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In this issue

In this issue, we feature a Guest Editorial by Robson, Clark and White, which sets out a thoughtful deliberation on the important agenda of patient safety. In response to this editorial, Probst, Hutton and Collins set out their thoughts and views and open up a wider debate relating to patient safety, in their 'Letter to the Editor'. I would be most interesting to hear your views on this important subject and debate.

The first two articles in this issue are concerned with student education in Australia. In the first original article, Findlay, Dempsey and Warren-Forward complete a qualitative analysis of the reflective clinical journals completed during professional placement by radiation therapy (RT) students to uncover the issues that affect students on placement and how these change as the students progress through the programme. A qualitative descriptive analysis was undertaken on the descriptive content of student journals completed by 97 students over three consecutive years while undertaking professional placement in Radiation Oncology Treatment Centres within Australia. The results of this study showed some similarities with studies completed in other health professions; however, the breadth of issues explored within the content of these RT student journals demonstrates the true diversity of the RT student experience on professional placement.

In the second article, Bridge, Pirihi and Carmichael present their findings on the role of radiotherapy patients in provision of student interpersonal skills feedback.

At Queensland University of Technology student radiation therapists receive regular feedback from clinical staff relating to clinical interpersonal skills. Although this is of great value, there is anecdotal evidence that students communicate differently with patients when under observation. The aim of this pilot was to counter this perceived observer effect by allowing patients to provide students with additional feedback.

Radiotherapy patients from two departments were provided with anonymous feedback forms relating to aspects of student interpersonal skills. Clinical assessors, mentors and students were also provided with feedback forms, including questions about the role of patient feedback. Patient perceptions of student performance were correlated with staff feedback and assessment scores. Results indicated that the feedback was valued by both students and patients. Students reported that the additional dimension focused them on communication, set goals for development and increased motivation.

In the next article by Ian Gleeson, the author presents his findings on the calculation of planning margins for different verification techniques in radical prostate radiotherapy. The purpose of this study was to calculate and compare planning target volume (PTV) margins for an offline 3 mm tolerance/daily bony anatomy verification, tattoo alignment and online prostate marker matching with those currently used at the author's institution. Seventy patients had offline bony anatomy megavoltage (MV) verification. Twenty-three different patients underwent fiducial marker matching using daily online kilovoltage verification. Systematic and random errors were measured in the right–left (RL), superior–inferior (SI) and anterior–posterior (AP) directions. Geometric uncertainties from literature were used to help calculate the margins. The author concludes that current margins for conformal radiotherapy (CRT) patients are too small for phase 2 in the SI and AP directions. Implementing online daily bony anatomy matching would not reduce the PTV margin significantly. Online daily marker correction showed current PTV71 Gy margins as excessive by (mm) five RL, two SI and four AP.

In the fourth article, Liney, Marsden, Horsfield, Murray, Manton and Beavis present their solution to improve visualisation of cervix applicators for MR-only guided brachytherapy planning. Current guidelines for image-guided cervical cancer brachytherapy planning recommend both computed tomography and magnetic resonance imaging (MRI) for adequate visualisation of the applicator and soft tissues, respectively. MRI-only planning would be ideal as it would save time within the patient pathway and avoid the concomitant CT exposures. However, applicator visualisation is usually achieved using fluid-filled fiducial marker tubes, which can be awkward to use and suffer from unwanted air bubble artefacts. Therefore, a new, fiducial-free imaging technique was developed. A dual-echo time (TE) turbo spin-echo sequence was used, at 1·5 T, to provide both T2-weighted images (100 ms TE) for tissue visualisation and strongly proton density-weighted images (17 ms TE) for improved applicator visualisation. In-house software was used to automatically segment the applicator in the short TE images (using Otsu's method) and transfer the information to the long TE images to provide a single fused data set. The authors conclude that the dual-echo technique provides a simple and efficient method for improving the visualisation of brachytherapy applicators in cervical cancer MRI images without the need for marker tubes.

The aim of the next study, by Matteo Tamponi et al., was to evaluate typical random and systematic set-up errors and analyse the impact of no action level (NAL) correction protocol on systematic set-up errors and clinical target volume (CTV)-PTV margins. A total of 668 pairs of orthogonal electronic portal images were compared with digitally reconstructed radiographs from CT planning scans for 100 patients consecutively treated during 2011. Patients were divided into groups depending on the treated anatomical region. Patient-specific and population random and systematic set-up errors were calculated. Impact of application of NAL correction protocol on systematic set-up errors and CTV-PTV expansions were evaluated. In conclusion, set-up errors resulted in being reasonably controlled and application of NAL correction protocol could further improve the level of accuracy. However, the NAL application alone did not seem to add any substantial benefit on CTV-PTV total margins without the adoption of corrective strategies to reduce other important uncertainties limiting accuracy of 3D CRT.

In the next article, Islam et al. study the effect of correction/calibration factors on accuracy of in vivo dose delivery with cylindrical *n*-type isorad diode in conventional radiotherapy. The main aim was to use pre-calculated correction factors and calibration factors for measurement of accuracy of dose delivery before implementation of such in vivo dosimetry on real patients visiting for the first radiation treatment. These factors were verified by generating the most common treatment plans on human phantom, except for the breast and colon using cobalt-60 unit.

Six treatment plans were generated, that is, the nasopharynx, bladder, prostate, brain, larynx and lung of human phantom, and a total of 18 fields were planned keeping in view the correction factors, which are to be verified. MULTIDATA Decision Support System 2·5, Shimadzu simulator, Isorad diode *n*-type, electrometer patient dose monitor and ATOM Adult male human phantom (Model 701-D; CIRS, Norfolk, VA, USA) were used. This study is helpful to identify areas of improvement in treatment of patients such as quality control/quality assurance (QA) of treatment planning system, beam data modifications, machine repair maintenance, QA audit in radiotherapy.

In the next paper, Chow and Jiang undertake a dosimetric evaluation using the PTV dose-volume factor (PDVF), study the variation of PTV dose distribution on patient size in prostate volumetric-modulated arc therapy (VMAT) and intensity-modulated radiotherapy (IMRT). The authors use the PDVF to evaluate treatment plans of prostate VMAT and IMRT. The PDVF was used to compare the variation of PTV coverage between VMAT and IMRT owing to weight loss of patient. VMAT and IMRT plans of five patients (prostate volume = 32–86·5 cm^3) using the 6 MV photon beams were created

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with the external contour reduced by depths of 0·5–2 cm to reflect the weight loss. Moreover, integral doses (volume integral of the patient dose) and prostate tumour control probability were calculated.

They conclude that PDVF can be successfully used to evaluate the variation of PTV coverage owing to weight loss of patient in prostate VMAT and IMRT.

Degradation of PTV coverage in prostate VMAT is less significant than IMRT regarding patient size reduction.

In the next article, Taylor, ffrench, Sale and Foulstone investigate rotational issues for rectal carcinoma treated with radiotherapy. The purpose of the study was to quantify the amount of inter-fractional pitch for rectal carcinoma patients, to investigate the dosimetric impact of pitch on the target volume and critical structures, and determine a tolerance where no pitch correction is required.

Daily pre-treatment images of rectal carcinoma patients were analysed to determine the residual pitch compared with the CT planning scan. The dosimetric impact of pelvic rotation was modelled. The dose coverage of the CTV and small bowel were evaluated using dose volume histograms. Authors conclude that clinically significant change in CTV coverage was found (when $\pm 10^{\circ}$ of pitch was simulated). A tolerance of $\pm 10^{\circ}$ of pitch has been implemented for rectal carcinoma patients treated with 3D CRT in our institution, when daily pre-treatment imaging with a zero action threshold for translational shifts is used.

In the study by Rex Cheung, the author identifies the under usage of radiotherapy and a lack of socio-economic disparity in treatment outcome and undertake a population-based study on adenoid cystic carcinomas. This study used receiver operating characteristic curve (ROC) to analyse surveillance, epidemiology and end results (SEER) adenoid cystic carcinoma data to identify predictive models and potential disparity in outcome. For the risk modelling, each factor was fitted by a generalised linear model to predict the cause-specific survival. The area under the ROC was computed. Similar strata were combined to construct the most parsimonious models. A random sampling algorithm was used to estimate the modelling errors. Risk of adenoid cystic carcinoma death was computed for the predictors for comparison. There were 5,947 patients diagnosed from 1973 to 2009, who were included in this study. The mean follow-up time (SD) was 93·8 (90·6) months; three-fifth of the patients were female. The mean (SD) age was 58·55 (16·01) years. SEER stage was the most predictive factor of outcome (ROC area of 0·68). Sex, radiotherapy and surgery had ROC areas of about 0·57. None of the socio-economic disparity was found for treatment outcome. Radiotherapy was underused in localised and regional stages when the intent was curative, especially in older patients. In conclusion, anatomic staging was predictive and useful in treatment selection and under-staging and underuse of radiotherapy may have contributed to poor outcome.

In the next article, Goldman, Anderson, Wennberg and Lind present their study into symptomatic radiation pneumonitis (RP) and changes in pulmonary function tests (PFTs) after loco-regional radiotherapy (LRRT) with V20 lung constraints in breast cancer (BC). Sixty-four women underwent PFTs before and 5 months after 3D planned LRRT for BC. The incidentally irradiated ipsilateral lung V20 was minimised to $<30\%$. Patients were monitored for symptoms of RP 1, 4 and 7 months after RT and data on co-variates were collected prospectively. The outcome was compared with a previous treatment series. Authors found that pneumonitis was less frequent with the applied constraint, that is, four mild and one moderate case, than in our previous report ($p < 0{\cdot}001$). In multivariate analyses, neither dosimetric data nor co-variates appeared to influence mean changes in vital capacity ($-0{\cdot}11$ L, standard error of the mean (SEM) 0·03) or diffusing capacity of the lung for carbon monoxide (DLCO; $-0{\cdot}20$ mmol/kPa min, SEM 0·01) except for pre-RT chemotherapy, which diminished the change in DLCO 5 months post-RT. In conclusion, the used constraint and 3D planning

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lowered the rate of RP and short-term changes in PFTs compared with our previous treatment series. Pre-RT chemotherapy affects DLCO baseline levels. Rates of side effects should be continuously studied when new target definitions or therapies are introduced in LRRT of BC.

In the next article, Pettit, Sanghera, Glaholm and Hartley present their study into the use of MuGard™, Caphosol® and Episil® in patients undergoing chemoradiotherapy for squamous cell carcinoma of the head and neck. This prospective audit aimed to record mucositis and dysphagia toxicity and the level of analgesia prescribed when recent products like MuGard™, Caphosol® and Episil® are compared with our standard departmental mouth care regimen. Patients undergoing concurrent chemoradiotherapy for locally advanced squamous cell carcinoma of the head and neck, prospectively audited weekly for eight consecutive weeks starting from week 1 of chemoradiotherapy from June 2009 to January 2011. Patients received either standard oral care regimen of aspirin, glycerin and sucralfate or MuGard™, Caphosol® or Episil® . Grade of mucositis, dysphagia and analgesia score were prospectively recorded using the common toxicity criteria v3.0. The authors conclude there is no evidence from this audit that MuGard™, Caphosol® and Episil® improves mucositis and dysphagia toxicity or the level of analgesia prescribed compared with our standard departmental mouth care regimen. Randomised trials comparing these approaches are required to detect any meaningful clinical benefit.

In the next paper, Marco Suadoni reviews the literature to investigate the issue of probiotics that are more efficacious than placebo at preventing radiotherapy-induced diarrhoea (RID) in adults with cancer. Patients with cancer, undergoing radiotherapy, often develop diarrhoea, causing distress and hindering treatment. As probiotics have favourable effects on the gut flora, they are potentially good candidates in the prevention of RID. The outcome of interest of this systematic review was the efficacy of probiotics in preventing RID. Four RCTs were finally selected from Medline and Embase. Three RCTs showed beneficial results, which were statistically significant. One RCT showed non-beneficial results, which were not statistically significant. The quality of the studies was mixed, and serious limitations were found. Although the indications are towards a benefit of probiotics use in preventing RID, more robust evidence is required in the form of well-designed RCTs.

In the case study, Boimel and Turaker describe an unusual case of a 38 year old female with a history of small cell lung cancer (SCLC) presenting with a new nodule in the thyroid gland, found to be metastatic SCLC, without evidence of widespread dissemination.

In the technical note, presented by Myers, Stathakis, Buckey and Papanikolaou, authors study the dosimetry of Varian RapidArc is a VMAT monthly QA using two techniques, a 2D ion chamber array with an isocentric gantry mount and an in vivo dosimetric device attached to gantry.

I hope you enjoy the variety of papers and topics presented in this issue.

Professor Angela Duxbury

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