy technologies. Annals of the ICRP 2009;39(4):1–86.

Using ARIA questionnaires and custom-built reports to review allied health measures for H&N RO patients
Andrew Do, Jessica Bain, Louise Malcolm
Epworth Healthcare, East Melbourne, Australia

Objectives: Conversion of PG-SGA, PSS-HN, and FOIS forms to electronic questionnaires in ARIA for ease of entry, centralised records and data collection.

Methods: Head and neck cancer patients undergoing radiation therapy are referred on to speech pathologists and dieticians for the assessment and ongoing management of their nutritional status, speech and swallow function during treatment. Outcome measures are collected to monitor patient progress and assess the impact of the service on clinical care.

ARIA is an information system used at the Epworth for Medical Oncology and Radiation Oncology. Data entered into questionnaires in ARIA is stored in a structured query language (SQL) database. SQL-compatible reporting tools can be used to create reports that extract and process the results of questionnaires for customisable display.

Results: Questionnaire templates in ARIA were created to transpose the three structured forms (PG-SGA, PSS-HN and FOIS) into the system. Questionnaires consist of defined multiple-option tick-lists, single-option pick-lists, and free-text entries to preserve the entry style of the forms and are formatted so that entries can be easily made through ARIA. Review of entered questionnaires can be performed in ARIA. Custom built reports can interrogate questionnaire data to review patient progression, trends, summaries over date ranges and all data items.

Conclusion: Questionnaires are simple to use, improved access to information through custom-created report software, supporting prospective collection of patient outcomes data.

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Independent validation of a feeding tube prognostic application for head and neck radiotherapy patients
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Objectives: Head and neck cancer (HNC) and its treatment with radiation therapy (RT) are associated with dysphagia, malnutrition and weight loss. Enteral feeding via a feeding tube (FT) is a common method of patient nutrition supplementation during and immediately following RT. Advanced T-classification and level 2 nodal involvement (L2) have been internally associated with prolonged FT use. The aim of this study was to validate the prognostic value of an internally generated FT prognostic-application (app) for utilisation in HNC RT patients.

Methods: Fifty-four patients (N = 54) with locally advanced HNC treated with definitive RT (+/- chemotherapy) were retrospectively analysed. T-classification, L2, prophylactic-FT insertion, FT-utilisation and weight-loss during RT were recorded. Patients were dichotomised into FT indicated (FTI) vs FT not-indicated (FTNI) based on prognostic-app criteria. Frequency distributions between groups were analysed.

Results: Patients with high-risk prognostic-app features were more likely to have FTs inserted (T-stage ≥3, P < 0.01; T-stage ≥3 + L2, P = 0.03). Ninety-seven percent (33/34) of patients who had FTs inserted were FTI. Duration of FT use was as long, or longer, than that estimated by the app in 79.4% (27/34) of patients. Of patients who did not receive a FT, 90% (18/20) were FTI. These patients lost more weight (mean 9.7% vs. 6.6%, P = 0.03) than FTI patients who had FTs inserted. A higher incidence of >10% weight-loss trend (38.9% vs. 21.2%, P = 0.20) was also reported.

Discussion/Conclusion: This feeding tube prognostic-app displays promising accuracy in an independent patient cohort. Prospective, multicentre evaluation is indicated to establish the external validity of this useful, electronic app.

Palliative care in 2018: what does it mean, when, how?
Philip Lee
Invited Speaker

For many in the community, as well as health care workers, palliative care is all about dying, all hope is lost, there are no more treatment options. While palliative care teams focus on ensuring that patients who are dying do so with dignity, comfortable, in the place of their choosing and surrounded by their loved ones, palliative care offers much more, including hope.

Supportive palliative care is just as important early in a patient’s life-limiting illness, while they continue to receive active treatment, as it is at the end of life. It is about quality of life, listening to the patient, empowering the patient to decide what treatment options will be accepted or declined.

How the effectiveness of this support is assessed is important to ensure the highest quality of care is provided.
Why don’t patients listen? Improving communication skills in RT
Catherine Adams
Invited Speaker

Listening is something we all think we are good at. We are communicating important information to our patients, but a lot of the time they don’t seem to listen. Why is this the case? It’s all about what people hear, not necessarily what we say.

This presentation will consider the factors that impact on people’s ability to hear, and consider how we can improve our ability to convey information in a manner our patients are more likely to hear.

Cancer is out. How about you?
Belinda Hua
Alfred Health, Traralgon, Australia

Although there has been progress for equal rights for the lesbian, gay, bisexual and transgender (LGBT) community, social stigma exists and influences health service delivery and experience. Stigma surrounding individuals of diverse sexuality and gender negatively influences health outcomes within this population when compared to their heterosexual and cisgender counterparts.¹

Cancer patients encounter multiple health care practitioners throughout their journey. In addition, LGBT patients may face further stress about disclosing their sexuality and/or gender identity to their health care practitioner and how sharing that information may consequently affect their care and safety.²

Margolies and Scout² attempted to better understand the cancer journey experience of LGBT patients by using an online survey, based on a holistic model of comfort inclusive of all aspects of the human experience related to illness. Survey results were used to guide development of key recommendations to assist the health care system construct a safer and more inclusive environment for LGBT cancer patients.

National data within the literature is limited for patients with cancer who identify as LGBT,¹ however the Victorian Department of Health and Human Services has designed a Rainbow Tick Program to identify gaps that may exist within the health care system in order to improve the experience and hence the health outcomes of cancer patients with diverse sexuality and gender.

This presentation will outline best and promising practices for health professionals working with LGBT patients and share the experience of implementing the Rainbow Tick accreditation in a regional hospital.

References
1. Gonzales G, Henning-Smith C. Health disparities by sexual orientation: results and implications from the behavioral risk factor surveillance system. Available at https://link.springer.com/article/10.1007/s10900-017-0366-z [Accessed 31 July 31 2017].
2. Margolies L, Scout NFN. LGBT patient-centred outcomes: cancer survivors teach us how to improve care for all. Available at www.cancer-network.org/patient_centered_outcomes [Accessed 28 July 2017].
Recognising and responding to patient communication barriers in radiotherapy practice
Darren Hunter
Peter MacCallum Cancer Centre, Melbourne, Australia

Introduction: Radiotherapy constitutes a core component of the multidisciplinary management of cancer. Patients from culturally and linguistically diverse (CALD) backgrounds form a growing proportion of radiotherapy patients. Radiation therapists are central to the provision of emotional comfort – ensuring patient safety, comprehension and engagement. This presentation aims to address concerns arising from communication barriers, and seeks to remedy this disparity with an improved approach to patient care.

Method: A literature review was conducted via MEDLINE (keywords ‘quality health care’, ‘CALD’, ‘oncology’), with a view to compare/contrast health care quality reported by cancer patients with limited English proficiency. This study specifically enquired upon CALD cancer patient satisfaction, access to care and the associated treatment outcomes. Comparison with international data enabled Australian health care system contextualisation.

Results: A review of current literature yielded 22 articles for analysis. Results revealed five emergent themes within the CALD patient demographic; (1) low health literacy/understanding, (2) poor patient support/respect, (3) uninformed consent, (4) reduced compliance and (5) compromised treatment access/outcomes. These results ratify the need to improve communication across an expanding multicultural community to facilitate equity of care.

Conclusion: All patients have the right to informed consent and access to the best available cancer care. Multilingual patient information may better empower patients to make informed decisions about their treatment, aid compliance/understanding and improve treatment outcomes. Though interpreters constitute the gold standard in effective communication, services are costly and geographically restricted. Interpretation software developments may provide an alternative means of overcoming current communication barriers among CALD patients.

References
1. Hyatt A, Lipson-Smith R, Schofield P, et al. Communication challenges experienced by migrants with cancer: A comparison of migrant and English-speaking Australian-born cancer patients. Health Expectations 2017. Available from https://doi.org/10.1111/hex.12529
2. Egestad H. How does the radiation therapist affect the cancer patients’ experience of the radiation treatment? Eur J Cancer Care 2013;22:580-588.

Do radiation therapists recognise anxious patients in the radiation oncology treatment setting?
Kelly Elsner
University of Sydney, Camperdown, Australia

Objectives: To assess to what extent radiation therapists (RTs) can recognise patient anxiety and recommend appropriate management strategies.

Methods: An online survey, designed with Qualtrics software, contained two vignettes representing common patient presentations in a radiation oncology setting. Three questions were used to assess responses to the vignettes. RTs in three countries were invited to participate via email. Descriptive analysis was performed using SPSS. Ethics approval was granted by the University of Sydney.

Results: Responses of 582 participants were analysed. In vignette 1, descriptions – anxious, worried and distressed – were endorsed and accounted for 80.1% of responses (1385/1730). In vignette 2 – angry, anxious, worried and distressed – accounted for 91.4% of responses (1937/2118). The most frequently endorsed management strategies were: vignette 1 ‘acknowledge and encourage’ patient – 576 (99.0%), ‘discuss psychosocial referral’ with patient – 296 (50.9%), and ‘involve friend/family in setup’ – 240 (41.2%); vignette 2 ‘acknowledge and encourage’ patient – 519 (89.1%), ‘contact radiation oncologist/nurse prior to treatment’ – 514 (88.3%), and ‘discuss psychosocial referral’ with patient – 252 (43.3%).

Discussion: Relevant indicators were recognised as signs of anxiety in both vignettes. Management strategies endorsed demonstrate RTs willingness to engage with patients and/or the multidisciplinary team to provide emotional and psychological support to patients.

Conclusion: When presented with vignettes, RTs can detect anxiety and recommend appropriate management strategies. Understanding how RTs do this in practice and the possible systemic barriers is important to determine future approaches to implementing psychosocial care in the radiation oncology setting.

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Preparing patients for RT using ‘RT Prepare’: does it reduce distress and is it cost-effective?
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Objectives: (1) To determine whether a radiation therapist (RT) led education intervention (RT Prepare) for women with early breast cancer reduced psychological distress, decreased concerns about radiotherapy, increased patient knowledge, improved patient preparedness and (2) To determine the intervention’s cost effectiveness.

Methods: A multiple baseline study was conducted. Ethics approval was gained. The RT Prepare intervention comprised two consultations with an RT: prior to planning and on the first day of treatment. RTs focused on providing sensory and procedural information and addressing patients’ pre-treatment anxiety. Measures were collected on four occasions: after consultation with radiation oncologist, prior to planning, treatment commencement and after treatment completion. Outcome measures included psychological distress, patient preparedness, concerns about radiotherapy and patient knowledge. Generalised Linear Mixed Models were used to compare groups. Intervention costs were determined.

Results: 218 usual care and 190 intervention patients participated. Compared to usual care, intervention participants reported lower psychological distress at treatment commencement ($P = 0.01$); lower concerns about radiotherapy prior to planning and at treatment commencement ($P \leq 0.01$); lower procedural concerns at planning and treatment commencement ($P \leq 0.001$); lower sensory concerns at planning ($P < 0.001$) and higher patient knowledge at relevant time-points ($P < 0.001$). Intervention costs were $159 per patient, these were estimated to reduce if RT Prepare was provided on an ongoing basis. Costs were estimated for departments/centres of different sizes.

Conclusion: The RT Prepare intervention reduced breast cancer patients’ psychological distress. Additional research now needs to be conducted to further test this intervention and assist RTs in preparing patients for radiotherapy.

Saturday 17 March, 11:15–12:45
ED Imaging

Seeing the big picture – using multidisciplinary research collaborations to stop buck passing
Michelle Moscova
Invited Speaker

Many health care policies and interventions target one part of the hospital with little regard to ‘unintended consequences’. An Australian example is introduction of the National Emergency Access Target (NEAT), which aimed to improve waiting times for patients in emergency departments (ED). While NEAT focussed on ED, it ignored reliance of ED on other hospital departments in order to deliver patient care. The target also did not consider that delays in discharging patients from ED were contributed to by the shortage of beds in wards. Other ‘unintended consequences’ of NEAT included increase in imaging requests for ED patients, staff dissatisfaction, more less urgent patients being admitted to wards and increased exit block from intensive care units. Quality improvement initiatives often focus on one hospital department and they often don’t consider ‘unintended consequences’ of these initiatives and their effect on other parts of the hospital. This often leads to passing the buck and blaming other departments for not achieving the intended outcome. However, success of these initiatives usually requires coordination of the entire hospital system and effect on other hospital departments also needs to be considered. This presentation will discuss how collaborative inter-disciplinary research can break communication barriers and identify the bigger picture improving health care quality.
The lateral check X-ray: a help or hindrance in the acute setting?
Caitlin Haimes,1 Blake Ellis2
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Background: Observations demonstrate patients frequently present to an emergency department with acute abdominal pain where a chest X-ray is requested. The current radiology protocol at a major public hospital is not supported by literature, stating that a lateral chest X-ray in an acute abdominal series is not clinically relevant.1 Through observation at a large private hospital in New South Wales, similar patient presentations do not require such imaging. There is no current literature surrounding diagnostic imaging requesting trends comparing public and private hospitals.

Aims and Method: The aim of this study is to determine differences in trends between major public and private hospitals when requesting imaging for triage category 3–5 patients presenting with acute abdominal pain, and to determine whether a lateral chest X-ray provides any additional diagnostic information for these patients. The number of imaging requests for this patient cohort presenting to both Sydney Adventist Hospital and Westmead Hospital will be compared. An image review of 30 chest examinations including both PA and lateral will be conducted by a radiologist to determine whether any diagnostic benefit was gained from performing the lateral projection. Ethics approval has been obtained for this study.

Discussion: Observation in public hospitals reveals a requesting trend towards protocols and pathways rather than clinical relevance. This study has the potential to improve practice, departmental efficiency and reduce radiation dose for this patient cohort, as well as determine requesting trends between public and private hospitals.

Reference
1. Alazzawi S, Sprenger De Rover W, Morris-Stiff G, Lewis M. (2010). Erect chest radiography in the setting of the acute abdomen: essential tool or an unnecessary waste of resources. Ann R Coll Surg Engl 2010;92(8):697-699.

Caring about practice: comparison of cervical spine imaging practice at an adult major trauma centre
George Sammour,1 Nadine Thompson2
1Westmead Hospital, Westmead, Australia 2Sydney Adventist Hospital, Wahroonga, Australia

Objectives: This study evaluates cervical spine imaging practice, pre and post publication of internationally accepted cervical spine imaging recommendations.1–4 When both a cervical spine X-ray (CSX) and CT cervical spine (CTCS) were performed, the adequacy of CSX and abnormality identification in both the CSX and CTCS was reviewed.

Method: A retrospective cohort study was performed at Westmead Hospital. All electronic requests for CSX and CTCS were collected from 01/01/2012 to 30/06/2013 and 01/01/2015 to 30/06/2016. These two cohorts were pre- and post-publication of international guidelines of cervical imaging best practice. Patients with both a request for CSX and CTCS were identified. CSXs were evaluated for adequacy. The reports for both the CSX and CTCS were compared to assess abnormality detection.

Results: The first and second cohort revealed 418 and 204 patients with both CSX and CTCS requested for them respectively. In each cohort more than 60% of the examinations performed had nil abnormality detected. On review, 71% of the CSX examinations were found to be adequate in the first cohort and 68% in the second. The primary reason for inadequacy was associated with lack of visualisation of C7/T1.

Conclusion: Best practice imaging guidelines for cervical spine imaging may have impacted requesting practices at our facility as there was a decrease in the number of patients with both CSX and CTCS requested for them. Inadequate CSXs due to patient habitus and compliance resulted in the need for a CTCS.

References
1. Sheikh K. Evaluating of acute cervical spine imaging based on ACR appropriate criteria. Emergency Radiology 2012;19:11–7.
2. Hess EP. Trends in CT utilization rates: a longitudinal practice based study. Journal of Patient Safety 2014;10:52–8.
3. Hoffman JR, Wolfson AB, Todd K, Mower WR. Selective cervical spine radiography in blunt trauma: methodology of the National Emergency X-Radiography Utilization Study (NEXUS). Ann Emerg Med 1998;32(4):461–9.
4. Stiell IG, Wells GA, Vandemheen KL, et al. The Canadian C-spine rule for radiography in alert and stable trauma patients. JAMA 2001;286:1841–8.
A collaborative multi site review: ED practices increase imaging requests in larger hospitals
Nadine Thompson,¹ Michelle Moscova,² Amith Shetty,³ Noel Young,³ Doungkamol Sindhusake⁴
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³Westmead Hospital, Westmead, Australia ⁴University of Western Sydney, Parramatta, Australia

Objective: This study aims to compare imaging request patterns at four hospitals in Western Sydney. Expanding on previous research¹ demonstrating imaging requests increase post introduction of NEAT (National Emergency Access Target).

Method: Data for all e-orders from Westmead, Auburn, Blacktown and Mt Druitt hospitals were collected from the hospital information system from 1/7/2011 to 30/6/2016 and independently analysed for comparison. Linear trend over time was tested using F-statistics in a simple linear regression model. Nominal logistic regression was used to look at trends of utilisation of different modalities (X-ray, CT, US and others) over time at each hospital.

Results: There was a significant linear trend (P < 0.0001), indicating that each quarter since June 2011, emergency department (ED) imaging requests increased proportionately at Westmead and Blacktown hospitals (larger hospitals). No change in the number of imaging requests from ED was observed at Auburn Hospital (P = 0.134) (small hospital). No change in the number of requests from wards was noted at Westmead and Auburn hospitals (P = 0.11 and P = 0.21 respectively). A clear trend was observed over time across all sites with an increase in total proportion of CT requests.

Conclusion: At larger hospitals, imaging requests from ED have increased since the introduction of NEAT. There was no decrease in ward imaging requests to compensate for the increase in imaging requests in ED at these hospitals, indicating that these increases are likely to result from ED practice changes. There was no increase in the imaging requests at smaller hospitals, indicating that NEAT may affect small and large hospitals differently.

Reference
1. Tse R, Thompson N, Moscova M, Sindhusake D, Shetty A, Young N. Do delays in radiology lead to breaches in the 4-h rule? Clinical Radiology 2016;71(6):523–31.

Efforts to increase value-based practice in medical imaging: a junior radiographer’s perspective
Haley Vu, Michael Fuller
Flinders Medical Centre Adelaide, Australia

Medical Imaging has grown in scope and importance with a significant increase in the number of patients benefiting from rapidly advancing technologies. It has been argued that medical imaging has grown in volume rather than value.¹ It is common for the worth of the services to be assessed in terms of productivity measures such as NEAT targets rather than benefit to the patients. This paper considers how to increase the value-based worth of medical imaging from a junior radiographer’s perspective.

There are some practices in medical imaging that impact patient experience and productivity. Duplicate studies are sometimes performed when patients are transferred from one facility to another. Similarly, duplicate examinations can be requested within the same facility when different referrers are not aware of what their colleagues have already ordered. Unnecessary X-rays are requested by junior doctors who may be undersupervised when activity levels are high. Portable chest X-rays are requested that could be performed in the X-ray department because of nurse shortages on the wards.

Radiographers participating in hospital clinical meetings such as orthopaedic and trauma meetings can break down the communication barriers between departments. Workshops and departmental education sessions can be used to engender a common understanding and mindset amongst radiographers of focusing on imaging that answers the clinical question.

Value-based practice should be the central focus when setting up protocols for imaging departments. Radiographers should be aware of their role in the entire patient journey and be striving to add value to the patient’s care.

Reference
1. Daher NM. Value-based imaging, Is value emerging as a major new currency in US medical imaging markets? Imaging Technology News 2014. Available at www.itnonline.com/article/value-based-imaging [Accessed 17 August 2017].
Collimation creep
Sally Ball, Megan McKerrow
Princess Alexandra Hospital, Brisbane, Australia

Background: Since the introduction of computed radiography (CR) and digital radiography (DR), ‘exposure creep’ has been a widely reported phenomenon, whereby exposures increase over time resulting in increased dose to the patient with minimal diagnostic effect. There has been little documentation of ‘collimation creep’ whereby a larger field of view (FOV) is exposed when compared to the corresponding cassette size used in film-screen or CR. DR post-processing capabilities provide the ability to post-collimate to a smaller area, which ultimately results in an increased dose to the patient with no added benefit.

Objective: The study aim is to examine the extent of ‘collimation creep’ across routine radiographic examinations of different body parts.

Methods: A retrospective review was conducted for patients who have attended X-ray departments for examinations of selected projections of several body parts. DR post-processing was removed and original collimation dimensions recorded and used to calculate FOV. This was then compared to the FOV of the corresponding CR cassette used for that projection.

Results: A small scale pilot study was conducted to calculate sample size for a larger scale study. Preliminary findings from this pilot study demonstrated an average of >20% increase in the DR FOV from corresponding cassette size. The results of the large scale study will be presented at the conference.

Conclusion: Preliminary findings conclude that collimation creep on DR systems is evident on a range of commonly performed X-ray examinations. This results in an increased dose to the patient with no additional benefit.

This research has ethics approval.

Reference
1. American Society of Radiologic Technologists. Best practices in digital radiography. Albuquerque: American Society of Radiologic Technologists; 2012.
Scatter radiation during an ICU round: where can I hide?
Cathy Ly, Keith Jansz, Sanjeeta Nair
Austin Health, Heidelberg, Australia

Objectives: This project was designed to record radiation scatter doses at various distances from a patient during the mobile chest X-ray examination during a routine ICU round (see Figure). The data would then be evaluated to determine any trends in relation to the safest place for the staff and general public to be located during this examination.

Methods: Using a scatter detector,¹ the project team recorded the doses at various points from the source of the scatter radiation. A minimum of 10 recordings were taken at each point. The mobile chest X-ray examination was chosen, as it is usually the most commonly performed examination outside the radiology department. The data was then collated to observe any trends, specifically to identify if the results supported the use of the inverse square law² as a means of reducing the scatter radiation to the public and staff while the examination was performed.

Results: Once the data was collated it could be shown that the doses did indeed decrease the greater the distance from the source of the scatter, the patient.

Discussion/Conclusion: The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) has clear recommendations for the maximum dose limits for both medical imaging technologists (occupational) and the public: 20 mSv and 1 mSv per year,³ respectively. It is essential that, as professionals, we ensure that this limit is adhered to. One of the best ways for this to occur is with education to all staff and public with accurate and logical data.

References
1. www.step-sensor.de/media/allgemein/prospect_od_01_eng.pdf.
2. http://www.radiologymasterclass.co.uk/tutorials/physics/x-ray_physics_safety.
3. www.arpansa.gov.au/sites/g/files/net30861i/legacy/pubs/rps/rps1.pdf.

Collaboration in action: scoliosis dose comparison using current clinical protocols
Madeleine Shanahan,¹,² Moshi Geso,² Amanda Potter,³ Gaby Lennie³
¹University of Canberra, Bruce, Australia ²RMIT University, Bundoora, Australia ³Royal Children’s Hospital Melbourne, Parkville, Australia

Objective: Radiography is a valuable diagnostic and monitoring tool for patients with adolescent scoliosis.¹,² Radiation dose is important as this patient group is statistically more likely to develop cancer during their lifetime.³ The purpose of this collaborative project was to compare dose area product (DAP) and surface dose (SD) measurements for scoliosis imaging using current clinical techniques for four image acquisition systems: EOS⁴ normal and microdose and DR standard and low dose.

Methods: EOS⁴ and Shimadzu RADspeed Auto X-ray coupled with Cannon CXDI 70C wireless flat panel detector systems were used. PA and left lateral images were acquired of a RSD anthropomorphic phantom using the four image acquisition techniques. Dosimeter measurements were obtained using Deschênes et al.¹ locations. Three independent image acquisitions were made for each technique and the resultant SDs for each location, and DAP measurements were averaged to minimise random error.

Results: DAP measurements were consistently lower when images are acquired using EOS⁴ normal dose and microdose compared to those acquired using DR system normal and low dose-PA and lateral 767, 109, 2380, 1206 mGy² respectively. SD showed similar trend with the highest dose measured on right lateral aspect T10 level and lower doses on the breasts.

Discussion: DAP provides a general indication of patient dose across imaging systems. Direct dosimetry allows radiation dose to specific anatomic regions to be measured. Reviewing clinical dose protocols and SD allows radiographers to identify if further dose reductions strategies may be instituted.

Conclusion: Comparing current clinical protocols EOS⁴ provides lower patient dose for scoliosis imaging.

Acknowledgements: The authors would like to thank and acknowledge the Victorian Medical Radiation Practitioners Education Trust for grant funding received for this project.

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To grid or not to grid: communicating the results of a clinical based study
Michael Neep, Hannah To
Metro South Health, Logan, Australia

Objectives: Digital technologies are progressing rapidly with several vendors offering scatter correction software so that chest X-rays can be acquired without a grid while maintaining diagnostic image quality.1,2 The aim of this study was to evaluate this software from one vendor before implementation into clinical practice.

Methods: Full ethical review was waived due to this software being TGA approved. 30 chest X-rays of patients of varying sizes were acquired using a digital radiography detector. 10 chest X-rays were acquired with a grid and 10 without a grid, both processed with the existing image processing software. 10 X-rays were acquired without a grid and processed with the scatter correction software. Four blinded observers evaluated the quality of the images by assessing contrast, brightness and diagnostic quality. Dose area product (DAP) was also collected.

Results: All 30 images were considered to be of diagnostic quality. The observers preferred the level of contrast present on the non-grid chest X-rays with the existing image processing software applied. When scoring brightness, the gridded technique was preferred. However, the non-grid technique processed with the scatter correction software was a close second. The mean DAP for the grid and non-grid techniques were 15.49 and 8.21 cGycm² respectively.

Discussion/Conclusion: Interestingly, the most preferred technique overall was the chest X-ray acquired without a grid but with the existing image processing software applied. Coupled with a reduction in dose of 47% over the grid technique, the authors endorse the use of non-grid chest X-rays as a means of radiation safety.

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Saturday 17 March, 13:45–15:15
Communication (MI)

Communication failures in medical imaging – lessons for patient safety learnt from a legal perspective
Michelle Moscova
Invited Speaker

Failure to communicate radiological findings and failures in obtaining informed consent are some of the top reasons for lawsuits to be initiated by patients in radiology. Communication with the patient during the procedure is critical for effective medical care and ensuring patients understanding of this procedure. Timely communication of the radiological findings is also critical for making an accurate diagnosis.

This presentation will discuss communication failures in medical imaging, lessons that can be learnt and how harm to patients can be avoided in the future.
Communication of risk – Do our views match those of our patient?
Cameron Younger, Charles Douglas, Helen Warren-Forward
University of Newcastle, Newcastle, Australia

Objectives: This research sought to investigate the views of radiographers and members of the public regarding their views on the significance of risk from ionising radiation examinations, and how this risk is most meaningfully communicated to patients.

Methods: A cross-sectional survey was used to gather information. Participants were asked to consider a number of hypothetical scenarios (variations in the cancer-onset time and accuracy of the test) and to give the threshold of ionising radiation cancer risk that they would consider material. Participants were also asked their views on how, when and by whom the risk could be most meaningfully communicated.

Results: There were 293 participants (121 radiographers and 172 members of the public). There was a high degree of agreement between radiographers and their patients on what represents significant risk. Radiographers and their patients have very similar views on the most appropriate communication medium, provider and method. Radiographers have the same communication ideals as our patients. However, while our communication views and desires show no significant difference, they may be unrealistic in a real-world environment.

Discussion/Conclusion: While it is good (and useful) to know that our views are harmonious with the patient, the greater challenge now lies in working towards the best care of our patient by providing the most appropriate level of communication in a busy clinical environment.

Fail-safe alert notification – Assisting referrers in meeting their professional obligations
Karen Thomas
Fiona Stanley Hospital, Perth, Australia

Communication of imaging examination results and actioning of findings is every bit as important as the examination itself. With increasing demands for health care services in an environment of limited resources, the challenge for referrers to meet their obligations to review and act on examination results is burgeoning.

It is the responsibility of all health care service providers to have processes in place to enable referrers to meet their obligations. A failure or inability of a referrer to review examination findings, in particular unexpected or incidental findings, can have a significant detrimental impact on patient wellbeing.

The Royal College or Radiologists has recently published standards for the communication of radiological reports,¹ which outlines the imperative for Imaging providers to develop a fail-safe back-up process to prevent such failures.

In the absence of a comprehensive IT platform for results acknowledgement, Fiona Stanley Hospital has implemented a fail-safe alert process utilising existing IT capability and personnel resources. Fail-safe provides referrers with a mechanism to more readily identify priority examinations for review and actioning, and includes an audit trail for the organisation to monitor compliance.

Implementation of the fail-safe process has required close collaboration between relevant stakeholders and detailed communication of the process strategy and application. The process is currently in its infancy with success to be measured in terms of rate of compliance and patient outcomes.

Reference
1. Royal College of Radiologists. Standards for the communication of radiological reports and fail-safe alert notification. London: The Royal College of Radiologists, 2016 16(4):1–16.
Communicating their way: a novel approach to connecting with patients from non-English speaking backgrounds
Chelsea Castillo, Tom Steffens
Princess Alexandra Hospital, Brisbane, Australia

In 2015–16, approximately 17,000 refugees were settled in Australia.¹ All people applying for permanent visas require testing for tuberculosis (TB), which includes a chest X-ray.² Many of those new to our country do not speak English as their first language. State health department policies recommend interpreters where language barriers exist.³ While interpreters have been proven to increase the level of patient understanding, indirect communication can make rapport building for health professionals more difficult.⁴–⁶ Non-verbal techniques such as directing speech towards the patient, eye contact and open posture can assist in overcoming this challenge.⁷ Another effective approach is for health professionals to learn simple phrases in the patient’s native language.⁸

A learning resource was developed to enable radiographers at a large TB clinic to better connect with patients from non-English speaking backgrounds. This involved:

- Selecting three languages which have seen the largest increase in persons settling in the local area (Vietnamese, Mandarin, Arabic)⁹
- Formulating a list of phrases used during chest X-ray examinations
- Translation of chosen phrases into each language, with assistance of native speakers. These translations were further developed into English syllables
- Using a flashcard learning app (Chegg Flashcards) with an audible pronunciation assistance feature installed on a tablet, radiographers were encouraged to learn the chosen phrases.

The tool was reviewed for pronunciation, appropriateness of phrases and usability. Radiographers were also asked to share the reactions from patients.

As radiographers become more familiar with using the resource, further languages will be added.

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‘Yarning’ with Aboriginal patients: culturally appropriate engagement in the context of brief radiographic examinations
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Introduction: Recognising, respecting and incorporating Aboriginal ways of knowing and learning into contemporary health care contributes to better engagement with and, in turn, outcomes for Aboriginal people and communities.¹ To foster awareness of the issues and develop strategies to engage Aboriginal patients, employers commonly mandate cultural training for non-Aboriginal health workers.

Case presentation: My previous experience of cultural training contrasts starkly with that afforded to me on recent relocation to practice in country NSW. Here, I participated in candid, thought-provoking and meaningful training, with a subsequent opportunity to explore key concepts. An emphasis was placed on the notion of ‘yarning’ as a key strategy to engage Aboriginal patients and their families in their care but it seemed to conflict with a time-efficient (and often time-limited) diagnostic radiography examination. How, within the confines of a brief interaction, could I invest the time required to establish a non-clinical dialogue reciprocity around the patient’s life experiences and interests, avoiding direct, potentially invasive inquiry in relation to their clinical condition?

Management and Outcome: Facilitated by an Aboriginal colleague, this narrative describes two powerful separate clinical interactions with Aboriginal male patients in a rural referral hospital. It explores whether, ‘traditional practice’ can be adapted to facilitate a ‘non-traditional approach’ to engaging with Aboriginal patients, that is, having a yarn on a timeline.

Discussion: The outcomes of explicit reflection and insights gained from these instances of short, sharp individualised patient-centred care will be shared with the audience to inspire similar redefining moments of practice in others.

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Informed consent in medical radiation science
Cameron Younger, Charles Douglas, Helen Warren-Forward
University of Newcastle, Newcastle, Australia

Introduction: Autonomy is a fundamental patient right, and autonomy requires that the patient gives their informed consent for a procedure, test or examination. Health carers have an ethical responsibility to disclose the risks and benefits of an examination to their patient. However, for some health care professions, the legal responsibility is unclear.¹ This presentation will explore the concept of informed consent, and how it applies for the stochastic risk of an ionising radiation examination.

Case presentation: In this presentation, we consider the case of the medical radiation scientist who seeks to ensure that their patient has the most meaningful information about the risks and benefits of their ionising radiation examination. The legal and ethical obligations in this very challenging aspect of patient care will be discussed, and how it applies to ionising radiation stochastic risk.

We ask if there is a place for collaborative consent, where there is a unified and agreed on way to disclose stochastic risk for all health carers (referring physicians, radiologists and radiographers) involved in a patient’s care.

Management and Outcome: The patient journey is most successful when there is continuity of care, where all health care professionals are working towards a common goal. Yet, provision of information is often an area where patients find the greatest inconsistencies. Pathways to improve this will be discussed.

Discussion: While focussing on diagnostic imaging for radiographers, the principles discussed have applicability to all medical radiation scientists. We hope to achieve the goal of better care through better communication.

Reference
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Verification of deformable registration for PET scans in head and neck setting at LMCTC
Glen Dinsdale, Michael Jameson
Liverpool & Macarthur Cancer Therapy Centres, Liverpool, Australia

Objective: Deformable image registration (DIR) plays an important role in adaptive radiotherapy (ART). Due to the complex nature of DIR, a standardised approach to validate DIR is challenging. This study evaluated the accuracy of DIR as part of ART implementation for head and neck (H&N) patients using the AAPM task group report.¹

Method: 10 H&N patients were recruited retrospectively. A single observer delineated specific OAR on planning CT and the PET CT in MIM maestro (V6.7, MIM software, Cleveland, OH). GTV based on SUV 2.5 was also generated. Rigid and DIR was performed on CT, PETCT and PET in MIM. CT contours were defined as the reference volumes. Overlap measure was performed using dice similarity coefficient (DSC) Hausdorff (HD) and mean distance to alignment (MDA).

Ethics approval was received under the adaptive project implementation.

Results: Table 1 highlights the scores for DCS, HD and MDA for each of the structures delineated. DSC scores for deformed OARS were consistently higher than the rigid OARS, average MDA was smaller for all deformed OARS compared to rigid OARS.

Discussion/Conclusion: These preliminary results demonstrate the accuracy of DIR for PET in H&N setting. Minimal difference between rigidly DIR aligned PET data could be attributed to PET scans performed in treatment setup in the department.

Table 1: Verification of deformable registration for PET scans in head and neck setting at LMCTC

|                | Rigid          | Deformed       |
|----------------|----------------|----------------|
|                | Mandible      | Larynx        | Rt eye | Mandible | Larynx | Rt eye |
| DSC            | 0.80          | 0.85           | 0.78   | 0.94      | 0.90   | 0.88   |
| Range          | (0.6–0.9)     | (0.8–0.9)      | (0.6–0.9) | (0.9–1)   | (0.9–0.9) | (0.85–0.91) |
| Std dev        | 0.125         | 0.03           | 0.11   | 0.01      | 0.02   | 0.03   |
| Hausdorff dist | 7.39          | 10.88          | 6.78   | 6.74      | 13.29  | 5.88   |
| Range          | (4.8–9.1)     | (6.9–16.9)     | (3.7–9.3) | (5.4–8.1) | (10.1–16.1) | (4.5–6.8) |
| Std dev        | 1.61          | 4.90           | 2.10   | 1.11      | 2.63   | 1.14   |
| Mean dist to al | 1.51          | 1.87           | 1.77   | 0.45      | 1.25   | 1.05   |
| Range          | (0.9–2.7)     | (1.5–2.3)      | (1.2–0.9) | (0.36–0.53) | (1.1–1.6) | (0.9–1.3) |
| Std dev        | 0.73          | 0.37           | 0.66   | 0.06      | 0.22   | 0.18   |
| HD PET       | 24.8688168   | 1.29142292     | 0.89901063 |
| MDA PET       | (22.1–32.2)  | (1.1–1.8)      | (0.7–1) |
| DSC PET       | 4.35          | 0.310          | 0.135  |
| % average volume change | 0.63% |

*Results are averaged for five patients.

Reference
1. Brock K, Mutic S, McNutt T, et al. Image Co-Registration II: TG132 Quality Assurance for Image Registration.
Validation of knowledge-based planning for primary central nervous system malignancy
Shelley Wong,1 Maiko Crispin,1 John Atyeo,1 Kenny Wu,1 James O’Toole,1 Mario Perez,1 Michael Back,1,2,3 Thomas Eade1,3
1Royal North Shore Hospital – Northern Sydney Cancer Centre, Sydney, Australia 2Sydney Neuro-oncology Group, Sydney, Australia 3Sydney Medical School, University of Sydney, Sydney, Australia

Objective: To validate knowledge-based planning,¹ using Rapid-planTM (RP) for patients treated with IMRT for primary central nervous system (CNS) malignancies.

Methods and Materials: Two cohorts of patients with primary CNS malignancies (glioblastoma, anaplastic glioma and high-risk meningioma) previously managed with definitive IMRT to target doses of 54–60 Gy, were identified from the ethics approved neuro-oncology database. The first cohort was used to create the RP library, with the second cohort used to independently validate the model. Patients treated with an IMRT integrated boost technique or having an overlapping PTV with the brainstem or optic apparatus were excluded. Clinically treated plans and the RP plan were compared using departmental target coverage constraints for GTV, PTV and organs-at-risk (OAR). Doses to the target structure were required to meet the constraints and then the OARs were compared. A difference of ≥3 Gy between OAR doses was classified as a dosimetrically superior plan.

Results: Eighty patients were included in the planning study (69 for model creation and 11 for validation). In 10 out of the 11 plans, RP produced clinically acceptable plans similar or superior to the treated plans. Two of the RP plans produced significantly superior contralateral temporal lobe doses.

Conclusion: Using RP for single target volume brain sites not overlapping with OARs produced clinically acceptable plans in a single calculation using templated field arrangements. RP will result in a reduction to the start of RT after surgery, improving standard of care through increased consistency and quality of treatment plans for high grade brain tumours.

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2. Appenzeller L, Michalski J, Thorstad W, Mutic S, Moore K. Predicting dose volume histograms for organs-at-risk in IMRT planning. Med Phys 2012;39:7446–61.

Volumetric modulated arc therapy: a non-conventional approach to palliative radiotherapy
Stephanie King
Gippsland Radiation Oncology, Traralgon, Australia

Introduction: Volumetric modulated arc therapy (VMAT) is a highly conformal radiotherapy technique that is more commonly used in the context of curative treatment regimens as it produces a highly conformal dose distribution while minimising dose to surrounding tissue and organs at risk.

Case Presentation: This case study describes the use of VMAT in the palliative setting to treat the entire bony pelvis of a 34-year-old patient with malignant peripheral nerve sheath tumour. As the patient had already undergone numerous courses of radiotherapy, including treatment to the abdomen and spine, further dose to previous treatment areas was a major consideration in the decision to provide treatment and the type of treatment provided. A statement of permission for this paper was not obtained from the patient.

Management and Outcome: The patient was prescribed 20 Gy in 10 fractions. Three dynamic conformal arcs provided 93% coverage of the target volume while minimising the small bowel mean dose to 9.4 Gy. The patient’s pain dramatically improved during the course of treatment with no evidence of toxicity.

Discussion: The use of VMAT in the palliative setting is quite unconventional however for this particular case, it was the specific dosimetric characteristics of VMAT that were desirable to enable the patient to undergo further treatment without the experience of acute radiation toxicity, thereby alleviating her pain and improving her quality of life.
Creation and validation of a knowledge-based single isocentre multiple brain metastases technique
James O'Toole, Kenny Wu, Andrew Le, Mario Perez, Dasantha Jayamanne, Michael Back, Thomas Eade
North Sydney Cancer Centre, Sydney, Australia

Objectives: To create a single isocentre multiple brain metastases (SIMBM) technique¹ at Northern Sydney Cancer Centre using knowledge-based planning software and compare the quality and efficiency against a multi isocentre SRS (MIS) planning approach.

Methods: Twenty-six SIMBM plans were uploaded into the knowledge-based planning software RapidPlanTM (v13.6) to create a SIMBM model. The model was trained through analysing geometric and dosimetric statistics of the uploaded plans, with the number of metastases uploaded ranging from 2–9.

Ten patients with multiple brain metastases, varying from 2–6 and not used in the creation of the model, were planned using a single isocentre and the SIMBM model. A standard beam arrangement was used with couch angles dependent on the number of metastases being treated. Each patient was also planned using multiple isocentre technique in the Brainlab planning system – iPlan (v4.5.3).

Paddick Conformity Index (PCI)² was used to compare the conformity. The volumes of the 37.5% and 50% were also compared using a gradient index (GI). Beam on times (BOT) were also compared.

Results: Preliminary PCI analyses appear to favour SIMBM technique with MIS producing the superior GI results for the 37.5% and 50% isodose lines. This difference was deemed insignificant. There was shorter BOT using SIMBM.

Discussion: A knowledge based SIMBM approach can save time in the planning and treatment of multi metastases with clinically acceptable doses with respect to dose conformity and low dose drop off.

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Developing knowledge-based planning for gynaecological cancer: a retrospective dosimetric validation study of RapidPlan
Meegan Shepherd, Alexandra Turk, James O’Toole, Marita Morgia, Mark Stevens, Regina Bromley, Thomas Eade
Northern Sydney Cancer Centre, Centennial Park, Australia

Objective: To validate knowledge based planning for gynaecological pelvic VMAT.

Methods: Varian RapidPlan (RP) knowledge-based planning software was used to create the model. 34 patients previously treated for endometrium and cervix cancer were identified using the Northern Sydney Cancer Centre gynaecological database. All patients had been treated on a standardised department protocol (2–4 target volumes) to a dose of 45–60 Gy in 25 fractions. Patients were divided into the development cohort (n = 22) and validation cohort (n = 12).

The RP model created optimisation objectives for target volumes and critical organs.

A three arc VMAT plan using RP optimisation objectives was created for the validation cohort using a single pass through the optimiser with no intervention from the planner. The RP was evaluated against the treated plan by two radiation oncologists (RO) with expertise in gynaecological RT. The RP was deemed acceptable if the target volumes had the same or improved coverage and the organs at risk (OAR) had the same or less exposure than the treated plan.

Results: All 12 RPs were deemed clinically acceptable with six plans RO preferred in both target coverage and OAR doses than the original plan. In the six RPs not preferred, but clinically acceptable, dose inhomogeneity and decreased conformity, leading to higher doses to OARs was cited as the rationale.

Conclusion: Knowledge-based planning using RP for endometrium and uterine-cervix cancer was validated, producing clinically acceptable plans in a single calculation. This has implications for patient outcomes,¹ department workflow,² plan quality³ and adaptive planning.

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Saturday 17 March, 13:45–15:15
Mental Health/Trauma Fellowship Session

Trauma: recognising and moderating its impact on ourselves and others
Catherine Adams
Invited Speaker

We are all exposed to human suffering in our workplaces, often on a daily basis. This adds to the external traumas we experience as part of our life.

This presentation will consider how this chronic trauma impacts on our ability to function, and how can we moderate the impact it has to ensure we stay well and provide the best possible care to ourselves and our patients.

A major incident terrorist attack: an experience and learning
Nathan Brunskill
Sydney Adventist Hospital, Sydney, Australia

On 22 May 2017 at 22:31 a suicide bomber detonated an improvised explosive device, packed with nuts and bolts to act as shrapnel, in the Manchester Arena. At 23:46 a major incident had been declared across the city. Twenty-three adults and children were killed and 250 were injured.

This presentation will describe the journey of a radiographer through-out the incident and the immediate response, and lessons learned relating to major incidents. Millions of people are now living with the threat of terrorism as modern warfare shifts towards civilian arenas. Around the world the number of natural and man-made disasters continues to rise. This ever-increasing threat requires preparedness and consideration around the globe. Acute NHS hospitals are at the core of a major incident response in the UK and can easily become overwhelmed. If a response to the incident is to be an effective and quality one it requires trained and skilled personnel who are provided with adequate training and preparedness. Evidence acquired through research and real-life experience suggests however, that in developed countries, hospitals are poorly prepared for such an attack related response. This presentation gives an overview of what to expect during a major incident but also highlights lessons that can be learned from such an incident.

Due to the relatively rare and unpredictable nature of major incidents it is envisaged that this presentation can provide education to others about a scenario that is rarely experienced, but harrowing in nature.

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Sharing the load

Philip Lee

Invited Speaker

For all palliative care team members, medical, nursing and allied health, the constant stress of caring for patients with life-limiting illnesses, cancer, chronic disease and acute life threatening medical events is a real challenge. In addition, the complications that occur with these illnesses such as severe pain, disability and disfigurement, can be very confronting. Staff are also dealing with families and carers who might present in an aggressive manner as they struggle to care for their loved one.

Junior staff, who are on a very steep learning curve, constantly strive to demonstrate that they are developing their skill base as well as becoming increasingly independent. They may sense that admitting that they are not coping with the emotional challenges of managing difficult case scenarios is a sign of weakness or incompetence and hence be reluctant to seek assistance and guidance from their supervisors and mentors.

It is vital that teams have systems in place to mentor the whole team, to ensure that team members feel comfortable about seeking assistance and guidance, to be able to debrief and to share the load.

Medical imaging and the Great War

Luke Barclay¹,²

¹Canberra University, Melbourne, Australia ²Central Gippsland Health, Sale, Australia

This year, the 11th hour of the 11th day of the 11th month will mark 100 years since the guns fell silent on one of the most murderous of all conflicts. An estimated total of some 37 million soldiers killed, wounded or missing in what is termed the Great War.

The birth of medical imaging occurred in 1895 with the discovery by Rontgen of X-rays — just 20 years before this First World War. Their mysterious power of being able to visualise the interior of living tissue and organs and in particular, a soldier’s wounds was well recognised by the military authorities. In war 100 years ago, the principal application of medical imaging was brutally simple. With a wounded soldier the primary objective was to identify the location of metallic foreign bodies such as shrapnel and projectiles lodged within the soldier’s body. Once situated, a surgeon could extricate them as quickly as possible. As with many things, the rapid needs of war hastened the development of equipment including: cellulose film, thermionic X-ray tubes and the beginnings of modern day computed tomography.

With the help of the archives of the Australian War Memorial and a review of published literature, a picture of medical imaging’s importance in this significant theatre war has been pieced together through the lens of those that would have been there. This investigation will demonstrate how a fledgling profession and associated technology dramatically emerged as an important tool in military medicine.
The goal of radiation therapy is to deliver a lethal dose of radiation to diseased tissue while minimising dose to surrounding healthy structures. Prior to the actual treatment delivery, treatment planning is the most critical part of a patient’s radiation treatment management. The most crucial step is the accurate localisation and delineation of the target volume. Advances in tumor localisation and treatment delivery capabilities are limited by the inability to deliver treatment with complete precision to the localised tumor on a day-to-day basis over an entire course of radiation treatment. Most solid tumors are soft tissue masses, so the lack of inherent soft tissue contrast within images can result in reduced visualisation and distinction of tumor boundaries from surrounding structures such as blood vessels, fatty tissues and lymph nodes. The ability to deliver an intended radiation dose to the tumor and to minimise the radiation dose to the healthy surrounding structures is related to contrast media delivery and timing for lesions and their surrounding structure. The aim of this session is to reduce the uncertainties surrounding the target volume, by reviewing the margins that need to be added to the target volume as a buffer to accommodate the variation and uncertainties, and to ensure that the localised tumor receives the full intended dose.

MRSIM HN: assessing the use and impact of dedicated MRI in oropharyngeal radiotherapy
Haylea Richardson,1 Chris Wratten,1 Mahesh Kumar,1 Minh Thi Tieu,1 Leah Best,2 Jameen Arm,2 Laura O’Connor,1 Jason Dowling,3 Matthew Clapham,6 Joel Parker,4 Peter Greer1,5
1Calvary Mater Newcastle, Newcastle, Australia 2Hunter New England Area Health Diagnostic Services, Newcastle, Australia 3The Australia e-Health Research Centre, Brisbane, Australia 4Central Coast Cancer Centre, Gosford, Australia 5University of Newcastle, Callaghan, Australia 6Hunter Medical Research Institute, Newcastle, Australia

Objectives: The aim of this project was to consider if radiation oncologists would adjust their target volumes and anatomical contours with the availability of an MRI scan in a diagnostic position (dMRI) compared to a dedicated MRSIM scanned in the planned treatment position (MRSIM) for patients with oropharyngeal cancer.

Methods: The study assessed 26 oropharyngeal squamous cell carcinoma patients indicated for chemoradiation between 2013-2015. Each participant prospectively underwent two separate MRI acquisitions (dMRI and MRSIM). To reflect the clinical workflow, the scans were made available to the radiation oncologist in a staged interval firstly the dMRI registered to the planning CT, then the registered MRSIM. If a modification was made a result of the MRSIM, these patients were replanned to demonstrate the impact of the change to the surrounding organs at risk. Registration time, image and registration quality were also assessed.

Results: Target volume modifications were made in 19 of the 26 patients a result of using the MRSIM image registration. The post-MRSIM volumes were larger than the CT/dMRI and this was attributed to improved confidence in visualisation of soft tissue invasion. The margin for organ sparing was reduced given the larger target volumes resulting in higher mean doses, particularly to the oral structures. MRSIM provided an improvement in efficiency and had comparable stand alone image quality to the dMRI.

Discussion/Conclusion: We now recommend at our centre for all eligible oropharyngeal patients to undergo an MRSIM in preparation for radiotherapy planning.

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Assessment of MR image quality using two flat table overlays for radiotherapy planning
Robba Rai, Doaa Elwadia, Gary Liney
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University of New South Wales, Sydney, Australia
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Objectives: MRI systems have integrated radiofrequency (RF) coils in the table and a flat table overlay (FTO) used in radiotherapy (RT) reduces image quality due to RF attenuation and distance from the RF coil. It is important to evaluate new set-ups in RT planning to improve patient care and ensure safety of staff. This study aims to assess image quality comparing two FTO for clinical imaging.

Method: Phantom imaging was performed on a 3T MRI to measure signal-to-noise ratio (SNR) and RF attenuation of FTO material. Three setups: CIVCO (MRIC) and Q-Fix (MRIQ) FTO and the standard diagnostic couch (MRID) were assessed. Following local ethics approval, prostate imaging was performed in a volunteer comparing current clinical setup using MRIC and compared to MRIQ and MRID. DICE similarity coefficients (DSC) were calculated for prostate, rectum and seminal vesicle regions.

Results: There was a 45% decrease in SNR for MRIC and 39% for MRIQ compared to MRID. Line profiles adjusted for table distance showed reduction in SNR attributed to material attenuation of 13% and 18% for MRIQ and MRIC respectively. DSC for prostate, rectum, seminal vesicles between MRIC and MRIQ was 0.79, 0.82 and 0.73, and 0.67, 0.48 and 0.56 for MRIC and MRID respectively. MRIQ is lighter (7 kg) compared to MRIC (22 kg) making handling safer for staff.

Conclusion: A bigger difference in attenuation compared to thickness (distance from the coil) was observed. Q-Fix FTO performed similarly in terms of image quality and treatment positioning but superior in manual handling.

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Saturday 17 March, 13:45–15:15
Virtual Reality

Using virtual reality in a clinical setting
Peter Dooley
Invited Speaker

High levels of sedation for many procedures are used in the Canterbury Health System, driven in part by increasing levels of mental health issues and anxiety. Peter Dooley, Team Leader of MRI at Christchurch Hospital, uses virtual reality as a cost-effective, safe and engaging way to inform and build trust in young patients. Putting children in simulated reality gives them some control of the experience and provides a means of understanding what is happening to them. To experience, albeit in an imaginary way, the procedure allows children to stay in better control of their emotions and negate the need for sedation.
Virtual reality experience at Peter MacCallum Cancer Centre
Renae Thorson,¹ Jane Williamson,² Trent Clews-de Castella,³ Joseph Purdam,³ Nigel Anderson,³ Greg Wheeler¹
¹Peter MacCallum Cancer Centre, Melbourne, Australia ²Victoria Paediatric Integrated Cancer Service, Melbourne, Australia ³Phoria Pty Ltd, Melbourne, Australia

Misconceptions and fear of separation during radiotherapy can be stressful for both parent and child. As radiotherapy techniques become more conformal, demanding tighter tolerances, there becomes a greater requirement for sedation to ensure precision radiotherapy delivery.¹

Sedation of a child has its own set of complexities and is avoided wherever possible. Play therapy and distraction-therapy are effective, evidence-based practices employed by departments (including Peter Mac) to minimise the use of sedation.¹ Familiarisation and demonstration of the radiotherapy process in the form of a mock treatment is one effective way to alleviate both patient and carer anxiety. Virtual reality (VR) provides a medium in which to achieve this.³ VR is currently used as a distraction tool in various medical departments and has recently been used as a familiarisation tool in imaging modalities such as magnetic resonance imaging (MRI). A VR program initiated by the Paediatric Integrated Cancer Services, with Peter Mac, is being used to demonstrate the simulation and treatment process to the child and parent/s. A 360-degree VR experience, in two separate 10 min videos, has been developed collaboratively (with Phoria Pty Ltd) which will be available to the wider paediatric medical community. The VR experience is viewed on site, then taken home and viewed at the families leisure, in the lead up to their simulation appointment.

This presentation will describe the collaborative, development phase of the VR experience, articulating the steps undertaken to establish this innovative patient and carer resource. Initial clinical experiences will also be shared.

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Implementing a virtual reality simulation clinic with dynamic patient interaction and communication for medical-imaging students
Daniel Sapkaroski¹,², Marilyn Baird,¹ Matthew R Dimmock¹
¹Monash University, Clayton, Australia ²Monash University, Clayton, Australia

Introduction: An immersive virtual reality simulation clinic with dynamic patient interaction and communication was developed to facilitate the training of medical radiation science students. The software was integrated into the medical imaging program at Monash University in order to benchmark against existing simulation techniques.

Methods: An iterative approach to development, based on cycles of user feedback, was used to develop and refine the simulated clinical environment. This environment uses realistic 3D models, embedded clinical scenarios, dynamic communication, 3D hand gesture interaction, gaze and positional stereoscopic tracking and online user capabilities using the Unity™ game and physics engines. Students’ perceptions of educational enhancement of their positioning skills following the use of the simulation tool were analysed via a 5-point Likert scale questionnaire and compared to other digital medical imaging simulation tools.

Results: Student perception scores indicated a significant difference between simulation modalities in favour of the immersive CETSOL VR Clinic, χ²(4, N = 91) = 9.48, P < .001.

Conclusion: Students perceived the CETSOL VR Clinic™ to improve their clinical and technical skills more strongly than other simulation environments that do not include dynamic patient interaction and communication.
How do we know what patients and their carers expect at this stage of their illness, what are their goals and what is important to them? It is very challenging meeting the needs of supportive and palliative care patients and their carers if we do not ask. So often clinicians assume that the patient’s whole focus is pursuing every treatment option that is available, even if the likely response to that new line of treatment is minimal at best. The conversation about these treatment options usually focusses of what might be achieved, rather than the impact on survival time, quality of life or the risk of significant side effects. In addition, the life goals of a patient may be at odds with the goals of the family.

There are many communication techniques that can assist the clinician to start a conversation with a patient. In our multicultural society it is also important to recognise the many different cultural expectations. How we deal with these differences can impact on both patient and family care as well as the relationship between the family and the managing team.

Several case examples will be presented demonstrating both good and unfortunate outcomes from starting a conversation with patients and their families.

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Difficult patients and the importance of communication in medical imaging
Rebecca Ramsay
I-Med Bundaberg, Bundaberg, Australia

Difficult patients can become a demanding force when it comes to the medical imaging department, where staff are already overbooked, understaffed and under resourced.
As health professionals, we need to understand the wide variety of reasons patients may turn up to our clinic and present as angry, upset or difficult. In many cases the underlying problem is unrelated to the patient’s interaction with the imaging professional.
Identification and de-escalation of this type of behaviour is an integral part of modern health care.
Difficult patients tend to have underlying issues prior to arriving for their examination. Some patients are difficult because of generalised fear or frustration, fear loss of control, or are uncertain of what to expect. A lack of understanding of the health care system can be another aspect they may feel their expectations aren’t being met.¹,²
Not taking this behaviour personally is the first step to diffusing the situation.¹ When confronted with an increasingly difficult patient, remaining calm and professional is important. Don’t argue and listen to the patient. Be empathetic towards their expressed concerns. Letting them know you will try to resolve their problem as soon as possible, while keeping them updated in a timely manner is also important.¹,² Actively involving the patient in the decision-making process where practical can also help.
By implementing such strategies, we can improve our communication with our patients and thus improve their quality of care.

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Design and implementation of an interactive, educational mobile application for paediatric patients requiring radiotherapy
Melanie Pemberton,¹ Whitney Hatfield,² Francesca Lomandas,³ Simon McQuitty,¹ Andrew Pullar,¹ Anshu Sharma,⁴ Amanda Carter,⁴ Dian Tjondronegoro,³ Glenn Stewart,³ Catriona Hargrave¹,⁵
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Objectives: Resource intensive play or distraction therapies have been successfully utilised to improve compliance during radiation therapy and reduce the need for daily sedation for paediatric cancer patients.¹,² The ability of smart technologies to effectively present complex health information can assist staff to target patient-specific information needs prior to initial radiation therapy appointments. This project aimed to develop a prototype tablet-based application (App) with interactive educational content for paediatric patients via a collaborative project.

Method: Ethics approval was obtained. A literature review conducted determined the framework suited to delivering procedural information while promoting environmental familiarisation. A university-based information technology team, radiation therapists (RTs), occupational therapists (OTs) and a paediatric radiation oncologist then developed a patient experience map. A storyboard, multiple testing and feedback sessions were used to prioritise App resource creation and feature development.

Results: The framework of the Paediatric and Radiation Therapy Information (PARTI) App prototype utilises an immersive virtual environment and games approach promoting self-paced learning. The design process prioritised users aged 7–9 years and developed features that included animations such as a pedagogical agent ‘Buddy’ to guide users through the App, and a virtual representation of the radiation oncology department. Embedded photos, videos and sound recordings of planning and treatment procedures were included to facilitate environmental familiarisation. Games reinforce existing treatment preparation procedures used by RTs and OTs.

Discussion: The PARTI App prototype is currently being evaluated through a survey of both patients and their parents or carers, which will guide final version development.

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Modulated arc total body irradiation technique modification and implementation: first clinical experience
Melanie Pemberton, Mitchell Peters, Carole Brady, Beth Taylor, Lucy Sim, Sylwia Zawlodzka-Bednarz, Jennifer Biggs, John Baines
Queensland Health – Metro South Princess Alexandra Hospital Raymond Terrace, Brisbane, Australia

This presentation is a clinical review of paediatric patients treated using the modulated arc total body irradiation (MATBI) technique. The MATBI technique described by Kirby et al.¹ and Held et al.² was implemented at Radiation Oncology Princess Alexandra Hospital Raymond Terrace (ROPART) in 2015. To evaluate the efficacy of the implemented technique, an audit of the cases clinically treated was conducted. This review was granted exemption from institutional ethics. Seventeen patients have been treated to date for various diseases using a range of dose fractionations. Five patients have required general anaesthetic (GA) due to age and behavioural issues. Dose is modulated using the beam-weight optimisation in the Pinnacle3 3D treatment planning system. Lung and kidney dose is further reduced using compensators placed close to the patient’s skin surface. Custom design equipment was developed and included a treatment couch, a 3D printed custom-made compensator support and beam spoiler. A digital radiography (DR) Canon CXDI 701C wireless flat panel detector is used to verify the position of compensators. The use of bolus has been kept to a minimum. From a stabilisation and dosimetric perspective, this technique has shown to be adaptable to a wide range of body types.

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Saturday 17 March, 15:45-17:15
IGRT 2

Keeping abreast of clean skin: experiences of eliminating skin marks on breast patients
Hayley Mack, Sandra Paul, Catherine Russell
Alfred Health Radiation Oncology, Melbourne, Australia

Surface guided radiation therapy (SGRT) has been employed at Alfred Health Radiation Oncology (AHRO) since 2009, using an optical monitoring system (AlignRT®). Initially SGRT was utilised as a set up aid for torso sites. Further enhancements have enabled AHRO to use SGRT for patient monitoring and as an efficient and highly accurate markerless deep inspiration breath hold technique. AHRO ceased tattooing breast patients 20 years ago because of the permanent and sometimes unsightly nature of tattoos, choosing to use marker pens instead. As AHRO has become increasingly reliant on SGRT for providing high quality care, it was proposed that elimination of all skin marks could be reasonably achieved for breast patients, without compromising accuracy or efficiency. The rationale for this was to eliminate the need to remark fading lines and avoid placing surgical tapes on sensitive skin. Implementing this has been highly effective. Accuracy of breast treatment has been well maintained, with SGRT continuing to show that it is comparable to skin marks for positioning patients. Manual manipulation of patients has also decreased. Breast patients no longer have to be concerned with maintaining skin marks during treatment and also have no permanent reminder of their treatment once finished.

SGRT has been an invaluable tool at AHRO for patient setup, monitoring and treatment techniques. The successful elimination of all skin marks for breast patients has provided scope to expand this approach to other treatment sites.

(AHRO staff have received support from VisionRT to attend and present at relevant conferences and meetings.)
Using the haystack to find the needle: optical monitoring system with stereotactic ablative radiotherapy
Cherie Evans
The Alfred, Prahran, Australia

Surface guided radiation therapy (SGRT) is an evolving field of radiotherapy in recent years with the development of optical monitoring systems. SGRT is an additional part of quality assurance for most techniques at Alfred Health Radiation Oncology (AHRO) including stereotactic ablative radiotherapy (SABR). AHRO uses an optical monitoring system (AlignRT™) to observe intra-fraction patient movement between initial treatment setup, acquiring initial cone beam computer tomography scan (CBCT) and the subsequent corrected treatment position. SABR treatment involves very high doses per fraction, requiring a high degree of accuracy in treatment delivery. Ensuring the patient remains in the correct position for the entirety of treatment is of paramount importance.

SABR treatments at AHRO require the radiation oncologist (RO) to be present for the assessment of the initial CBCT with the radiation therapist (RT). SGRT enables the RTs to set the patient up with six degrees of freedom and monitor the intra-fraction position based on the external patient surface. SGRT tolerance levels can be set, highlighting to the therapists outside the room if any patient movement has occurred. A CBCT can be initiated if the patient has deemed to have moved beyond the SGRT tolerances.

CBCT coupled with SGRT allows AHRO to confidently deliver SBRT treatment regimens for a range of anatomical sites. The collaboration between RTs and ROs ensures an efficient high quality SABR treatment service at the AHRO whilst continuing to deliver excellent patient care to each individual patient.

Exacting measures: comparing two imaging modalities for intracranial stereotactic radiation therapy
Elizabeth Brown,1,2 Ryan Lusk,1 Brock Lamprecht,1 John Shakeshaft,1 Mark Pinkham,1,3 Andrew Pullar,4 Peta Hanlon,1 Michelle Mauro,1 Matthew Foote1,3,5
1 Radiation Oncology Princess Alexandra Hospital, Brisbane, Australia 2 School of Clinical Sciences, Queensland University of Technology, Brisbane, Australia 3 School of Medicine, University of Queensland, Brisbane, Australia 4 Radiation Oncology Princess Alexandra Hospital Raymond Terrace, Brisbane, Australia 5 Gamma Knife Centre of Queensland, Brisbane, Australia

Objectives: In-room six-dimensional X-ray treatment verification (ExacTrac) for pre-treatment and intra-fraction setup error correction has the potential to facilitate margin reduction for intracranial stereotactic radiation therapy (SRT).1,2 The objectives of this study were: 1) to assess the agreement between pre-treatment ExacTrac and cone beam computed tomography (CBCT) and 2) to assess intra-fraction stability of our thermoplastic mask system.

Methods: Twenty-four patients were positioned for each fraction of intracranial SRT using CBCT with six degrees of freedom (Hexapod) couch correction. Parallel ExacTrac imaging was acquired and the residual error observed was recorded. Sixteen of these patients also had ExacTrac imaging performed immediately after each treatment arc to evaluate intra-fraction stability. Ethics approval was obtained.

Results: A total of 116 CBCT-ExacTrac image pairs were assessed. The overall root mean square (RMS) of the residual error between CBCT versus ExacTrac was ≤0.5 mm for translations and <0.4° for rotations. This matched the quality assurance tolerance for coincidence between CBCT and ExacTrac isocentres of 0.5 mm. A total of 171 pre- and post-arc ExacTrac image pairs were analysed to assess intra-fraction stability. The RMS for translations was <0.3 mm and <0.2° for rotations.

Conclusion: There is very good agreement between CBCT and ExacTrac imaging in this series. It appears feasible to use ExacTrac imaging alone and investigate margin reduction for these treatments. Our thermoplastic mask system provides acceptable intra-fraction stability for patients receiving intracranial SRT.

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An image-guided radiotherapy decision-support framework incorporating a Bayesian network and visualisation tool
Cathy Hargrave,1,2 Kerrie Mengersen,2 Tomasz Bednarz,2,3 Timothy Deegan,1 Michael Poulsen,1 Fiona Harden2
1Radiation Oncology Princess Alexandra Hospital Raymond Terrace, Brisbane, Australia 2School of Mathematics, Science and Engineering Faculty, Queensland University of Technology, Brisbane, Australia 3Data61, Commonwealth Scientific and Industrial Research Organisation, Brisbane, Australia

Objectives: While cone beam computed tomography (CBCT) completely images a patient’s tumour and organs at risk (OAR) improving patient care, it increases the complexity and decision times of image guided radiation therapy (IGRT). A prostate IGRT decision-support framework was developed to precisely measure and visualise CBCT inter-fraction variations and incorporate this data in a Bayesian network (BN) to predict treatment plan compliance (TPC).

Methods: Ethics approval was obtained. A graphical BN model was constructed to represent relationships between tumour/OAR inter-fraction variation, a feature alignment score (FAS) assessing online CBCT registration, delivered dose and TPC. These and other variables such as image quality influence the BN output recommending whether to proceed with treatment. BN predictions are based on conditional probability data generated from published studies, FAS modelling and a prostate IGRT survey. BN sensitivity and scenario testing was conducted, incorporating analysis of Mollweide plots used to measure directional volume differences of retrospective pre- and post-online image matching CBCT registrations.

Results: Sensitivity analysis established the BN performed as expected. Proximal seminal vesicle (PSV) and rectum variations exceeding thresholds increased low TPC probability to 40%. Prostate and PSV variations increased the likelihood of repeating patient preparation to 43%. Scenario testing resulted in one case where the BN recommended proceeding with treatment, while dosimetric evaluation indicated low TPC. However, Mollweide plots highlighted the entire posterior PSV on the CBCT was close to exceeding the planned tumour volume margin.

Conclusion: The BN and complementary Mollweide plots are effective decision-support tools for the online IGRT environment.

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DIBH – PRIME Trial investigates predictive factors, intrafraction motion and the patient experience
Patricia Browne, Nakia Beaton, Harish Sharma, Margot Lehman, Jennifer Harvey, Tao Mai, Elizabeth Brown, Cathy Hargrave, Patrick O’Connor, Arnold Ng, Sharon Watson
Princess Alexandra Hospital, Brisbane, Australia

Objectives: Breast cancer is the most common malignancy in Australian women. Deep inspiration breath hold (DIBH) technique reduces heart dose from radiotherapy (RT) for left-sided breast cancer. The objectives of this prospective study were to (1) evaluate the patient’s experience with the Elekta ABC device, (2) assess inter and intrafraction motion and (3) determine which breast cancer patients benefit most from DIBH.

Methods: Patients completed a questionnaire on their DIBH experience at three time points. Questions covered satisfaction with the device, quality of supporting information and fatigue. To assess inter and intrafraction motion, mV portal images were taken during breath-hold treatment beams. Patient demographics and medical histories were recorded. Plans were generated on DIBH and free breathing (FB) scans. Ethics approval was obtained.

Results: Of 31 patients, the average score for both comfort with the device and ease of holding ones breath was 9/10 (range 5–10). Patients felt significantly more tired and anxious in their lives during the last week of treatment compared to planning. There was minimal chest-wall movement between and during breath holds: 0.18 ± 1.2 mm and 0.18 ± 0.8 mm respectively. Average interfraction motion was 0.34 ± 1.8 mm. Dosimetric comparisons demonstrated an average decrease in maximum heart and LAD dose by 39% and 45% respectively.

Discussion/Conclusion: DIBH with Elekta ABC is well tolerated. The ABC device promotes minimal intra and interfraction motion giving confidence in PTV margins. Data analysis indicates that breast cancer patients suitable for DIBH gain significant dosimetric benefit.

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Implementation and initial experience in intra-fraction prostate motion management
Ainsley Thorburn, Timothy Deegan, Nikki Mason, Laura Curran, Simon McQuitty
Radiation Oncology Princess Alexandra Hospital – Raymond Terrace, South Brisbane, Australia

Since December 2016, Radiation Oncology Princess Alexandra Hospital Raymond Terrace (ROPART) has been using the Varian Calypso® system of real-time tumour tracking for selected prostate patients. Previously, prostate EBRT patients were managed for inter-fraction motion with image guided localisation using cone beam CT or gold-seed fiducial markers and there was no management of the unpredictable intra-fraction motion. The Calypso system was introduced to monitor and correct for intra-fraction motion using intraprostatic electromagnetic transponders.

During the first year of clinical use we have treated a cohort of 20 prostate patients using Calypso Dynamic Edge Gating. This presentation will discuss the collaborative implementation of the Calypso system in our department for prostate treatments. Discussion will include our screening, planning and treatment processes. These include initial observations, experiences and clinical benefits of using real-time intra-fraction motion detection and online intervention.

Saturday 17 March, 15:45–17:15
Interventional

Uterine artery embolisation
Rohit Tamhane
Invited Speaker

In the 1990s, a French gynaecologist first noticed the shrinkage of uterine fibroids in patients who had undergone emergency uterine fibroid embolisation for acute bleeding. He then noticed that the symptoms of fibroids were cured when the procedure was performed prior to myomectomy to make the surgery less bloody. Since then the procedure has evolved and is now an established treatment alternative for patients with symptomatic fibroids. In this session I will review the indications for the procedure, pre-procedure work-up including ultrasound and MRI, the arterial anatomy of the pelvis and the procedure itself. Finally, I will review the recent literature comparing long-term results of uterine fibroid embolisation versus myomectomy versus hysterectomy.
Patient radiation dose: a traditional angiography suite compared to a state-of-the-art hybrid operating theatre
Nathan Brunskill
Sydney Adventist Hospital, Sydney, Australia

Objectives: To evaluate the extent of patient radiation exposure during endovascular interventional procedures when performed in a state-of-the-art hybrid operating theatre compared to a traditional angiography suite.

Methods: A single centre, retrospective study was performed between November 2015 and June 2016 following the transition from a traditional angiography suite (Philips Allura. Installed 2001) to a state-of-the-art hybrid operating theatre (GE 740 Discovery IGS. Installed 2016).

Dose area products, procedural details and patient demographics were collated.

Index procedures were; iliac artery angioplasty (IAA), superficial femoral artery angioplasty (SFA) and bronchial artery embolisation (BAE).

Results: 130 procedures were performed in the angiography suite including 15 SFA, 13 IAA and 3 BAE compared to 152 procedures performed in the hybrid theatre including 29 SFA, 16 IAA and 9 BAE. Mean dose in the SFA group was 5581.3 cGycm² (2200–15,920) in the traditional angiography suite versus 699.4 (21.8–4449) in the hybrid, \( P < 0.00001 \). In the IAA group mean dose for the angiography suite was 7900 cGycm² (1000–27,700) compared to 1410.7 (33–5973) in the hybrid, \( P < 0.0008 \). In the BAE group mean dose was 18,333 cGycm² (8100–23,700) in the angiography suite with reductions to 1521.6 (45–3289) in the hybrid, \( P = 0.0001 \).

In total, the radiation dose during hybrid procedures was on average, 6085.45 cGycm² less per case when compared to the traditional angiography suite. A dosage decrease of 416.88%.

Conclusion: Procedures in the state-of-the-art hybrid dramatically reduce radiation dose to patients, compared to the traditional angiography suite.

A retrospective study on angiographic X-ray radiation dose for patients undergoing SIRT using SIR-spheres
Don Nocum
Sydney Adventist Hospital, Wahroonga, Australia

Objectives: To retrospectively study the angiographic X-ray radiation dose received by patients undergoing selective internal radiation therapy (SIRT) using SIR-spheres in a hospital setting. SIRT involves embolising radio labelled spheres into the arterial supply of the liver.¹

Methods: In this ethics approved study, a total of 54 patients were performed with a SIR-spheres ‘work-up’ (WU) procedure, followed by a SIR-spheres ‘Implant’ (IMP) procedure 1–2 weeks later. The dose-area-product (DAP) and time (minutes and seconds) metres on the Philips Allura Xper FD20 X-ray system were used to measure and record the X-ray radiation dose and fluoroscopy times, respectively. Cases were reviewed from October 2011 to July 2017.

Results: The radiation dose on patients reduced from the SIR-spheres work-up to SIR-spheres implant by 62.04% (mean DAP-WU = 731,360.1 mGycm²; Mean DAP-IMP = 453,759.4 mGycm²). The mean fluoroscopy time for the SIR-WU was 18 min and 21 sec compared to the mean fluoroscopy time of 14 min and 27 sec for the SIR-IMP.

Discussion: Reviewing and comparing X-ray radiation dose for procedures is part of quality patient care and practice. Angiographic X-ray radiation dose was less for the implant procedure as compared with the work-up procedure. These results are consistent with the dose reduction mechanisms of the X-ray system, operator dependent measures for limiting screening time and the significance of the SIR-sphere work-up to selectively catheterise the arterial vessels supplying the liver tumours prior to treatment.² There are no significant deterministic effects with angiographic X-ray radiation dose related to SIR-Spheres procedures.

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Optimising imaging for endovascular graft planning and follow up
Denise Elliott
Cook Medical, Brisbane, Australia

Endovascular repair of aortic aneurysms is becoming increasingly common as more complex anatomy can be treated throughout the whole aorta. Endovascular grafts are now frequently the treatment of choice over open repair of the aorta.¹ A successful outcome for the patient is dependent on a collaborative effort and clear communication from everyone involved,² from first consultation to ongoing yearly follow up. Medical imaging is crucial in diagnosis, endovascular graft planning, treatment and follow up of these cases.³

The radiographer’s role in the endovascular team is to deliver appropriate, high quality, targeted imaging in all phases of patient care. To do this, an understanding of what imaging is needed and why, is necessary. This presentation will explain the role of medical imaging in diagnosing and assessing patient suitability for endovascular graft therapy, endovascular graft planning and lifetime follow up. Examples will be given of imaging protocols for CT workup and appropriate follow-up protocols for X-ray and ultrasound. New technologies and future developments will be touched upon. The role of the endovascular graft planner will be highlighted as another potential career pathway open to radiographers. Endovascular graft planners work collaboratively with individual physicians in the planning of custom-made endovascular stent grafts to ensure the best possible graft design for each patient's unique anatomy and disease state. Planners are also involved with training, education, research and development to support endovascular teams nationally and internationally.

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Redefining the visible: a quality improvement investigation of suture needle radiological acuity
Matthew Simpson
Queensland Health, Brisbane, Australia

Objectives: When suture needles are lost intra-operatively, current operating theatre protocols dictate that the surgical count is deemed incorrect.¹ Previously it was assumed suture needle visibility was limited using mobile C-arm image intensifier systems.¹ With the progression to flat panel detector technology, a quality improvement investigation was designed to retest these assumptions. Collaborating within a multidisciplinary team, needle visibility was determined under simulated radiological test conditions with the intention of informing clinical decisions in the management of intra-operative count discrepancies.

Methods: Aiming to distinguish needle visibility radiologically, six different needles were examined under operating theatre conditions. They were placed beneath a whole body phantom in three regions: hand, neck and torso. Two different exposure modes, fluoroscopy and acquisition, were used on each needle and region to obtain images. The images were reviewed by two nurses and two radiographers to determine radiological visibility.

Results: Larger needle lengths (12–30 mm) were seen clearly with fluoroscopy. Smaller needle lengths (8 mm) were visible only when the acquisition exposure mode was utilised. Suture size, which by convention describes the thread / material thickness, did not impact radiological visibility.

Discussion/Conclusion: A multitude of variables make determining suture needle visibility radiologically difficult at best. Despite this, the findings disproved numerous previous held assumptions regarding needle visibility. In collaboration with the clinical nurse coordinator, the operating theatre protocols for discrepancy in closure counts¹ were updated and as a consequence needles have been successfully located and retrieved intra-operatively using flat panel C-arm systems thus saving the patient repeated surgical intervention.

References
1. De Plater J, et al. Clinical analysis: count discrepancies 2015–2017. Brisbane (AU): Princess Alexandra Hospital, Metro South Health; 2017. 5 p. Version 1.0.
2. Assistant Director of Nursing. Peri-operative. Discrepancy in closure counts. Brisbane (AU): Princess Alexandra Hospital, Metro South Health; 2017. 2 p. Procedure No. 01601/v8/07/2017.
Saturday 17 March, 15:45–17:15
Patient Care (MI)

Communicate, collaborate and care: how complexity thinking can inform preparation for patient-centred interprofessional practice
Adrian Schoo, Koshila Kumar
Invited Speakers

Communication and collaboration are essential ingredients of patient-centred care through interprofessional practice. Practising interprofessionally can be challenging since health systems are becoming increasingly complex due to reasons such as changing populations and associated health needs, medical and technical advancement, new roles, specialisation, political agendas and available resources. The challenge for education and training, whether undergraduate, postgraduate or as part of continuing professional development, is to prepare students and staff to work and lead in a way that best serves the consumers in a dynamic and complex health services environment.

Health professionals such as radiographers and radiation therapists operate in a health setting that includes various stakeholders and a diversity of interests. Challenges such as competing health services, little or no organisational support for interprofessional learning and fieldwork placement, competing timetables, bureaucracy, challenging staff/students, high clinical workloads, geographic isolation and limited professional development and career opportunities can also make it difficult to communicate and collaborate and optimise patient outcomes.

Education needs to go beyond the acquisition of knowledge and clinical skills alone to prepare to health professionals for their role in contemporary complex systems through best clinical/non-clinical practice (evidence-based research, consumer/stakeholder preferences and competency). Health professionals can be encouraged to understand and analyse the complexity within which they work, and identify opportunities to optimise impact, by utilising a micro-meso-macro level framework. This presentation will explain how complexity thinking can inform preparation for teamwork and patient-centred interprofessional practice.

Immobilisation in Australian paediatric medical imaging: a pilot study
Sarah Noonan, Kelly Spuur
Charles Sturt University, Wagga Wagga, Australia

Aims: To document the use of paediatric immobilisation techniques in medical imaging; investigate differences in current practice between paediatric and non-paediatric facilities and radiographer gender; and to investigate current immobilisation protocols.
Methods: An invitation via a SurveyMonkey link was distributed through the Australian Society of Medical Imaging and Radiation Therapy (ASMIRT) on-line newsletter. Frequency percentage analysis was undertaken. A Fisher’s exact test was used to determine dependency, as the ‘frequency of immobilisation’ response was on a Likert scale and the ages categorical.
Results: Patient age was the primary determinant in the use of immobilisation techniques. The most commonly used technique in general X-ray was ‘other people’; computed tomography (CT), Velcro, verbal reminders and distraction techniques; and in magnetic resonance imaging (MRI), sedation and Velcro. Immobilisation frequency was also reported to be facility dependent for 13–17 year olds ($P = 0.035$) with paediatric facilities rarely immobilising and non-paediatric facilities never. A comparison of immobilisation techniques demonstrated that Velcro use in X-ray was dependent on facility ($P = 0.017$) with paediatric facilities using it to 17 years.

No dependencies resulted upon comparing genders. Immobilisation frequency was not dependent between protocols or current practice.
Conclusion: Paediatric immobilisation technique was demonstrated to be age related across all modalities and facility types; ‘other people’, sedation, Velcro, verbal reminders and distraction techniques being regularly used. The dependency on Velcro use and the rationale for immobilisation frequency in 13–17 year olds could not be explained. A larger study should be carried out to validate these findings.

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**Improving patient care through systematic image review**

Daniel Sgualdino, Cameron Brown

Queensland Health – Metro South Health – Logan Hospital, Meadowbrook, Australia

**Objectives:** Monitoring and evaluating radiographic image quality is vital in promoting patient radiation safety.\(^1\)\(^2\) However, it can present a significant challenge in terms of efficiency and robustness. This study sought to develop and test an efficient and effective approach to image quality review.

**Methods:** Phase one developed the image quality review tool utilising a collaborative process. Phase two involved testing the tool using radiographers. Three radiographers undertook an audit of the same 50 wrist X-ray examinations. Participants assessed each examination and via the audit tool documented whether the overall quality was ‘acceptable’. Additionally, participants recorded why unacceptable images were chosen. One participant was required to complete the same audit two weeks following their first to assess intra-rater reliability. Audit results and the time taken to complete each audit were analysed.

**Results:** The mean completion time for the audit was 96 min and 40 sec (SD = 41 min 57 sec). Of the 50 studies, 27 were unanimously considered ‘acceptable’ and one was unanimously ‘unacceptable’. The joint probability agreement was 56% (28/50). Of the 22 occurrences of disagreement among the raters, 17 studies were considered by a split majority (2:1) as ‘acceptable’ and five studies were considered ‘unacceptable’ by the same margin. This resulted in an inter-rater reliability of 0.85. The 2-week re-audit displayed an intra-rater reliability of 0.72.

**Discussion/Conclusion:** This study describes a simple yet efficient and effective method of reviewing departmental image quality, however further refinement of the tool is necessary to improve the intra-rater reliability.

**References**

1. Martin CJ, Sharp PF, Sutton DG. Measurement of image quality in diagnostic radiology. Applied Radiation and Isotopes 1999;50 (1):21–38.

2. Langer SG, Ramthun S, Bender C. Introduction to digital medical image management: departmental concerns. American Journal of Roentgenology 2012;198(4):746–53.

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**Understanding patient pain tolerance and adapting patient care to improve the imaging experience**

Clare Gill, Nicole Flood

Princess Alexandra Hospital, Brisbane, Australia

The peripheral and central nervous systems form a sensory pathway that processes noxious information and cannot be changed by human interference. However, the perception of this stimulus by the cerebral cortex and the subsequent manifestation of that pain can be altered by genetic, developmental, familial, psychological, social and cultural factors. Race and gender alone are proven influencers on pain tolerance. Thus, an opportunity to intervene is presented through psychological manipulation or cognitive strategies such as attention diversion, self-statements, imagery and fantasy. Cognitive processes are directly related to behavioural change through mastery of self and self-efficacy and can consequently be employed as a means of diminishing patient pain to achieve diagnostic imaging. The Trimodal System of Pain Management elicits an optimal response and involves behaviour manipulation including operant conditioning, physical intervention including physiotherapy and cognitive strategies.

The purpose of this presentation aims to define the physiological processes involved in stimulus registration, information processing and subsequent pain perception; recognise influential factors on tolerance levels and apply cognitive strategies to improve the radiology experience.

A literature review of journal articles published between 2007 and present to adhere to current practice standards. Databases and electronic resources such as CKN and Sciencedirect were used with keywords such as nociceptive system, pain tolerance and sensitivity and cognitive coping strategies.

Harbouring the ability to quantify your patient’s pain sensitivity and identify possible causes can allow you to adapt your patient care, communicate your imaging goals and collaborate together to achieve an ideal treatment outcome.
Sydney Adventist Hospital provides MORE CARE
Tammy Brown, Andrew Fereig
Sydney Adventist Hospital, Wahroonga, Australia

In a competitive environment such as private health care, a private hospital must fulfil the expectations of all patients and staff. The MORE CARE initiative was introduced at our facility as a way of bringing attention and a clear focus to patient care and the expectations of all patients and staff. This was a key part of the AHCL strategic plan for 2015–2020. MORE CARE includes the philosophy of: Connect, Account, Respect and Empower.
MORE CARE includes caring for the body, mind and spirit. It is about caring for the whole person, not just immediate needs or wants. Our patients require more care than just their immediate health needs; our colleagues require more care than just their immediate work needs. Our patients are more than just their disease or pathology; our colleagues are more than just someone we work with. Introducing more care concepts such as actively connecting with our colleagues and patients, ensuring we account for our actions, genuinely respecting our patients, colleagues and ourselves while empowering our patients and colleagues to improve care to all has positive impacts throughout the entire hospital. The positive impacts are demonstrated through staff surveys and in patient feedback surveys. Utilising these surveys to further enhance patient and staff experiences results in a workplace and hospital that people choose over other competitors.
This presentation will give context to the philosophy and provide attendees with practical applications of how to demonstrate MORE CARE to their patients, colleagues and themselves in any health service.

Sunday 18 March, 09:00–10:30
Breast Imaging 1

BreastScreen TACT: results of the tomosynthesis at assessment clinic trial
Beverlee MacDonnell-Scott
Invited Speaker

BreastScreen Northern Sydney Central Coast has recently completed a trial comparing tomosynthesis (3D mammography) in the assessment clinic to conventional assessment procedures (2D work-up).
This presentation will outline the trial and discuss the results of introducing tomosynthesis into BreastScreen assessment clinics.