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Library Current Awareness Bulletin Radiology – February 2022

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News

Society lobbies for independent prescribing in diagnostic radiography
The Society of Radiographers
January 2022
[The Society and partner organisations presented the case to the Commission on Human Medicines (CHM).]

SoR and HEE issue joint guidance on diagnostic imaging support workers
The Society of Radiographers
January 2022
[Partnership sets out roles and responsibilities that workers can perform at four career levels].

Statistics

Diagnostic Imaging Dataset 2021-22 Data
NHS England
January 2022
[The Diagnostic Imaging Dataset (DID) is a central collection of detailed information about diagnostic imaging tests carried out on NHS patients, extracted from local Radiology Information Systems (RISs) and submitted monthly.]

Diagnostic Radiology

Adrenal Incidentaloma: Prevalence and Referral Patterns From Routine Practice in a Large UK University Teaching Hospital.
Hanna F.W.F, Hancock S.G., Cherian C., Alexander S., Julius I., Basil G., Powner G., Waldron J., Duff C.J., Lea S.C. et al
Journal of the Endocrine Society, vol. 6(1)
January 2022
[**Context**: Adrenal incidentalomas (AIs) are increasingly being identified during unrelated imaging. Unlike AI clinical management, data on referral patterns in routine practice are lacking. **Objective**: This work aimed to identify factors associated with AI referral. **Methods**: We linked data from imaging reports and outpatient bookings from a large UK teaching hospital. We examined (i) AI prevalence and (ii) pattern of referral to endocrinology, stratified by age, imaging modality, scan anatomical site, requesting clinical specialty, and temporal trends. Using key radiology phrases to identify scans reporting potential AI, we identified 4097 individuals from 479 945 scan reports (2015-2019). Main outcome measures included prevalence of AI and referral rates. **Results**: Overall, AI lesions were identified in 1.2% of scans. They were more prevalent in abdomen computed tomography and magnetic resonance imaging scans (3.0% and 0.6%, respectively). Scans performed increased 7.7% year-on-year from 2015 to 2019, with a more pronounced increase in the number with AI lesions (14.7% per year). Only 394 of 4097 patients (9.6%) had a documented endocrinology referral code within 90 days, with medical (11.8%) more likely to refer than surgical (7.2%) specialties ($P < .001$). Despite prevalence increasing with age, older patients were less likely to be referred ($P < .001$). **Conclusion**: While overall AI prevalence appeared low, scan numbers are large and rising; the number with identified AI are increasing still further. The poor AI referral rates, even in centers such as ours where dedicated AI multidisciplinary team meetings and digital management systems are used, highlights the need for new streamlined, clinically effective systems and processes to appropriately manage the AI workload.]

Attention based automated radiology report generation using CNN and LSTM.
Sirshar M., Paracha M.F.K., Akram M.U., Alghamdi N.S., Zaidi S.Z.Y., and Fatima T.
PloS one, vol. 17(1)
January 2020
[The automated generation of radiology reports provides X-rays and has tremendous potential to enhance the clinical diagnosis of diseases in patients. A new research direction is gaining increasing attention that involves the use of hybrid approaches based on natural language processing and computer vision techniques to create auto medical report generation systems. The auto report generator, producing radiology reports, will significantly reduce the burden on doctors and assist them in writing manual reports. Because the sensitivity of chest X-ray (CXR) findings provided by existing techniques not adequately accurate, producing comprehensive explanations for medical photographs remains a difficult task. A novel approach to address this issue was proposed, based on the continuous integration of convolutional neural networks and long short-term memory for detecting diseases, followed by the attention mechanism for sequence generation based on these diseases. Experimental results obtained by using the Indiana University CXR and MIMIC-CXR datasets showed that the proposed model attained the current state-of-the-art efficiency as opposed to other solutions of the baseline. BLEU-1, BLEU-2, BLEU-3, and BLEU-4 were used as the evaluation metrics.]

British Society of Breast Radiology Annual Scientifc Meeting 2021.
Breast Cancer Research. Conference: Annual Scientifc Meeting of the British Society of Breast Radiology 2021. vol. 23(SUPPL 2)
November 2021
[The proceedings contain 33 papers. The topics discussed include: novel software tools for extracting additional clinical value from DBT reconstructions; new pulse biopsy device proved to be safe and effective in axillary lymph nodes with pulsed insertion facilitating enhanced needle control: initial results from the German multi center PULSE study; investigation of sternal lesions identified by breast MRI; audit on the efficacy and accuracy of the elastography usage in conjunction with b mode ultrasound for suspected breast lumps in the symptomatic one stop breast clinic setting; management of additional lesions detected on staging and problem solving breast MRI - DGH experience; single centre assessment of usefulness of shear wave elastography in assessment of symptomatic breast lesions; and analysis of enhancement intensity and patterns of benign and malignant lesions on contrast enhanced spectral mammography.]

Client perceptions of the BreastScreen Australia remote radiology assessment model.
Smith D., Johnston K., Carlisle K., Evans R., Preston R., Beckett J., Geddes D., Naess H., Poole M., and Larkins S.
BMC Women's Health. 21(1)
December 2021
[**Background**: Telehealth and teleradiology are increasingly used around the world to facilitate health care provision when the health care provider and clients are separated by distance. The BreastScreen Australia Remote Radiology Assessment Model (RRAM) is an initiative developed to address the challenges of inadequate access to a local radiological workforce in regional Australia. With the growth in telehealth innovations more broadly, the RRAM represents a departure from the traditional onsite model where a radiologist would be co-located with practice staff during assessment clinics. Understanding client satisfaction is an important consideration with new models. This article explores client perceptions of the RRAM including awareness, satisfaction with experiences, confidence in the quality of care being received, and preferences regarding models of service delivery. **Method(s)**: Clients in four BreastScreen services across three Australian states and territories were invited to provide feedback on their experiences of the RRAM. Brief face-to-face interviews based on a survey were conducted at the conclusion of assessment clinic visits. Clients also provided feedback through surveys completed and returned by post, and online. **Result(s)**: 144 clients completed the survey regarding their experiences of the RRAM. The majority were aged between 50 and 59 years (55/144, 38.2%). Most had attended a BreastScreen service for either screening or assessment on a total of two to five occasions (85/142, 59.9%) in the past. Nearly all women who attended a RRAM clinic expressed satisfaction with their experience (142/143, 99.3%). Clients were aware that the radiologist was working from another location (131/143, 91.6%) and the majority believed there wouldn't be any difference in the care they received between the RRAM and the onsite model (120/142, 84.5%). Clients generally had no particular preference for either the onsite or RRAM model of service delivery. **Conclusion(s)**: Clients' high satisfaction with their clinic experiences, high confidence in care being received, and the majority having no preference for either the onsite or remote model indicates their acceptance of the RRAM. Client acceptance of the model supports continuation of the RRAM at these sites and expansion. Findings may inform future telehealth innovations where key health care team members are working remotely.]

Liver Transplant Imaging prior to and during the COVID-19 Pandemic.
Bellini M.I., Fresilli D., Lauro A., Mennini G., Rossi M., Catalano C., D'Andrea V., and Cantisani V.
BioMed Research International
January 2022
[**Background**: The suspension of the surgical activity, the burden of the infection in immunosuppressed patients, and the comorbidities underlying end-stage organ disease have impacted transplant programs significantly, even life-saving procedures, such as liver transplantation. **Methods:** A review of the literature was conducted to explore the challenges faced by transplant programs and the adopted strategies to overcome them, with a focus on indications for imaging in liver transplant candidates. **Results**: Liver transplantation relies on an appropriate imaging method for its success. During the Coronavirus Disease 2019 (COVID-19) pandemic, chest CT showed an additional value to detect early signs of SARS-CoV-2 infection and other screening modalities are less accurate than radiology. **Conclusion**: There is an emerging recognition of the chest CT value to recommend its use and help COVID-19 detection in patients. This examination appears highly sensitive for liver transplant candidates and recipients, who otherwise would have not undergone it, particularly when asymptomatic.]

Magnetic resonance imaging (MRI) for diagnosis of acute appendicitis
D'Souza N., Hicks G., Beable R., Higginson A., and Rud B.
Cochrane Database of Systematic Reviews 2021, Issue 12. Art. No.: CD012028.
December 2021
[**Review question:** To check the accuracy of magnetic resonance imaging (MRI), a medical imaging tool used for taking detailed pictures of the inside of the body, to test for appendicitis. **Why is diagnosing appendicitis important?** Appendicitis is a very common condition that is usually treated with emergency surgery, but it can be difficult to diagnose. Up to one in four patients may be incorrectly diagnosed with appendicitis. Tools such as MRI can help diagnose appendicitis quickly and early. **What was studied in this review?** We studied the accuracy of MRI for appendicitis in all patients. **What are the main results of the review?** We analysed the results of 58 studies with 7462 participants to calculate the accuracy of MRI. The results of these studies indicate that in theory, if MRI were to be used in 1000 patients with suspected appendicitis, where 250 patients actually had appendicitis, then: • an estimated 250 patients will have an MRI result indicating appendicitis, 12 of whom will not actually have

appendicitis; and • of the 750 patients with a result indicating that appendicitis is not present, 30 will actually have appendicitis. MRI remained very accurate when looking specifically at adults, pregnant women, and children. **How reliable are the results of the studies in this review?** There were problems with how most of the studies were conducted that may have resulted in MRI appearing more accurate than it actually is. **To whom do the results of this review apply?** The results apply to people with suspected appendicitis, including adults, pregnant women, and children. Most studies were conducted in Europe and North America in large university hospitals. Patients had often undergone an ultrasound scan without a clear result. **What are the key messages of this review?** Based on the studies included in this review, MRI seems to be a very accurate test for appendicitis. The chance of wrongly diagnosing someone with appendicitis or missing appendicitis was less than 5%. However, as most of the included studies had problems, we cannot trust their results completely. Although MRI is promising, until better studies have been performed, we cannot firmly recommend the use of MRI for the diagnosis of appendicitis. **How up-to-date is this review?** We searched for and used studies published up to February 2021.]

Quantitative multiparametric MRI predicts response to neoadjuvant therapy in the community setting.
Virostko J., Sorace A.G., Slavkova K.P., Kazerouni A.S., Jarrett A.M., DiCarlo J.C., Woodard S., and Avery S.
Breast Cancer Research. vol.23(1)
December 2021
[**Background**: The purpose of this study was to determine whether advanced quantitative magnetic resonance imaging (MRI) can be deployed outside of large, research-oriented academic hospitals and into community care settings to predict eventual pathological complete response (pCR) to neoadjuvant therapy (NAT) in patients with locally advanced breast cancer. **Method(s)**: Patients with stage II/III breast cancer (N = 28) were enrolled in a multicenter study performed in community radiology settings. Dynamic contrast-enhanced (DCE) and diffusion-weighted (DW)-MRI data were acquired at four time points during the course of NAT. Estimates of the vascular perfusion and permeability, as assessed by the volume transfer rate (Ktrans) using the Patlak model, were generated from the DCE-MRI data while estimates of cell density, as assessed by the apparent diffusion coefficient (ADC), were calculated from DW-MRI data. Tumor volume was calculated using semi-automatic segmentation and combined with Ktrans and ADC to yield bulk tumor blood flow and cellularity, respectively. The percent change in quantitative parameters at each MRI scan was calculated and compared to pathological response at the time of surgery. The predictive accuracy of each MRI parameter at different time points was quantified using receiver operating characteristic curves. **Result(s)**: Tumor size and quantitative MRI parameters were similar at baseline between groups that achieved pCR (n = 8) and those that did not (n = 20). Patients achieving a pCR had a larger decline in volume and cellularity than those who did not achieve pCR after one cycle of NAT ($p < 0.05$). At the third and fourth MRI, changes in tumor volume, Ktrans, ADC, cellularity, and bulk tumor flow from baseline (pre-treatment) were all significantly greater ($p < 0.05$) in the cohort who achieved pCR compared to those patients with non-pCR. **Conclusion(s)**: Quantitative analysis of DCE-MRI and DW-MRI can be implemented in the community care setting to accurately predict the response of breast cancer to NAT. Dissemination of quantitative MRI into the community setting allows for the incorporation of these parameters into the standard of care and increases the number of clinical community sites able to participate in novel drug trials that require quantitative MRI.]

Interventional Radiology

Current Standards for and Clinical Impact of Emergency Radiology in Major Trauma.
Iacobellis F., Abu-Omar A., Crivelli P., Galluzzo M., Danzi R., Trinci M., Dell'Aversano Orabona G., Conti M. et al
International Journal of Environmental Research and Public Health, vol. 19 (1)
January 2022
[In industrialized countries, high energy trauma represents the leading cause of death and disability among people under 35 years of age. The two leading causes of mortality are neurological injuries and bleeding. Clinical evaluation is often unreliable in determining if, when and where injuries should be treated. Traditionally, surgery was the mainstay for assessment of injuries but advances in imaging techniques, particularly in computed tomography (CT), have contributed in progressively changing the classic clinical paradigm for major traumas, better defining the indications for surgery. Actually, the vast majority of traumas are now treated nonoperatively with a significant reduction in morbidity and mortality compared to the past. In this sense, another crucial point is the advent of interventional radiology (IR) in the treatment of vascular injuries after blunt trauma. IR enables the most effective nonoperative treatment of all vascular injuries. Indications for IR depend on the CT evidence of vascular injuries and,

therefore, a robust CT protocol and the radiologist's expertise are crucial. Emergency and IR radiologists form an integral part of the trauma team and are crucial for tailored management of traumatic injuries.]

The effectiveness of the Safety in Interventional Radiology (SIR) Shield in reducing droplet transmission and its effect on image quality and radiation dose.
Ong S.J., Anil G., Chia K.L., Khoo D., Lee J.K., Chen P.X., Nares T.M., Koh C.J., Su P., Yang C., Singh P. et al
The British Journal of Radiology, vol. 95 1129)
January 2022
[**Objective:** To evaluate the efficacy of a barrier shield in reducing droplet transmission and its effect on image quality and radiation dose in an interventional suite. **Methods:** A human cough droplet visualisation model in a supine position was developed to assess efficacy of barrier shield in reducing environmental contamination. Its effect on image quality (resolution and contrast) was evaluated via image quality test phantom. Changes in the radiation dose to patient post-shield utilisation was measured. **Results:** Use of the shield prevented escape of visible fluorescent cough droplets from the containment area. No subjective change in line-pair resolution was observed. No significant difference in contrast-to-noise ratio was measured. Radiation dosage to patient was increased; this is predominantly attributed to the increased air gap and not the physical properties of the shield. **Conclusion:** Use of the barrier shield provided an effective added layer of personal protection in the interventional radiology theatre for aerosol generating procedures. **Advances in Knowledge:** This is the first time a human supine cough droplet visualisation has been developed. While multiple types of barrier shields have been described, this is the first systematic practical evaluation of a barrier shield designed for use in the interventional radiology theatre.]

Vascular 3D Printing with a Novel Biological Tissue Mimicking Resin for Patient-Specific Procedure Simulations in Interventional Radiology: a Feasibility Study.
Kaufmann R., Zech C.J., Brantner P., Thieringer F., Deutschmann M., Hergan K., Scharinger B., Hecht S., and Rezar R.
Journal of Digital Imaging
January 2022
[Three-dimensional (3D) printing of vascular structures is of special interest for procedure simulations in Interventional Radiology, but remains due to the complexity of the vascular system and the lack of biological tissue mimicking 3D printing materials a technical challenge. In this study, the technical feasibility, accuracy, and usability of a recently introduced silicone-like resin were evaluated for endovascular procedure simulations and technically compared to a commonly used standard clear resin. Fifty-four vascular models based on twenty-seven consecutive embolization cases were fabricated from preinterventional CT scans and each model was checked for printing success and accuracy by CT-scanning and digital comparison to its original CT data. Median deltas (Δ) of luminal diameters were 0.35 mm for clear and 0.32 mm for flexible resin (216 measurements in total) with no significant differences ($p > 0.05$). Printing success was 85.2% for standard clear and 81.5% for the novel flexible resin. In conclusion, vascular 3D printing with silicone-like flexible resin was technically feasible and highly accurate. This is the first and largest consecutive case series of 3D-printed embolizations with a novel biological tissue mimicking material and is a promising next step in patient-specific procedure simulations in Interventional Radiology.]

Radiation Therapy

A uniform and versatile surface-guided radiotherapy procedure and workflow for high-quality breast deep-inspiration breath-hold treatment in a multi-center institution.
Li G., Lu W., O'Grady K., Yan I., Yorke E., Arriba LIC., Powell S., and Hong L.
Journal of Applied Clinical Medical Physics.
January 2022
[**Purpose**: We share our experiences on uniformly implementing an effective and efficient SGRT procedure with a new clinical workflow for treating breast patients in deep-inspiration breath-hold (DIBH) among 9 clinical centers using 26 optical surface imaging (OSI) systems. **Methods**: Our procedures have five major components: (1) acquiring both free-breathing (FB) and DIBH computed tomography (CT) at simulation to quantify the rise of the anterior surface, (2) defining uniformly a large region of interest (ROI) to accommodate large variations in patient anatomy and treatment techniques, (3) performing two-step setup in FB by first aligning the arm and chin to minimize breast deformation and reproduce local lymphnode positions and then aligning the ROI, (4) aligning the vertical shift precisely from FB to DIBH, and (5) capturing a new on-site reference image at DIBH to separate residual setup errors

from the DIBH motion monitoring uncertainties. Moreover, a new clinical workflow was developed for patient data preparation using 4 OSI offline workstations without interruption of SGRT treatment at 22 OSI online workstations. This procedure/workflow is suitable for all photon planning techniques, including 2-field, 3-field, 4-field, partial breast irradiation (PBI), and volumetric-modulated arc therapy (VMAT) with or without bolus. **Results**: Since 2019, we have developed and applied the uniform breast SGRT DIBH procedure with optimized clinical workflow and ensured treatment accuracy among the nine clinics within our institution. About 150 breast DIBH patients are treated daily and two major upgrades are achieved smoothly throughout our institution, owing to the uniform and versatile procedure, adequate staff training, and efficient workflow with effective clinical supports and backup strategies. **Conclusion**: The uniform and versatile breast SGRT DIBH procedure and workflow have been developed to ensure smooth and optimal clinical operations, simplify clinical staff training and clinical troubleshooting, and allow high-quality SGRT delivery in a busy multi-center institution.]

Concurrent capecitabine with external beam radiotherapy versus radiotherapy alone in painful bone metastasis of breast cancer origin.
Ahmed S., Kamal S.M, Salah T., Fawzy Sedik M., and Youssief A.A.
Journal of Bone Oncology, vol.31
December 2021
[**Background**: In breast cancer, painful bone metastases are common. Local radiotherapy is the standard treatment of painful bone metastases. Pain control and overall response rateswere low in radiotherapy alone. The objectives of this study were to compare the safety and efficacy of external beam radiotherapy with concurrent capecitabine vs. external beam radiotherapy alone in pain control of painful bone metastases in breast cancer patients. **Materials and methods**: Eighty-four patients with painful bone metastases from breast cancer participated in this prospective study. We randomized the patients into two groups: group A treated with radiotherapy 30 Gy in 10 fractions and group B treated with capecitabine 825 mg/m2 every 12 hrs. concurrently with the same radiotherapy dose. **Results**: There was no statistically significant difference between the two groups regarding early treatment toxicity. Most of the toxicity was gastrointestinal (diarrhea and nausea) and mild (grade I or II). The median pain score decreased from week one, and there was a marked response at week4. The difference in median pain score between both groups was statistically significant with p-value = 0.045. The median analgesic score in both groups was statistically significant with a p-value = 0.032 at week 12. A complete response to pain at week 4 was 19% and 42.9% in groups A and B, respectively. **Conclusion**: Concurrent chemoradiation in painful bone metastases from breast cancer origin was tolerable and safe; it had a higher overall response rate and pain palliation than radiotherapy alone.]

Dose Reduction and Low-Contrast Detectability Using Iterative CBCT Reconstruction Algorithm for Radiotherapy.
Washio H., Ohira S., Funama Y., Ueda Y., Morimoto M., Kanayama N., Isono M., Inui S., Nitta Y., Miyazaki M. et al
Technology in Cancer Research & Treatment, vol. 21
January 2022
[**Introduction**: Several studies have reported the relation between the imaging dose and secondary cancer risk and have emphasized the need to minimize the additional imaging dose as low as reasonably achievable. The iterative cone-beam computed tomography (iCBCT) algorithm can improve the image quality by utilizing scatter correction and statistical reconstruction. We investigate the use of a novel iCBCT reconstruction algorithm to reduce the patient dose while maintaining low-contrast detectability and registration accuracy. **Methods**: Catphan and anthropomorphic phantoms were analyzed. All CBCT images were acquired with varying dose levels and reconstructed with a Feldkamp-Davis-Kress algorithm-based CBCT (FDK-CBCT) and iCBCT. The low-contrast detectability was subjectively assessed using a 9-point scale by 4 reviewers and objectively assessed using structure similarity index (SSIM). The soft tissue-based registration error was analyzed for each dose level and reconstruction technique. **Results**: The results of subjective low-contrast detectability found that the iCBCT acquired at two-thirds of a dose was superior to the FDK-CBCT acquired at a full dose (6.4 vs 5.4). Relative to FDK-CBCT acquired at full dose, SSIM was higher for iCBCT acquired at one-sixth dose in head and head and neck region while equivalent with iCBCT acquired at two-thirds dose in pelvis region. The soft tissue-based registration was 2.2 and 0.6 mm for FDK-CBCT and iCBCT, respectively. **Conclusion**: Use of iCBCT reconstruction algorithm can generally reduce the patient dose by approximately two-thirds compared to conventional reconstruction methods while maintaining low-contrast detectability and accuracy of registration.]

Experiences and Perceptions of Older Adults with Lower-Risk Hormone Receptor-Positive Breast Cancer about Adjuvant Radiotherapy and Endocrine Therapy: A Patient Survey
Savard M-F., Alzahrani M.J., Saunders D., Chang L., Arnaout A., Ng T.L., Brackstone M., Vandermeer L., Hsu T. et al
Current Oncology, vol. 28(6) pp. 5215–5226
December 2021
[Older patients with lower-risk hormone receptor-positive (HR+) breast cancer are frequently offered both radiotherapy (RT) and endocrine therapy (ET) after breast-conserving surgery (BCS). A survey was performed to assess older patients' experiences and perceptions regarding RT and ET, and participation interest in de-escalation trials. Of the 130 patients approached, 102 eligible patients completed the survey (response rate 78%). The median age of respondents was 74 (interquartile range 71–76). Most participants (71%, 72/102) received both RT and ET. Patients felt the role of RT and ET, respectively, was to: reduce ipsilateral tumor recurrence (91%, 90/99 and 62%, 61/99) and improve survival (56%, 55/99 and 49%, 49/99). More patients had significant concerns regarding ET (66%, 65/99) than RT (39%, 37/95). When asked which treatment had the most negative effect on their quality of life, the results showed: ET (35%, 25/72), RT (14%, 10/72) or both (8%, 6/72). Participants would rather receive RT (57%, 41/72) than ET (43%, 31/72). Forty-four percent (44/100) of respondents were either, "not comfortable" or "not interested" in participating in potential de-escalation trials. Although most of the adjuvant therapy de-escalation trials evaluate the omission of RT, de-escalation studies of ET are warranted and patient centered.]

Head and neck cancer patient positioning using synthetic CT data in MRI-only radiation therapy.
Palmer E., Nordstrom F., Karlsson A., Petruson K., Ljungberg M., and Sohlin M.
Journal of Applied Clinical Medical Physics
January 2022
[**Purpose:** The accuracy and precision of patient positioning is crucial in radiotherapy; however, there are no publications available using synthetic computed tomography (sCT) that evaluate rotations in head and neck (H&N) patients positioning or the effect of translation and rotation combined. The aim of this work was to evaluate the differences between using sCT with the CT for 2D- and 3D-patient positioning in a magnetic resonance imaging (MRI)-only workflow. **Methods:** This study included 14 H&N cancer patients, with generated sCT data (MRI Planner v2.2) and the CT deformably registered to the MRI. Patient positioning was evaluated by comparing sCT against CT data: 3D cone beam CT (CBCT) was registered to the deformed CT (dCT) and sCT in six degrees of freedom (DoF) with a rigid auto-registration algorithm and bone threshold, and 2D deformed digital reconstructed radiographs (dDRR) and synthetic DRRs (sDRR) were manually registered to orthogonal projections in five DoF by six blinded observers. The difference in displacement in all DoF were calculated for dCT and sCT, as well as for dDRR and sDRR. The interobserver variation was evaluated by separate application of the paired dDRR and sDRR registration matrices to the original coordinates of the planning target volume (PTV) structures and calculation of the Euclidean distance between the corresponding points. The Dice similarity coefficient (DSC) was calculated between dDRR/sDRR-registered PTVs. **Results:** The mean difference in patient positioning using CBCT was <0.7 mm and <0.3degree and using orthogonal projections <0.4 mm and <0.2degree in all directions. The maximum Euclidean distance was 5.1 mm, the corresponding mean (1SD) Euclidean distance and mean DSC were 3.5 +/- 0.7 mm and 0.93, respectively. **Conclusions:** This study shows that the sCT-based patient positioning gives a comparable result with that based on CT images, allowing sCT to replace CT as reference for patient treatment positioning.]

Navigating Radiation Therapy During COVID-19 Using YouTube as a Source of Information.
Li Z.H.J., Kim I., Giuliani M., and Ingledew P.A.
Journal of Cancer Education
January 2022
[The COVID-19 pandemic brought considerable change to the practice of radiotherapy. In the meantime, patients are increasingly turning to online resources for health information, with YouTube being one of the biggest platforms. However, little is known about what information is being disseminated to cancer patients about radiotherapy in the context of COVID-19. Therefore, this study aims to characterize and assess YouTube videos on radiotherapy during COVID-19. A YouTube search using the terms "Radiation therapy COVID-19", "Radiation therapy coronavirus", "Radiotherapy COVID-19", and "Radiotherapy coronavirus" was completed using a clear-cache web browser. The top 50 videos were collected from each search. After applying pre-determined exclusion criteria, each video was assessed for general parameters, source, and content. Two raters were used to ensure interrater reliability. One hundred five unique videos resulted from the four searches. Ninety-eight per cent were published in the last year. The median video length was 6 min and 54 s, and the median number of views was 570. Most videos were from the

USA (58%). The majority of videos were published by a commercial channel (31%), non-profit organization (28%), or healthcare facility (26%). Forty-two per cent of the videos covered a topic related to radiotherapy during the pandemic. Bias was identified in 6% of videos. YouTube information on radiotherapy during COVID-19 is non-specific and can be misleading. The results of this study highlight the need for healthcare providers to proactively address patient information needs and guide them to appropriate sources of information.]

Nomogram for the personalisation of radiotherapy treatments in breast cancer patients.
Beato T.I., Ferrer A.C., and Morillo M.V.
Breast, vol. 60 pp. 255-262
December 2021
[I**ntroduction**: Numerous prospective studies have shown that the incorporation of genomic assays into clinical practice significantly impacts the choice of adjuvant treatments for patients with early-stage breast cancer. However, the same evidence does not exist for the treatment of locoregional recurrences. **Hypothesis and objectives**: The main objective of this work was to identify the clinicopathological, molecular, and genetic parameters that allow patients to be more precisely categorised into risk groups, in order to create a locoregional recurrence risk classification tool, the PersonalRT27. **Material and methods**: To create PersonalRT27, we retrospectively assessed the variables of patients with early breast cancer (stages I or II) who had undergone the OncotypeDx R and MammaPrint R genetic tests. These variables and factors included in the tests were categorised and weighted to obtain scores between 1 and 5 points to represent a lower or higher risk of relapse, respectively, based on these factors and as determined by the researchers. **Results**: The mean follow-up time was 60.5 months (range 25-96 months); locoregional progression-free survival at the time of the analysis was 98.4%, and overall survival was 97.5%, of which 0.6% of the deaths had been cancer specific. The area under the curve for the PersonalRT27 was 0.76 (95% CI [0.70, 0.81]), sensitivity was 78%, and the specificity was 58.9%. We used these factors to create an inhospital web-based nomogram. **Conclusions**: The PersonalRT27 is a novel tool that integrates clinical-pathological, molecular, and genetic parameters. External and independent validation will be required to implement its clinical use.]

Personalized Nutrition as a Key Contributor to Improving Radiation Response in Breast Cancer.
Shastri A.A., Lombardo J., Okere S.C., Higgins S., Smith B.C., DeAngelis T., Palagani A., Hines K., Monti D.A. et al
International Journal of Molecular Sciences vol. 23(1)
December 2021
[Understanding metabolic and immune regulation inherent to patient populations is key to improving the radiation response for our patients. To date, radiation therapy regimens are prescribed based on tumor type and stage. Patient populations who are noted to have a poor response to radiation such as those of African American descent, those who have obesity or metabolic syndrome, or senior adult oncology patients, should be considered for concurrent therapies with radiation that will improve response. Here, we explore these populations of breast cancer patients, who frequently display radiation resistance and increased mortality rates, and identify the molecular underpinnings that are, in part, responsible for the radiation response and that result in an immune-suppressive tumor microenvironment. The resulting immune phenotype is discussed to understand how antitumor immunity could be improved. Correcting nutrient deficiencies observed in these populations should be considered as a means to improve the therapeutic index of radiation therapy.]

Prediction of post-radiotherapy survival for bone metastases: a comparison of the 3-variable number of risk factors model with the new Katagiri scoring system.
Sakurai T., Takamatsu S., Shimoyachi N., Shibata S., Makino M., Ohashi S., Taima Y., Minamikawa R., Kumano T et al.
Journal of Radiation Research
December 2021
[We investigated patient survival after palliative radiotherapy for bone metastases while comparing the prognostic accuracies of the 3-variable number of risk factors (NRF) model and the new Katagiri scoring system (Katagiri score). Overall, 485 patients who received radiotherapy for bone metastases were grouped as per the NRF model (groups I, II and III) and Katagiri score (low-, intermediate- and high-risk). Survival was compared using the log-rank or log-rank trend test. Independent prognostic factors were identified using multivariate Cox regression analyses (MCRA). MCRA and receiver operating characteristic (ROC) curves were used to compare both models' accuracy. For the 376 evaluable patients, the overall survival (OS) rates decreased significantly in the higher-tier groups of both models ($P < 0.001$). All evaluated factors except 'previous chemotherapy status' differed significantly between groups. Both

models exhibited independent predictive power (P < 0.001). Per NRF model, hazard ratios (HRs) were 1.44 (P = 0.099) and 2.944 (P < 0.001), respectively, for groups II and III, relative to group I. Per Katagiri score, HRs for intermediate- and high-risk groups were 4.02 (P < 0.001) and 7.09 (P < 0.001), respectively, relative to the low-risk group. Areas under the curve (AUC) for predicting 6-, 18- and 24-month mortality were significantly higher when using the Katagiri score (P = 0.036, 0.039 and 0.022). Both models predict survival. Prognostic accuracy of the Katagiri score is superior, especially in patients with long-term survival potential; however, in patients with short prognosis, no difference occurred between both models; simplicity and patient burden should also be considered.]

Prediction of the effects of radiation therapy in esophageal cancer using diffusion and perfusion MRI.
Wang P., Wang X., Xu L., Yu J., and Teng F.
Cancer Science, vol. 112(12) pp. 5046-5054
December 2021.
[Chemoradiation therapy (CRT) of locally advanced esophageal cancer (LAEC), although improving outcomes of patients, still results in 50% of local failure. An early prediction could identify patients at high risk of poor response for individualized adaptive treatment. We aimed to investigate physiological changes in LAEC using diffusion and perfusion magnetic resonance imaging (MRI) for early prediction of treatment response. In the study, 115 LAEC patients treated with CRT were enrolled (67 in the discovery cohort and 48 in the validation cohort). MRI scans were performed before radiotherapy (pre-RT) and at week 3 during RT (mid-RT). Gross tumor volume (GTV) of primary tumor was delineated on T2-weighted images. Within the GTV, the hypercellularity volume (VHC) and high blood volume (VHBV) were defined based on the analysis of ADC and fractional plasma volume (Vp) histogram distributions within the tumors in the discovery cohort. The median GTVs were 28 cc +/- 2.2 cc at pre-RT and 16.7 cc +/- 1.5 cc at mid-RT. Respectively, VHC and VHBV decreased from 4.7 cc +/- 0.7 cc and 5.7 cc +/- 0.7 cc at pre-RT to 2.8 cc +/- 0.4 cc and 3.5 cc +/- 0.5 cc at mid-RT. Smaller VHC at mid-RT (area under the curve [AUC] = 0.67, P = .05; AUC = 0.66, P = .05) and further decrease in VHC at mid-RT (AUC = 0.7, P = .01; AUC = 0.69, P = .03) were associated with longer progression-free survival (PFS) in both discovery and validation cohort. No significant predictive effects were shown in GTV and VHBV at any time point. In conclusion, we demonstrated that VHC represents aggressive subvolumes in LAEC. Further analysis will be carried out to confirm the correlations between the changes in image-phenotype subvolumes and local failure to determine the radiation-resistant tumor subvolumes, which may be useful for dose escalation.]

Preparation, toxicity reduction and radiation therapy application of gold nanorods
Xie L., Zhang X., Chu C., Dong Y., Zhang T., Li X., Liu G., Cai W., and Han S.
Journal of Nanobiotechnology, vol. 19(1)
December 2021
[Gold nanorods (GNRs) have a broad application prospect in biomedical fields because of their unique properties and controllable surface modification. The element aurum (Au) with high atomic number (high-Z) render GNRs ideal radiosensitive materials for radiation therapy and computed tomography (CT) imaging. Besides, GNRs have the capability of efficiently converting light energy to heat in the near-infrared (NIR) region for photothermal therapy. Although there are more and more researches on GNRs for radiation therapy, how to improve their biocompatibility and how to efficiently utilize them for radiation therapy should be further studied. This review will focus on the research progress regarding the preparation and toxicity reduction of GNRs, as well as GNRs-mediated radiation therapy.]

Prone versus supine free-breathing for right-sided whole breast radiotherapy.
Fargier-Bochaton O., Wang X., Dipasquale G., Laouiti M., Kountouri M., Gorobets O., Nguyen N.P., Miralbell R. et al
Scientific Reports, vol. 12(1) pp. 525
January 2022
[Prone setup has been advocated to improve organ sparing in whole breast radiotherapy without impairing breast coverage. We evaluate the dosimetric advantage of prone setup for the right breast and look for predictors of the gain. Right breast cancer patients treated in 2010-2013 who had a dual supine and prone planning were retrospectively identified. A penalty score was computed from the mean absolute dose deviation to heart, lungs, breasts, and tumor bed for each patient's supine and prone plan. Dosimetric advantage of prone was assessed by the reduction of penalty score from supine to prone. The effect of patients' characteristics on the reduction of penalty was analyzed using robust linear regression. A total of 146 patients with right breast dual plans were identified. Prone compared to supine reduced the penalty score in 119 patients (81.5%). Lung doses were reduced

by 70.8%, from 4.8 Gy supine to 1.4 Gy prone. Among patient's characteristics, the only significant predictors were the breast volumes, but no cutoff could identify when prone would be less advantageous than supine. Prone was associated with a dosimetric advantage in most patients. It sets a benchmark of achievable lung dose reduction.]

Research on the cutoff tumor size of omitting radiotherapy for BCSS after breast conserving surgery in women aged 65 years or oder with low-risk invasive breast carcinoma: Results based on the SEER database.
Yang Z., Li K., Qiu P., Ma Y., Wang B., Yan Y., Meng D., Feng C., Ren Y., Li Y., Li P., and Zhou C.
Breast, vol. 60 pp.287-294
December 2021
[**Background**: Radiotherapy after breast-conserving surgery (BCS) is not always necessary in older women staged T1N0M0 with low-risk invasive breast cancer, but few studies have concluded the detailed tumor size as a reference for avoiding radiotherapy. The study was conducted to explore and identify the optimal cutoff tumor size. **Methods**: The study population was from the Surveillance, Epidemiology, and End Results (SEER) database in 2010-2016. Propensity score matching was used to balance the confounders between groups. Predictors associated with survival were analyzed by Kaplan-Meier, X-tile, Cox proportional hazards model and competing risk model. **Results**: A total of 52049 women and 3846 deaths were included in the cohort with a median follow-up of 34 months. Based on the cutoff value determined by X-tile analysis, the study population were divided into small tumor group (<=14 mm in diameter) and large tumor group (>14 mm in diameter). Small tumors and radiotherapy were correlated with better breast cancer-specific survival (BCSS). In subgroup analysis, the absolute benefit of BCSS in 6 years attributed to radiotherapy was only 0.90% (RT vs. non- RT:98.77% vs. 97.87%) for patients with small tumors but up to 3.33% (RT vs. non- RT:97.10% vs. 93.77%) for those with large tumors. **Conclusion**: Small tumors and adjuvant radiotherapy were associated with improved long-term prognosis, and 14 mm in diameter was the cutoff tumor size of omitting radiotherapy for patients aged 65 or older with T1N0M0 stage, ER+ and HER2-breast carcinoma after BCS.]

Risk factors for radiation pneumonitis after rotating gantry intensity-modulated radiation therapy for lung cancer.
Tatsuno S., Doi H., Okada W., Inoue E., Nakamatsu K., Tanooka M., Tanaka M., and Nishimura Y.
Scientific Reports. 12(1)
January 2022
[The risk factors for severe radiation pneumonitis (RP) in patients with lung cancer who undergo rotating gantry intensity-modulated radiation therapy (IMRT) using volumetric modulated arc therapy (VMAT) or helical tomotherapy (HT) are poorly understood. Fifty-two patients who received rotating gantry IMRT for locally advanced lung cancer were included in this retrospective study. In total, 31 and 21 patients received VMAT and HT, respectively. The median follow-up duration was 14 months (range, 5.2-33.6). Twenty (38%) and eight (15%) patients developed grade >= 2 and >= 3 RP, respectively. In multivariate analysis, lung V5 >= 40% was associated with grade >= 2 RP (P = 0.02), and past medical history of pneumonectomy and total lung volume <= 3260 cc were independently associated with grade >= 3 RP (P = 0.02 and P = 0.03, respectively). Rotating gantry IMRT was feasible and safe in patients with lung cancer undergoing definitive radiotherapy. Reducing lung V5 may decrease the risk of symptomatic RP, and care should be taken to avoid severe RP after radiotherapy in patients with a past medical history of pneumonectomy and small total lung volume.]

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