SASRO

Scientific Association of Swiss Radiation Oncology

28th ANNUAL **SASRO** MEETING 2024

THURSDAY 19 - SATURDAY 21, SEPTEMBER 2024

CAMPUS SURSEE, OBERKIRCH, LUCERNE

ABSTRACT BOOK

Table of Contents

MAIN TALKS

SHORT TALKS

POSTER PRESENTATIONS

** Young papers*

MAIN TALKS

M 01 Using the learning health system to drive improved cancer care: The Manchester experience and RAPID-RT study

Dr Gareth Price

Cancer Research UK Manchester Centre, Manchester, UK

There is increasing interest in the use of routinely collected healthcare data to provide evidence to support clinical decision making in patients who are often under-represented in conventional medical research. The learning healthcare system concept aims to develop such real-world evidence across three cyclic stages: i) innovative real-world data capture and sharing; ii) the analysis of real-world data archives to provide clinical insight; and iii) the prospective use of real-world data to evaluate the clinical impact of changes in practice.
This talk will explore the implementation and use of a learning healthcare system for cancer in Manchester, UK. The concept will be illustrated using the 'bench-to-bedside' exemplar of the discovery and evidence-based clinical translation of a new Organ At Risk, a subregion of the heart, in thoracic radiotherapy. We will discuss the use of novel image-based data mining techniques to identify the proposed region from retrospective data archives; the implementation of the new standard-of-care heart-sparing radiotherapy technique to avoid it, including a bespoke auto-segmentation tool for the region; and the design and implementation of a prospective 'rapid-learning' pragmatic study, using only real-world data, to provide evidence of the clinical impact of the new technique and permit its refinement over a series of learning cycles.

M 02 Innovations in Health Data Utilization: Innovative methods for data processing and clinical trials

PD Dr Jan Peeken

TUM, Munich, Germany

The rapid expansion of health data offers unprecedented opportunities for transforming healthcare, but it also presents significant challenges in effectively processing and utilizing this wealth of information. Innovations in health data utilization are reshaping how clinical data is collected, processed, and applied to improve patient outcomes and streamline clinical trials.
Advanced methodologies, including artificial intelligence, machine learning, and state-of-the-art data analytics, are unlocking new possibilities for extracting actionable insights from complex datasets. These approaches are enabling real-time decision-making, improving patient stratification, and optimizing trial designs. By integrating these technologies, clinical trials can be conducted more efficiently, with faster data analysis and more adaptive methodologies that respond to evolving patient needs and trial conditions.
Furthermore, Learning Health Systems are revolutionizing the healthcare landscape by continuously integrating new data to optimize treatment protocols and personalize patient care. This cycle of data collection, analysis, and feedback not only enhances clinical trial efficacy but also shortens the timeline from research to real-world application, ultimately improving patient care.
These innovations in health data processing hold the potential to revolutionize clinical trials, fostering a healthcare environment that is more responsive, precise, and data-driven.

M 03 Next Health – Emerging Opportunities with AI

Mrs Karin Frick

Gottlieb Duttwiler institute, Zurich, Switzerland

This talk explores the transformative potential of Artificial Intelligence (AI) in healthcare, highlighting emerging opportunities and challenges. AI's predictive analytics facilitate early identification of high-risk patients and optimize resource allocation. Personalized medicine is advancing through AI's integration with genomics, allowing for tailored treatments. Furthermore, AI-driven research is accelerating medical discoveries. The talk will also review recent research on AI's impact on decision-making in medicine, demonstrating how AI can enhance diagnostic accuracy and efficiency.

M 04 How does AI work?

Dr Marco Meinschad

SALK, Salzburg, Austria

Artificial Intelligence is playing an increasing role in everyday life. This is true for the private sector as well as healthcare. It can be a powerful tool in the processing of large amounts of data, finding (new) correlations in data, automatisation and language processing. Used well as a tool, it has the potential to make processes much more efficient. In the health sector image reconstruction, recognition, and image segmentation are currently the most prominent applications of AI. Furthermore, AI is used in diagnosis, decision support, treatment recommendations and administration to name a few. Those tools are already saving time, replacing manual labour and support staff in efficiently taking care of the patient's needs.
The presentation will answer the following questions: What is the general way an AI works, what is the basic architecture of a neural network and how is an AI trained? What are pitfalls in the training and application of AI-based tools, and how can we counter those pitfalls? What do the terms „weak" and „strong" AI mean?

M 05 CDE-based data structuring for IT and AI solutions in radiation therapy

***Fabio Dennstädt*[1], Maximilian Schmalfuss[2], Johannes Zink[3], Janna Hastings[4,5], Roberto Gaio[1], Paul Martin Putora[1,6], Nikola Cihoric[1]**

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Background
The increasing complexity and data-driven nature of oncology and radiation therapy necessitates structured and precise data management strategies. The National Institutes of Health (NIH) in the USA has introduced Common Data Elements (CDEs) as a uniform approach to facilitate consistent data collection. However, there is currently a lack of a comprehensive set of CDEs or defined structures for describing situations for and within radiation oncology. The aim of this study was to create a CDE-based data structure for radiotherapeutic decision-making for promotion of structured data collection and to apply IT and AI solutions in clinical practice. The study was done in the field of breast cancer and conducted by the International Society for Radiation Oncology Informatics (ISROI).

Method
Local Standard Operating Procedures (SOPs) were analyzed to identify relevant decision-making criteria used in clinical practice. Corresponding CDEs were identified and a structured data framework based on these CDEs was created. The framework was translated into machine-readable JSON format. Six clinical practice guidelines of the American Society for Radiation Oncology (ASTRO) were analyzed as full-text to investigate how many of the guideline recommendations and the corresponding decision-making criteria could be presented using the data structure.

Results
The study identified 31 decision-making criteria mentioned in the SOPs, leading to the establishment of 46 CDEs. A hierarchical structure within an object-oriented data framework was created and converted into JSON format to facilitate the application of IT systems. 94 recommendations with mentioning of decision-making criteria in 216 cases were identified across the six ASTRO guidelines. In 151 cases (70.0%) the mentioned criterion could be presented with the data framework.

Conclusion
The CDE-based data structure represents a clear framework for structuring medical data for radiotherapeutic decision-making. The approach not only facilitates detailed description of individual cancer cases but also aids in the integration of information technology in clinical settings and promotes the sharing of standardized data from the local level to international clinical practice guidelines.

M 06 Clinical applications of artificial intelligence in radiation therapy

PD Dr Jan Peeken

TUM, Munich, Germany

Artificial intelligence (AI) has become a prominent and widely discussed phenomenon, characterized by both significant potential and some degree of hype. In the medical field, AI offers the promise of enhancing various aspects of healthcare, particularly in radiation oncology, which relies heavily on data and medical imaging. This talk explores the potential applications of AI within the radiation oncology workflow, highlighting several key areas where AI is already making an impact and where future advancements are anticipated.

One critical application of AI in radiation oncology is the improved detection of tumors, especially in screening studies. AI's ability to analyze vast amounts of data and identify patterns not easily discernible by human eyes enhances the accuracy of tumor detection. Additionally, AI contributes to the characterization of tumor tissues, facilitating better risk stratification based on multi-omics data. This, in turn, allows for more personalized treatment plans tailored to the individual patient's needs.

In the radiation planning process, AI aids in organ segmentation, target volume definitions, and autoplanning, thereby increasing the precision and efficiency of treatment planning. Furthermore, AI enables and refines adaptive radiotherapy workflows, allowing for real-time adjustments to treatment plans based on patient-specific responses. The ability to predict therapy responses and monitor treatment outcomes through longitudinal imaging studies further underscores the transformative potential of AI in radiation oncology.

AI also supports treatment decision-making for both professionals and patients through enhanced knowledge support systems. By automating text-based processes, such as data extraction and text formulation, AI improves the daily workflow, reducing the administrative burden on healthcare providers.

In conclusion, AI has the capacity to enhance the capabilities of radiation oncologists and at the same time increase work efficiency.

M 07 What can we do to improve the outcome of unresectable lung cancer? Chemoradiotherapy optimization and recent practise-changing data

Prof. Andreas Rimner

Universitätsklinikum Freiburg, Germany

For patients with inoperable or unresectable non-small cell lung cancer (NSCLC) definitive concurrent chemoradiotherapy (cCRT) followed by consolidative durvalumab currently gives the best option of cure for patients. Two main strategies will further improve the outcome for these patients. Firstly, CRT optimization will increase the chance of locoregional control and therapy completion while reducing treatment-related toxicities. Various strategies are being explored including the use of modern radiation techniques, such as stereotactic body radiation therapy boosts, image-guided therapy, adaptive therapy and proton therapy. Dose constraints to organs at risk such as the lungs, esophagus and heart are continuously refined based on newer data. Secondly, advances in the role of systemic consolidation therapy have demonstrated progression-free and overall survival benefits. The increased personalization of consolidative therapy based on genomic and immunological markers continues to show marked improvements in the outcomes of patients with locally-advanced NSCLC.

Two such trials were presented at ASCO 2024 that demonstrated meaningful improvements in these patients.In patients with inoperable/unresectable stage III EGFR-mutated NSCLC following definitive cCRT The LAURA trial demonstrated a statistically significant and clinically meaningful improvement in PFS with the addition of consolidation therapy with osimertinib vs placebo (Median PFS was 39.1 months (95% CI 31.5-NC) vs 5.6 months (95% CI 3.7-7.4); HR 0.16 (95% CI 0.10, 0.24), p<0.001) (Lu et al. 2024).

In patients with limited-stage small cell lung cancer following definitive chemoradiotherapy the ADRIATIC trial demonstrated a statistically significant and clinically meaningful improvement in PFS and OS with the addition of durvalumab vs placebo (Median PFS 16.6 months (95% CI 10.2–28.2) vs 9.2 months (95% CI 7.4–12.9); HR 0.76 (95% CI 0.61–0.95), p=0.0161, Median OS 55.9 months (95% CI 37.3–NE) vs 33.4 months (95% CI 25.5–39.9); HR 0.73 (95% CI 0.57–0.93), p=0.0104) (Spigel et al., 2024)

Radiation oncologists play a critical role in knowing the most recent improvements in radiation techniques, systemic treatment options and surgical approaches. They must be present at multidisciplinary tumor boards to help support evidence-based treatment decisions.

M 08 Past, current and future role of radiotherapy in Hodgkin disease

Prof. Christian Baues

St. Elisabeth Gruppe, Rhein-Ruhr, Germany

Over the past decades, the treatment of Hodgkin's lymphoma has developed into a combined therapy of chemo-immunotherapy and radiotherapy.

In the early days of treatment, radiotherapy was the only option. Large radiation fields were irradiated with a relatively high dose. Over time, however, the positive effect of chemotherapy was demonstrated in prospective studies, so that radiotherapy was increasingly used as a consolidating component in the overall treatment. In the course of this development, a reduction of the radiation fields and the radiation dose could be achieved with an increase in effectiveness through the addition of chemotherapy. A major change in therapy stratification was brought about by the implementation of PET-CT. Especially in the advanced and intermediate stages, it has been shown that radiotherapy only needs to be used as consolidation in the case of PET-positive residual findings. However, this strategy could not be implemented reliably, especially in the early stages. For this reason, new concepts aim to identify and implement biomarkers in order to optimize therapy stratification.

However, radiotherapy appears to be playing a greater role again, particularly in combination with immunotherapies, so that a new change in the planning of radiation fields and doses could be imminent.
Currently, radiotherapy continues to be a crucial component in the treatment of patients with Hodgkin's lymphoma. The current further development and optimization of the therapy, as well as the reduction of side effects, are clearly in the foreground for the benefit of the patient.

M 09 German Hodgkin Study Group: evolution & organization

Prof. Christian Baues

St. Elisabeth Gruppe, Rhein-Ruhr, Germany

The German Hodgkin Study Group was founded in 1978 by Prof. Volker Diehl and has included over 22,000 patients in prospective randomized studies over the decades.

During this time, the GHSG has steadily grown and become more professional. At the same time, the requirements for clinical trials, national and international regulations, as well as the financial costs of conducting trials have become ever greater and more complex. As a result, the group grew and initially conducted German multi-center studies over the years. Later, further cooperation agreements were concluded in Europe and finally globally in order to be able to meet the high standards also with regard to the recruitment periods of clinical trials and sponsors. In an internationally competitive environment, the GHSG has succeeded over five decades in consistently asking relevant clinical questions to optimize the treatment of Hodgkin's lymphoma in a rare disease and answering them in prospective multicentre studies.

The challenges of the future lie in the continuation of independent scientific work at the highest national and international level, as well as the further development and optimization of the treatment of patients with Hodgkin's lymphoma.

M 10 Swiss sarcoma network: evolution and organization

Prof. Bruno Fuchs

Luzerner Kantonsspital, Lucerne, Switzerland

The Swiss Sarcoma Network (SSN) is pioneering the development of a Learning Health System (LHS) that systematically transforms prospective real-world-time data into actionable knowledge, ultimately enhancing patient value. Through the SARCONNECTOR project, SSN is establishing a web-based integrated digital platform that consolidates clinical outcomes, economic metrics, multi-omic profiles (genomics, proteomics, and metabolomics), and patient-reported outcomes (PROMs) across the entire patient care cycle. This initiative aims to elevate sarcoma care by integrating real-world-time data into a comprehensive digital infrastructure, setting new benchmarks in precision medicine and value-based healthcare (VBHC). The platform's core focus is on creating a robust system for data collection, analysis, and feedback, ensuring that insights derived from data directly contribute to improving patient outcomes and optimizing resource allocation. This presentation will delve into SSN's innovative approach, highlighting how the Learning Health System framework facilitates the continuous cycle of data transformation into knowledge and feedback into clinical practice, thereby driving improvements in sarcoma care and patient value.

M 11 A cyberattack response plan: How to ensure that patients continue to be treated (correctly)

Mr Samuel Peters

Department of Radiation Oncology, Kantonsspital St.Gallen, Switzerland

The threat of cyber attacks is increasing, posing significant challenges to healthcare services, including radiation therapy. In 2023, cyberattacks occurred every 39 seconds, causing costs over $8.4 trillion. In the US, over 725 major healthcare data breaches have been reported, each costing around $11 million. These attacks are driven by the accessibility of personal and financial data, making ransom demands lucrative for cybercriminals. Experts agree it's a matter of "when," not "if," one will be affected.
In the event of a cyberattack on a hospital, the radiation oncology department is most severely affected as the daily routine relies fully on the availability of digital data. This may be due to a complete encryption of servers, workstations and even treatment devices by malware. It may also be possible, that all servers and the entire network are shut down preventively by the central IT department to prevent further spread of the malware. In both cases, "normal" treatment of patients is no longer possible. To ensure that treatment can still continue during such an event which can last for several weeks, 6 things need to be considered:

1. Preparedness in the event of a cyberattack (having a business continuity plan (BCP), identify systems and affected personnel, hold backups, regular testing of BCP)
2. Preventive measures (user awareness, antivirus policy, system patching)
3. Detection and reaction (detection tools, data breach identification, system isolation)
4. Respond (activation of a BCP: communication, treatment and data handling in case of an event)
5. Recovery (activation of recovery plan, check recovered data, merge recovered and during event created data)
6. Debriefing (recap past events, adapt reaction and recovery plan)

Key questions for departments include: What measures are in place? How can patient safety be ensured?

Preparedness involves strategies, security measures, and incident response plans to mitigate cyber threats, including data backups and clear detection, response, and recovery plans. The response phase activates the business continuity plan, following set procedures to resume patient treatment quickly. This includes informing relevant parties, holding meetings, and potentially redirecting patients. Detailed documentation of actions taken is crucial during this phase.

M 12 Experience and Lessons from a Hospital Cyberattack

***Carla Cases*[1], Artur Latorre[1], Sergi Serrano[1], Jordi Tarrats[1], Francesc Leon[1], Carlos Clavell[1], Meritxell Mollà[1]**

[1] Department of Radiation Oncology, Hospital Clínic, Barcelona Spain

Aims
The objective of this study is to raise awareness about the critical impact of cyberattacks on radiotherapy facilities and to describe the mitigation strategies and dosimetric impact for patients treated during and after a cyberattack which took place at Hospital Clínic in Barcelona during March of 2023.

Methods
After a ransomware cyberattack in March 2023 a retrospective assessment was conducted to analyze the impact of several mitigation strategies, the successfully implemented strategies as well as the aspects that could have been improved. The study involved analyzing treatment plans and dosimetric data before, during, and after the incident and the impact on Biological Effective Dose of the interruption.

Results
The cyberattack led to a complete halt of radiotherapy services for three days, with a gradual recovery over 12 days. During this period, 81 patients were identified and managed, and 26 of those patients were derived to continue their treatment at another hospital (Sant Pau Hospital) through the activation of a contingency plan. During the days of the cyberattack emergency radiotherapy plans were prepared with limited access to relevant clinical data thus making it mandatory to evaluate the quality of the plans when all data was available. Dosimetric analysis revealed strategies that could have been implemented, considering the lack of clinical information, to ensure the best agreement between the original CTV and the emergency CTV. Effective contingency planning and rapid response were crucial in mitigating the impact. This incident highlights the minimum information needed to be ensured for a safe contingency plan to safeguard against future disruptions.

Discussion
The study underscores the vulnerability of radiotherapy services to cyberattacks, emphasizing the importance of robust contingency plans. The immediate response, including patient prioritization and inter-hospital collaborations, mitigated the impact but highlighted areas for improvement in data backup and system security as well as dosimetric strategies to ensure the best possible emergency plans for each anatomic region. The findings advocate for enhanced cybersecurity measures, regular backups, and inter-institutional cooperation to ensure treatment continuity during such crises.

M 13 Practical considerations when moving “from bench to bedside”

Dr. Serena Psoroulas

University of Zurich, Zurich, Switzerland

The recent interest in ultra-high dose rates and the so-called FLASH effect has brought many clinics to consider a relatively fast translation of preclinical results into clinical practice. However, translating biological results obtained in small animals (mostly mice, eventually with implanted tumors) to patients (larger field sizes, highly heterogeneous tumors) poses many questions which medical physicists, clinicians and radiobiologists together need to answer to make sure they can collect valuable data on biological phenomena still largely under investigation. I will report on some of these considerations, as they have been faced by teams in Switzerland when setting up explorative clinical trials in FLASH: among those, how to define your control arm when your endpoint strongly depends on this definition, the quest for harmonization when no dosimetric and traceable standard is available, and the experience of working with clinical machines at the limits of their capability. Even though I will focus on FLASH experiments, such considerations could be easily extended to other radiobiological effects where preclinical evidence is available and there is a strong interest for clinical translation.

M 14 The role of ctDNA in radiotherapy treatment monitoring

Prof. Michael Krauthammer

University of Zurich, Zurich, Switzerland

The talk will review our liquid biopsy research in radiotherapy, focusing on the assessment of patient circulating tumor DNA (ctDNA) using shallow Next Generation Sequencing (NGS). We discuss bioinformatics and AI approaches to derive epigenetic tumor signatures from the NGS data, and how these signatures may allow us to monitor treatment progress in a tumor-agnostic manner.

M 15 Towards personalized dose fractionation in radiotherapy

Prof. Kirsten Lauber

LMU Munich, Germany

Investigating fractionation-dependent recovery in preclinical models of breast cancer

Breast cancer remains one of the most prevalent cancers affecting women worldwide, and radiotherapy plays a crucial role in its clinical management. Dose fractionation is a central aspect of radiotherapy with substantial implications for treatment efficacy and safety. Whereas conventional fractionation schedules with daily doses of 1.8-2 Gy constituted the clinical standard over decades, the advent of improved treatment planning algorithms and high precision dose administration workflows enabled the implementation of hypofractionated regimens with fraction sizes of > 5 Gy, revealing noninferior efficacy and safety outcomes in clinical trials. So far, the selection of the fractionation regimen does not take into account the radiobiological characteristics of the respective tumor. This leaves the optimal, personalized fractionation regimen for patients potentially unrecognized. Therefore, our research aims at investigating the influence of dose fractionation in clinically relevant regimens on the clonogenic survival of various breast cancer subtypes in vitro and in orthotopic mouse xenotransplants. We made use of a panel of breast cancer cell lines and measured clonogenic survival upon irradiation in single fractions and in different fractionation regimens. Fractionation-dependent recovery was assessed in form of individual recovery scores as extracted via dimensionality reduction from dose equivalents of single-fraction irradiation. These scores were integrated with exome and transcriptome sequencing data and time course profiles of cell fate decisions. Significant differences in overall radiosensitivity and fractionation-dependent recovery were observed. Hierarchical clustering of the the dose equivalents revealed clusters of distinct fractionation-dependent recovery which were associated with the genetic status of DNA damage repair regulators, the transcriptomic breast cancer subtype, and the pattern of radiation-induced cell fate decisions. Representative cell lines of the recovery clusters were orthotopically transplanted into athymic mice and subjected to single-dose or fractionated radiotherapy, respectively. Evaluation of the therapeutic outcome according to RECIST1.1 criteria confirmed the in vitro observations. Our study reveals an unexpectedly high degree of heterogeneity in fractionation-dependent recovery in preclinical models of breast cancer and characterizes underlying molecular and cell biological determinants. These findings open the perspective of personalized fractionation schedules in the future and identify vulnerabilities for pharmacological modulation of fractionation-dependent recovery which deserve further investigation.

M 16 Lasertherapie und Hautpflege

Mr Fabien Schüepp

Raditec Medical AG, Bellikon, Switzerland

M 17 Automation in Photon Treatment Planning - The USZ Experience

MSc. Enkelejda Lamaj Dosimetrist

University Hospital of Zurich, Zurich, Switzerland

In recent years, automation has significantly transformed radiation oncology treatment planning. This advancement has made the process more automated, efficient, and standardized for many types of treatments. Automated systems can quickly generate treatment plans that adhere to predefined protocols, reducing the time required and minimizing human error. However, a substantial fraction of patients require more complex treatment planning, particularly those who have undergone previous radiation therapy. These cases often involve unique challenges that necessitate a more tailored approach and are not optimal for automation.
Scripting and optimization templates in the treatment planning software have been of a great help on plan preparation and creating optimization structures that a planner needs to prepare before optimizing a treatment plan. Additionally it can be efficiently used to prepare Eq2Gy plans or assess the complexity of a treatment plan. In the optimizer itself Rapid Plan models and Multicriteria Optimization (MCO) can be used to optimize a plan in a short time, by maintaining the high plan quality.
Automation in the photon treatment planning process, have led to higher efficiency and higher quality plans by saving a significant amount of time, minimizing the risk of errors and being a great help for beginners. Automation should be taken as a chance to free up time to focus on more complex cases and further development.
This presentation will explore the advantages and limitations of automated treatment planning. We will focus on identifying which aspects of the planning process can and should be automated, and where the expertise and skills of treatment planners are crucial. Understanding this balance will help guide future investments in both technology and professional development to ensure the best outcomes for all patients.

M 18 Optimizing the treatment planning process with scripting

Dr Tyler Williamson

Paul Scherrer Institut PSI, Villigen, Switzerland

Objective
This study aims to evaluate the effectiveness of automated planning scripts in reducing planning time for proton therapy treatment of head and neck cancer patients, focusing on the comparison between manual and automated planning methods.
Methods: A total of 304 head and neck cancer patients were included, with 152 patients treated using manual planning in Eclipse and 152 using automated planning in RayStation. Planning times were measured from the completion of physician contours to the plan being completed in working days.
The Auto Plan script automated several key processes:

1. Contouring: Automated creation of planning structures and helper contours.
2. Planning: Adding a plan with standardized beam parameters and optimization settings.
3. Optimization: Automatic adjustment of optimization objectives and refinement of the treatment plan based on the feasibility of organ-at-risk doses.

Results
The median planning time was reduced from 3.0 days (manual) to 2.3 days (automated), a reduction of 0.7 days (23.53%). Additionally, 57% of automated plans were approved without the physician requesting changes, compared to 43% for manual plans.

Conclusion
Automated planning scripts have demonstrated substantial improvements in both planning time and plan quality for proton therapy treatment of head and neck cancer. The transition from Eclipse to RayStation, facilitated by the Auto Plan script, enabled a more standardized and efficient planning process. Future directions involve updating the Auto Planning script to accommodate additional treatment sites and provide more flexibility for physician input.

M 19 EOC experience with a RapidPlan model applied on “Delineate” prostate cancer schema

Dr Matteo Coppotelli

EOC, Locarno, Switzerland

Background
The shift from traditional to knowledge-based radiotherapy marks a significant advancement in prostate cancer treatment. RapidPlan, a knowledge-based (KB) treatment planning tool by Varian, leverages historical patient data to optimize dose-volume constraints, enhancing precision and consistency in radiotherapy.

Aim
This study aims to define optimized organ-at-risk (OAR) planning goals using a knowledge-based planning model generated on synthetic CT within the DELINEATE regimen (60 Gy/20 fractions with SIB 67 Gy to DIL).

Methods
Historical treatment plans from 30 patients treated in an MRI-only planning workflow were used to train a RapidPlan model with a 6MV-FFF photon beam VMAT technique. The model was employed to automatically generate plans for 30 patients, and new planning goals were defined based on the 90th percentile calculation of dose-volume histogram (DVH) metrics.

Results
he implementation of RapidPlan led to significant improvements in dose distribution and OAR sparing:

- Rectum: Reduced dose across various metrics (e.g., V24.36Gy: from 80% to 26%, V40.36Gy: from 65% to 29%).
- Bladder: Significant dose reduction (e.g., V29Gy: from 24% to 4%, V40.36Gy: from 50% to 12%).
- PRV Urethra and Pudendal Arteries: Reduced dose variability and improved sparing. New planning goals were established.

Conclusions
The use of RapidPlan resulted in reduced variability in dose distributions and enhanced OAR sparing compared to traditional planning methods. The newly defined planning goals are four times lower compared to the DELINEATE dose limits, with additional goals established for the bladder and pudendal arteries.

M 20 Clinical Audits in Radiation Protection - The Swiss Experience

Thomas Götzfried

Luzerner Kantonsspital, Lucerne, Switzerland

The presentation provides a comprehensive overview of the clinical audit system in radiation protection implemented in Switzerland, emphasizing its critical role in ensuring safety and quality in medical practices involving high-dose ionizing radiation. The purpose, structure, and challenges of the system are thoroughly examined. Clinical audits are an essential part of maintaining high standards in various medical disciplines, including radiology, nuclear medicine, cardiology, and radiotherapy. These audits are required by the Swiss Radiation Protection Ordinance and are conducted every five years to ensure that facilities consistently follow best practices when using radiation. The audit process is robust and includes thorough assessments conducted by teams of trained auditors. Typically, these teams consist of a physician, a medical physicist, and a radiation therapist or nurse who work together to review practices in each facility. The audits are designed as peer reviews and focus on key principles of justifying, optimizing, and limiting radiation use in clinical settings. The overall goal is to provide actionable recommendations that help improve clinical practice and ensure the protection of patients and medical staff from unnecessary radiation exposure. Several significant challenges were encountered during the first audit cycle. Switzerland's linguistic and cultural diversity presented communication barriers, while some facilities resisted, viewing audits as inspections rather than opportunities for improvement. In addition, the limited availability of medical physicists presented logistical difficulties in assembling qualified audit teams. Despite these challenges, the audit process has proven invaluable, and the positive feedback underscores its role in improving the quality of care across the country. The presentation also highlights the dynamic nature of the audit system, stressing the importance of continuous evaluation, adaptation, and the need for close collaboration with professional associations. As the audit program evolves, its unwavering commitment to rigorous standards and quality improvement ensures that Switzerland remains at the forefront of radiation protection and patient safety in medical practice. This proactive approach not only protects public health but also sets a standard for other countries in their radiation protection efforts.

M 21 Superficial Hyperthermia

Dr Winfried Arnold

Luzerner Kantonsspital, Lucerne, Switzerland

In 2017, both superficial and deep hyperthermia treatments were only available at the Cantonal Hospital Aarau and the Lindenhof Hospital Bern. Seven years later, approximately 10 out of the 30 radio-oncology centers across Switzerland offer some form of hyperthermia therapy.
In this two-hour education session, two medical experts will present the fundamentals of hyperthermia, covering its mechanisms and various applications, with a special emphasis on clinical case presentations. Additionally, a representative from the radio-oncology nursing team will share insights into their role and perspective on hyperthermia treatment.

M 22 Tiefenhyperthermie

Dr Emmanuel Stutz

Inselspital, Bern, Switzerland

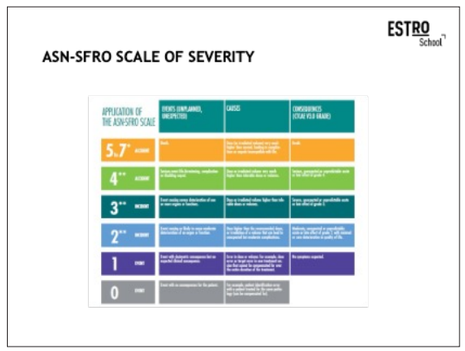
In 2017, both superficial and deep hyperthermia treatments were only available at the Cantonal Hospital Aarau and the Lindenhof Hospital Bern. Seven years later, approximately 10 out of the 30 radio-oncology centers across Switzerland offer some form of hyperthermia therapy.
In this two-hour education session, two medical experts will present the fundamentals of hyperthermia, covering its mechanisms and various applications, with a special emphasis on clinical case presentations. Additionally, a representative from the radio-oncology nursing team will share insights into their role and perspective on hyperthermia treatment.

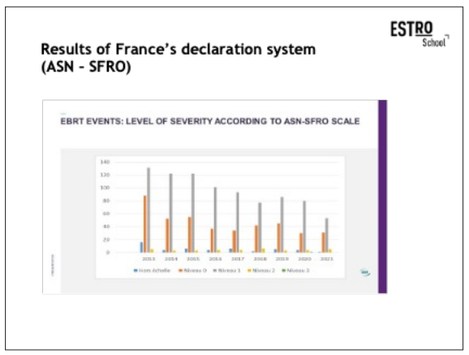
M 23 Sharing information on adverse events at national level: a 10 year experience in France

Dr Nicolas Pourel

Radiation Oncologist, Institut du Cancer – Avignon Provence (Sainte-Catherine), France

The *Société Française de Radiothérapie Oncologique* (SFRO) and the *Autorité de Sureté Nucléaire* (ASN) have set up a common declaration system of Significant Radioprotection Events (SRE) based on a joint scale of severity désigner in the aftermath of the Épinal accident (revealed in 2007). Declared SREs are centrally collected by ASN and rated with the assistance of SFRO experts. Locally, each and every RT centers in France operates a Committee on Return of Expérience (CREx), inpired by the aviation industry, dedicated to 'in-depth' analysis of SREs through various Incident Learning Systems (ex. of ILS in use: ORION®, Ishikawa's diagram, etc). Results collected from 2013 on through this nationwide declaration system, lessons learned and some insight on how to communicate on safety in RO at national level will be shown and discussed.





M 24 Leveraging Kaapana within RACOON for Federated Radiological Data Analysis

Dr Milulas Bankovic, Dr Benjamin Hamm

DKFZ, German Cancer Research, Heidelberg, Germany

Introduction

In the evolving field of radiology, the ability to analyse large volumes of imaging data across multiple centres is crucial for advancing research and improving patient outcomes. However, technical, organisational, and legal hurdles often impede effective data sharing and analysis. The Kaapana platform, in conjunction with the RACOON initiative, addresses these challenges by providing a robust infrastructure for federated data analysis and machine learning.

Problem Statement

Radiological research often requires vast datasets from multiple institutions to achieve statistically significant results. Traditional data sharing methods include data privacy concerns, incompatible systems, and inefficient workflows. These issues lead to delays in research progress and hinder the adoption of new analytical methods in clinical practice.

Solution Overview: Kaapana is an open-source platform designed to streamline the provisioning of data analysis tools and workflows, particularly in medical imaging. By leveraging container orchestration with Kubernetes, workflow management with Airflow, and data storage with dcm4chee, Kaapana provides a scalable and modular solution for radiological data analysis. The RACOON consortium represents a concrete use case of Kaapana's deployment. Within this consortium, Kaapana is deployed in each of the 38 German university clinics. This distributed IT infrastructure enables federated learning and standardised application of analytical methods to patient data while ensuring that the data remains within institutional boundaries.

Implementation and Impact: Kaapana has been successfully deployed in projects such as RACOON and the DART project, facilitating large-scale, multi-center studies. By standardising workflows and enhancing data accessibility, these tools support collaborative research efforts, ultimately contributing to better clinical research.

Conclusion

Kaapana and its use within the RACOON initiative represent a transformative approach to radiological data analysis, overcoming traditional barriers to multi-center research. By leveraging advanced technologies such as container orchestration and workflow management, Kaapana standardises and streamlines data analysis processes, making it easier for researchers to collaborate and share insights across multiple institutions. This presentation will explore how these innovations are reshaping radiological research and clinical practice, promoting more effective and comprehensive data analysis.

M 25 Leading a multicultural international team

Ms Sophie Perryck[1]

[1] Department of Radiation Oncology, University Hospital Zürich, Zürich, Switzerland

Recruiting and retention are a hot topic. On one side, the need for cancer treatments is growing exponentially due to a demographic change in the population. Than we have to factor in Switzerland's overcapacity of linacs. We provide more radiation therapy treatment than needed because we offer our services beyond this country's border. Opposite of this is the current low enrollment of future health professionals in health care training programs. Current health care professionals are thinking about leaving the department and health care all together. All this leads to recruiting beyond borders. My team of 25 RTTs represents about 13 nationalities and I am not mentioning those with a second nationality. From a manager perspective, this requires flexibility, cultural understanding and an openness into language (verbal and non-verbal) differentiations. Lost in translation just became real.

M 26 Is Fasting the latest adjuvant in Cancer Treatment

Byron Heavens

Luzerner Kantonsspital, Lucerne, Switzerland

Fasting during radiation therapy has emerged as a potential strategy to enhance treatment efficacy and reduce side effects of the treatment. Recent studies suggest that fasting may protect normal cells while sensitizing cancer cells to radiation, potentially improving therapeutic outcomes. The underlying mechanisms involve metabolic alterations, stress response pathways, and immune modulation. Fasting appears to induce a differential stress response, where healthy cells enter a protective state, whereas cancer cells, due to their high metabolic demand and altered signaling pathways, become more vulnerable to radiation damage. This presentation explores the current evidence on the benefits and challenges of fasting during radiation therapy, highlighting its potential role in optimizing cancer treatment and improving patient quality of life.

M 27 Clinical Implementation and Workflow of Gated / DIBH Patients using Optical Surface Monitoring

Alessandro Taccogna MRT(T) Bsc

Departement of Radiation Oncology, University Hospital Zürich, Zürich, Switzerland

Aims

to introduce and become more efficient with our Gating Patients Workflow. Specifically, with the use of Vision RT- AlignRT in combination with Regions of Interests (ROIs) and set Gating Tolerances. Thus, no longer relying on traditional techniques of having a physical apparatus (Varian Respiratory Gating System - RSGC) on patients, with the intention of reducing errors and inaccuracies pertaining to Gating cube placement.

Methods

assessing current Work Instructions / Practices and adapting them to integrate into our new Work Flow while getting feedback from the Clinical experiences at Planning-CT and on Treatment floor.

Conclusions

Workflow has been established and continuing to assess functionality and feasibility for the future. As it stands, the goal of implementing said practice has improved efficiency and streamlined the Gating Procedures concerning Free-Breathing, Inspiration and Expiration and exists a continuing goal for improvement and adaptation in the future.

M 28 Diversity and a Multicultural Environment in a Radioncology Department

Catia De Almeida

Luzerner Kantonsspital, Lucerne, Switzerland

In the rapidly evolving field of radioncology, diversity and a multicultural environment are essential for fostering innovation, enhancing patient care, and driving equitable outcomes. This presentation explores the benefits of embracing diversity within a radioncology department, including improved problem-solving, increased cultural competence, and enhanced patient satisfaction. It also addresses the challenges and barriers to creating a truly inclusive workplace, such as communication barriers and resistance to change. Strategies for cultivating a multicultural environment will be discussed, highlighting the importance of leadership commitment, continuous education, and inclusive hiring practices. As a practical example, this presentation will examine the initiatives and experiences of the Luzerner Kantonsspital radioncology department, demonstrating how diversity has positively impacted the team dynamics and patient care. By embracing diversity and fostering a multicultural environment, it can enhance the collaborative potential of the team and ensure that patient care is both comprehensive and culturally sensitive, ultimately leading to better health outcomes and a more inclusive healthcare experience for all.

M 29 INTERLACE results

Dr Mary McCormack

HCA Healthcare, London, UK

A phase III multicentre trial of weekly induction chemotherapy followed by standard chemoradiation versus standard chemoradiation alone in patients with locally advanced cervical cancer: the GCIG INTERLACE trial

Background
Locally advanced cervical cancer (LACC) is treated with chemoradiation (CRT), but many patients still relapse and die from metastatic disease. CRT with or without induction chemotherapy (IC) was investigated in the randomized phase 3 INTERLACE trial to determine if IC improves both progression free survival (PFS) and overall survival (OS).

Methods
Adults (age ≥18 years) at 32 medical centres in 5 countries with LACC (FIGO 2008 stage IB1 node positive, IB2, IIA/B, IIIB or IVA) were randomized (1:1), by minimization, using a central electronic system, to CRT or IC (6 weekly intravenous carboplatin AUC2 and paclitaxel 80mg/m2) followed by the same CRT. Stratification factors were recruiting site, stage, nodal status, 3D conformal radiotherapy or intensity modulated radiotherapy, age, tumour size and histology (squamous vs non squamous). Primary endpoints were PFS and OS within the Intention to treat population. (Clinicaltrials.gov number NCT01566240. EUDRACT number 2011-001300-35)

Findings
500 patients were recruited between 8th November 2012 and 17th November 2022 with 250 patients in each group. 70% were stage IIB and 11% IIIB. Pelvic lymph nodes were positive in 43%. Patient characteristics were well balanced. 92% of IC patients had ≥5 cycles. Median interval between IC and CRT was 7 days. Four or more cycles of cisplatin were given to 85% (IC/CRT) and 90% (CRT). Over 92% received external beam radiotherapy and brachytherapy with a median overall treatment time 45 days. After a median follow-up of 67 months, 5-year PFS rates 72% (IC/CRT) and 64% (CRT) with a HR of 0.65 (95%CI: 0.46-0.91, p=0.01). HR for OS was 0.60 (95%CI: 0.40-0.91, p=0.02) and 5-year OS rates were 80% (IC/CRT) and 72% (CRT). Grade ≥3 adverse events were reported in 59% (IC/CRT) vs. 48% (CRT).

Interpretation
Short-course induction chemotherapy followed within 7 days by chemoradiation significantly improves survival of patients with LACC. Implementation of this protocol relies on effective multidisciplinary team working and therefore may present challenges in some settings.

M 30 Critical Analysis of INTERLACE Study Results Through the Lens of EMBRACE Studies

Prof. Primoz Petric

University Hospital Zurich, Zurich, Switzerland

Recent advances in external beam radiotherapy and intracavitary/interstitial MRI-based image-guided adaptive brachytherapy (IGABT) for locally advanced cervical cancer have substantially improved clinical results while maintaining favorable side-effects profile (1). In contrast, chemotherapy approaches have changed minimally over the past decades, with concomitant cisplatin during radiotherapy remaining the standard approach. The INTERLACE study, presented at ESMO 2023 and published so far only as abstract, suggests that short-course neoadjuvant chemotherapy (NACT) before chemoradiotherapy improves progression-free and overall survival (2). The authors concluded that this regimen should be considered the new standard of care, and many institutions have followed this advice. However, there are major concerns regarding the INTERLACE trial and the strength of its conclusions.

Compared with EMBRACE studies, the INTERLACE trial included younger patients with better performance, lower stages, and no paraaortic metastases. Additionally, INTERLACE recruitment spanned over a decade during which radiotherapy evolved from outdated, suboptimal techniques. Both factors may have exaggerated the demonstrated benefits of NACT. Moreover, prior trials and meta-analyses with adjuvant and neoadjuvant combinations of chemotherapy with radiotherapy or surgery have consistently shown lack of benefit of these combinations (3). In real-world patients, the normal tissue reserves including bone marrow are limited. By expending these reserves on unnecessary NACT, we risk compromising the curative treatment for many patients who are unfit for clinical studies. NACT, by design, prolongs the overall treatment time, which is a well-established negative prognostic factor for local control. In addition, NACT-induced prolonged leukopenia and thrombocytopenia can compromise timely administration of IGABT, further extending the overall treatment time or leading to omission of interstitial IGABT. Finally, the INTERLACE study concludes that NACT is feasible in all countries. However, the study was not designed to test this question and included a disproportionately low number of patients from developing world. Implementing NACT in these regions could actually lead to negative public-health and economic consequences due to the already stretched healthcare resources (3).

In this lecture we will critically assess the INTERLACE results, which are currently limited to an abstract and a conference presentation (2). This will be compared with EMBRACE-I and II studies on advanced chemoradiotherapy including IGABT (1).

We will show that NACT before chemoradiation should not become new standard of care (3). It is not needed for the vast majority of patients, and may in fact cause harm. Its implementation could compromise the excellent outcomes of advanced chemoradiation and IGABT, widen the profile of side effects, increase their probability, inflate treatment costs and impede implementation of modern IGABT were it is most critically needed. Further research and a more detailed analysis of the INTERLACE data are required to identify specific patient subgroups who might benefit from NACT.

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M 31 Moderate Hypofractionation and Beyond

Prof. Ananya Choudhury

Cancer Research UK Manchester Centre, Manchester, UK

Moderate hypofractionation has been used to treat patients for decades. It is efficient, cost effective & reduces the burden on patients. With advances in technology, hypofractionation can be delivered safely and effectively. This talk will outline the trials underpinning the evidence for hypofractionation in common cancers.

M 32 Ultra/-hypofractionation in sarcoma

Prof. Gabriela Studer

Luzerner Kantonsspital, Lucerne, Switzerland

M 33 Necrosis following ultrahypofractionated neoadjuvant Radiotherapy in STS

Dr Beata Bode

University Hospital Zurich, Zurich, Switzerland

Soft tissue sarcomas (STS) are a heterogeneous group of rare malignancies that often require multimodal therapy for optimal outcome. The malignant potential and the histopathological entity of soft tissue masses is established according to currently valid WHO criteria on core biopsies (CB) of untreated tumors. Based on the specific pre-treatment pathological diagnosis and staging results, a personalized therapy plan is developed at a multidisciplinary sarcoma board

Pre-operative radiotherapy is one of the most important treatment options for STSs fulfilling the indication criteria. Resected tumors undergo extensive histopathological examination in order to (1) assess the presence of neoplastic tissue at the resection margins and to (2) evaluate the microscopic response of the neoplastic tissue to the neo-adjuvant pre-treatment. Radiotherapy-induced reactions include tumor necrosis, fibrosis, inflammation, and ischemic changes due to blood vessel obliteration, all of which may be difficult to differentiate from spontaneous changes within the tumor. Neo-adjuvant therapy extensively modifies the microscopic appearance of the tumor tissue, so that post-treatment adjustments of the histopathologic classification or grading cannot be done.

The predominant type of the therapy-induced changes depends on several factors, including (1) STS entity, (2) applied method, and (3) the time lapse between the preoperative treatment and the tumor resection. In ultrahypofractionated (uf) STS radiotherapy, the interval to resection is significantly shorter than in normofractionated (mf) radiotherapy, resulting in a different spectrum of microscopic tissue changes. The previously established criteria for tumor tissue regression under neo-djuvant radiotherapy cannot be directly applied to the uf pre-treated tumors. Historically, the regressive changes were most commonly studied in the context of the nf radiotherapy and the regression scale of microscopic changes resembling the well established scoring system for chemotherapy pre-treated bone sarcoma has been adapted to STS. The prognostic value of the extent of the STS regression under the neo-adjuvant treatment remains controversial.

The similarities and differences in the spectrum of the tissue reaction to the uf as compared to nf pre-treated STSs, as well as the potential implications for the prognosis will be discussed during the lecture.

M 34 Spatially fractionated stereotatic body radiation therapy (Lattice): a general overview

Mr. Claudio Antunes[1]

[1] Luzerner Kantonsspital, Lucerne, Switzerland

This is a general overview of Lattice radiation therapy, which is becoming more prominent and relevant in the field. It is meant as a first entry point to anyone interested, going over what it is, how it's volumes are created, it's mechanisms and results.

It succinctly explains what it is and why it's a promising technique, moving on to GTV creation and the reasoning behind it followed by involved radiobiological concepts as part of a heterogeneity-based mindset vs. the usual uniformity-based paradigm of radiotherapy. Some cases are showcased (all anonymized to the utmost) with a focus on before and after (circa 3 months) gross disease volume comparison.

It is concluded that radiotherapy is still a developing field and practitioners should be ready to adapt, embracing change where adequate. This technique is usable on most present commercially available equipment and while still not quite standardized, it is a valuable tool in overcoming the limitations of conventional fractioning.

M 35 A digital shared decision-making tool for treatment choices in oligometastatic disease

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Introduction
Patient preferences are of paramount importance for high-quality, patient-oriented care. In oligometastatic prostate cancer, systemic therapy added to local therapy (surgery or radiotherapy) can improve survival. However, a large proportion of patients opts for a local treatment only in order to avoid or delay the toxicity and quality-of-life implications of androgen deprivation therapy. To date, there is no established methodology on how to integrate patient preferences into the complex decision-making process of individualizing multimodality treatment. Our project aims to address this gap by developing a digital shared decision-making tool based on patient reported outcomes measures ("PROMS") for designing a personalized treatment strategy.

Methods
An existing, pilot-tested generic digital decision aid has been adapted to an omPCa patient population, integrating the information needed to make a well-considered decision on systemic therapy options. The tool is designed such that it can be used as a live digital interface during the consultation, allowing the specialist to add or adjust information pertinent to the individual patient. The result of the shared decision-making process will be documented digitally and thus be easily available for future reference during follow-up. An oligometastatic patient cohort (maximum of n=300) will be recruited over a period of 18 months and followed up over one year. This mixed methods study will also include a qualitative component exploring in more depth usability (from both patient and provider perspectives), acceptance and fit with clinical routine.

Results and discussion
The project is running from July 2023 to December 2026. We will present on shared decision-making, the usefulness of digitally collected PROMs as well as the conceptual approach, prototype and study protocol, thereby also touching on ethical questions.

Conclusions
The presentation of the prototype will not only prompt feedback on the tool itself, but invite discussions on the potential, pitfalls and limitations, and ethical implications of using digital tools for shared decision-making with oligometastatic patients.

M 36 The canine connection: How dogs will help to improve the quality of life in human patients with malignant brain tumours

***E. Schültke*[1], E. Engels [2,3], S. Long [4], M. Lerch [3], M. Cameron [2], J. Paino [3], J. P. Bustillo [3], V. T. de Rover [3], B. Frerker[1], M. Klein [2], D. Häusermann [2], G. Hildebrandt[1]**

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Aim
Planning a veterinary trial, where microbeam radiation therapy (MRT) is administered as one component of the treatment strategy with the aim to improve the quality of life of veterinary and human patients suffering from malignant brain tumours.

Method
MRT is a new irradiation concept profiting from both a high dose rate and spatial dose fractionation at the micrometre range. MRT was developed with the aim in mind to improve the quality of life and the prognosis of patients with malignant brain tumours. In numerous MRT studies conducted by different research groups internationally in rodent models of orthotopic induced brain tumours, the tumours were reduced in size significantly after one single MRT session, tumour growth was delayed significantly and, in some instances, tumours have been even completely ablated. At the same time, normal tissue function was well preserved. In a first veterinary pilot study treating canine patients with spontaneous malignant brain tumours, conducted at the biomedical beamline ID 17 of the European Synchrotron Radiation Facility (ESRF) in Grenoble, France, MRT administered in one single therapeutic session has achieved a significant decrease in tumour size, a decrease in seizure frequency and an overall improvement in the quality of life for more than half a year after irradiation.

Results
Based on previous in-vitro results and recent dosimetry studies conducted at the Imaging and Biomedical Beamline (IMBL) of the Australian Synchrotron in Melbourne, a trial protocol for the first MRT study treating canine patients with malignant brain tumours at the Australian Synchrotron has been developed.

Conclusions
Considering the similarities between canine and human patients with malignant brain tumours, regarding both histology and course of the disease as well as in key physical parameters for irradiation treatment planning, such as tumour size and depth from surface, the outcome of the canine MRT brain tumour trial should be indicative of the therapeutic potential and the limitations to be expected in future MRT studies serving human patients.

The authors have no conflict of interest to declare.

M 37 Partial tumor irradiation: Radiobiological rational, indications and treatment outcomes

Dr. Slavisa Tubin

Med Austron, Vienna, Austria

Unresectable, recurrent bulky tumors represent a large spectrum of highly complex clinical scenarios that are very challenging to treat. Conventional radiotherapy is ineffective in most of these cases leaving the patients desperate and hopeless. This is true because of the very large tumor volume and its very intimal relationship with nearby critical organs and tissues whose limiting dose-constraints unable an ablative radiation dose to be delivered, especially if were previously irradiated. Additionally, conventional radiotherapy applied to larger treating volumes is associated with lymphopenia who negatively affects survival. Usually, the only therapeutic option that can be offered to these patients is palliative or best supportive care. From that the need to improve treatment outcomes for this patient population arises.
Recently, a small group of scientists inspired by the immunomodulatory potential of ionizing radiation moved beyond the conventional giving to the radiotherapy a quite different, unconventional form that might overcome the obstacles that make conventional radiotherapy impotent, resulting in improved therapeutic ratio. This innovative, partial tumor irradiation, adopts different radiobiological mechanisms of action that are based on modulation of anti-tumor immune response. Often, a very dramatic bulky tumor regression, including even complete tumor response, can be observed. The principle behind this innovative approach is to improve the radiotherapy therapeutic ratio by adding to the radiation-mediated tumor cell killing, also an immune-mediated tumor cell killing component in order to boost the anti-tumor effect. The available literature suggests the safety and effectiveness of this unconventional approach characterized by the high neoadjuvant and immunogenic potential. This lecture will focus on rational, indications and therapeutic potential of novel partial tumor irradiation and its future perspectives.

MAIN TALK

M 38 **40 years of hyperthermia**

Dr Markus Notter

Lindenhospital, Bern, Switzerland

MAIN TALK

M 39 **MR-Only Treatment Preparation**

Dr Kira Wang

University Hospital Zurich, Zurich, Switzerland

SHORT TALKS

S-01

Acute and Short- to Intermediate-Term Treatment Tolerance of Adjuvant Ultra-Hypofractionated Whole Breast Radiotherapy Employing Moderately Hypofractionated Sequential Boost

***Dr. Olga Unterkirhere*[1], Mr. Tino Streller[1], Mr. David Jeller[1], Mr. Philippe Logaritsch[1], Dr. Susanne Bucher[1], Prof. Peter Dubsky[2], Prof. Christoph Glanzmann[1], Prof. Gabriela Studer[1]**

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Aim
This analysis evaluated the impact of boost dose on early and intermediate treatment tolerance in patients who underwent adjuvant ultra-hypofractionated whole breast radiotherapy (uhWBRT) with or without moderately hypofractionated sequential boost, following breast-conserving surgery.

Methods
uhWBRT was introduced in our department in March 2020 for patients with breast tumors that did not require lymphatic irradiation. We analyzed data from 436 patients who received 26 Gy/5 daily fractions with a sequential boost of 10.0-12.5 Gy/4-5 daily fractions (338 patients, 77.5%) or without any boost (98 patients, 22.5%). The cohort included 377 patients with invasive carcinomas (pT1-pT3), 59 with DCIS, with a mean age 62 years (range, 26–85). Acute reactions were accessed at the completion of radiotherapy and after 2-3 weeks. Late effects and patient-reported outcomes (PROMs) were evaluated 6 months post-radiotherapy and annually thereafter. Dose distribution parameters for targets and organs at risk were analyzed to determine the influence on early and late outcomes.

Results
Acute toxicity of grades 0/1/2 was observed in 29.6%/60.0%/10.4% at the completion of radiotherapy, and in 51.8%/41.0%/7.2% 2-3 weeks after RT. G2 late effects were identified in 5.5%/1.4%/1.9%/0%/0%, and G3 in 1.8%/2.1%/0.6%/0%/0% of patients at 6-months/1/2/3/4 years. PROMs on cosmesis were rated in 97.7% as good or excellent. No significant differences were observed in the frequency of G2 acute toxicity (RR=0.899, p=0.779), ≥G2 late effects (RR=0.971, p=0.456) and fair cosmetic outcomes (RR=1016, p=0.0.295) when comparing patients with and without a boost. In patients receiving a boost, the frequency of ≥G2 late effects was influenced by PTV boost D95%>34.35 Gy (RR=1.073, p=0.016) and of fair cosmetic outcomes by PTV breast Dmax>37.25 Gy (RR=1.051, p=0.018) and PTV boost D2%>37.05 Gy (RR=1.048, p=0.021). After a mean follow-up of 18 months (median 14, range 0–48), one local failure, two nodal failures, and nine distant relapses were diagnosed. Three non-tumor related deaths were observed.

Conclusion
Schedules applied are safe and well tolerated. Acute reactions, short- to intermediate-term late outcomes, and PROMs were comparable to those reported in the FAST-Forward trial and were not influenced by Moderately Hypofractionated Sequential Boost applied after Adjuvant uhWBRT.

S-02* Facing the Future and Unmasking the Best Fit: A Retrospective Comparative Evaluation of Open and Closed Facemasks for Stereotactic Radiotherapy/Radiosurgery Treatments

***Mr. Stephen Obena*[1], *Ms. Katia Messias Alves*[1]**

Kantonsspital Winterthur (KSW), Winterthur, Switzerland

Purpose
This study aimed to evaluate the accuracy and motion limitation of open facemasks compared to closed facemasks in Stereotactic Radiation Therapy (SRT) and Stereotactic radiosurgery (SRS) treatments. The primary objective was to determine if open facemasks could achieve comparable or better immobilization than closed facemasks. The secondary objective was to investigate whether open facemasks, with Surface-Guided radiation Therapy (SGRT) systems, could reduce the frequency of repositioning and repeat imaging.

Materials and Methods
This retrospective cohort study analyzed setup data from patients treated with SRT/SRS using either open or closed facemasks between March 2020 and February 2024. Data sources included patient treatment logs and imaging records. Key data points were setup accuracy and the frequency of repo- sitioning and repeat imaging events. Statistical analysis compared the translational and rotational setup error means of the two facemask types using the Mann-Whitney U-test to determine if the differences in means were statistically significant.

Results
A total of 180 patients met the inclusion criteria for the study, with 90 patients treated using closed facemasks and 90 patients treated using open facemasks with SGRT. A total of 1,024 cone-beam computed tomog- raphy (CBCT) scans were analyzed, and setup errors were recorded at 512 CBCTs per cohort group. The analysis revealed significant differences in mean displacement between the open and closed facemasks. The open face- mask (with SGRT) showed reduced displacements in the x and z directions ($p<0.01$), while the closed facemask exhibited smaller mean displacement in the y direction ($p<0.01$). Additionally, the open facemask (with SGRT) reduced displacements in all rotational directions ($p<0.01$). The number of repositioning and repeat imaging events with the open facemask with SGRT were less compared to closed facemasks.

Conclusion
The integration of open facemasks with SGRT systems in SRT and SRS is recommended as a stan- dard of care. The results demonstrate that open facemasks with SGRT technology provide superior immobi- lization accuracy, reduce the frequency of repositioning and repeat imaging sessions, and enhance treatment efficiency and patient comfort. These benefits highlight the transformative impact of SGRT in modern radiation therapy practice, offering clinicians a reliable tool to optimize treatment outcomes and patient care.

S-03 Feasibility of the low dose Radiotherapy (LDRT) as a treatment option for facet joint arthritis (FJA)

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Aims
Facet joint arthritis (FJA) is a recognized cause of lower back pain (LBP) and the correlation between radiological findings and clinical presentation is often modest[1]. Treatment includes analgesics, physiotherapy and interventional procedures including facet joint injections with local anesthetic or steroids, and radiofrequency ablation (RFA). Low-dose radiation therapy (LDRT) is an accepted treatment for osteoarthritis[2] and it is a potential treatment for FJA, but its efficacy and safety compared to steroid injections have not yet been investigated. Patients with symptomatic FJA unresponsive to conservative treatment were eligible for randomisation between LDRT and steroid injections in the Low-dose Radiation in Symptomatic Facet Joint Arthritis study.

Methods
Inclusion criteria included age ≥ 45 years, KPS ≥ 70%, immediate pain reduction of ≥ 50% after one analgesic infiltration of the affected facet joint(s) and recurrence of symptoms 4-12 weeks after the injection. Three par- ticipants underwent LDRT following DEGRO guidelines with 10 x 0.5 Gy using a 3D-radiotherapy technique. Pain levels (VAS score), physical examination and KPS were recorded before and 3 months after therapy. Safety outcomes included skin hyperpigmentation and dryness, dermatitis.

Results
All patients completed LDRT. The first patient, a 59 year old male with FJA at L4-S1 experienced pain reduction from 7/10 to 3/10 (VAS) after three months (>50%). No side effects were reported. Two other participants, a 81 year old female with FJA at L1-S1 and a pre-therapeutic pain level of 8, and a 81 year old male with a pre- therapeutic pain level of 6 are yet to be evaluated at 3 months.

Conclusion
This case report demonstrates a notable reduction in pain and no severe side effects, suggesting LDRT may be a viable treatment for FJA and a non-invasive alternative to steroid injection. Further studies are required to establish its efficacy and safety.

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S-04 Clinical implementation of an MR-Only workflow for the intra-cranial radiotherapy treatment

***Mrs. Lisa Milan*[1], Mr. Francesco Pupillo[1], Ms. Paula Sargenti[2], Mr. Stefano Moretto[2], Dr. Margherita Casiraghi[1], Ms. Maria Antonietta Piliero[3], Ms. Klaudia Krzekotowska[1], Ms. Margherita Corsi[1], Mr. Matteo Coppotelli[1], Dr. Davide Giovanni Bosetti, Dr. Gianfranco Pesce[2], Dr. Francesco Mosè Castronovo[2], Prof. Thomas Zilli[2], Dr. Stefano Presilla[1]**

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Aim
To describe clinical implementation of a commercial AI-based software for brain synthetic CT (sCT) re- construction, focusing on Hounsfield Units (HU) estimation, dosimetric accuracy, online matching, geometric distortion, and registration of couch and immobilization systems compared to CT.

Methods
A retrospective analysis was conducted on 74 patients (117 target volumes) who received normo- fractionated or stereotactic treatments. Both CT and MRI scans were performed on the same day using ther- moplastic head fixation. The accuracy of HU was evaluated using Mean Absolute Error (MAE) in HU values for brain, target volumes, and bones in a subset of 15 patients. Dose-volume histogram metrics including Dmean, D2%, and D98% were used to compare dose distributions for targets and organs at risk (OARs) across the en- tire cohort. Gamma passing rates were calculated using 1%/1mm and 3%/3mm. For a subset of 15 patients, the 6 degrees-of-freedom sCT-CBCT offline matches were performed and compared to online CT-CBCT matches. Sequences for B0 map evaluation were also acquired to calculate patient-specific geometric distortions, partic- ularly in cases involving metal dental implants. The impact of mask registration with markers on dose distri- bution was assessed.

Results
The average MAE was under 10 HU for brain and up to 40 HU in target areas involving bones, due to bone tissue HU value differences reaching up to 150 HU. The mean dose differences for targets stayed within ±0.6%. However, discrepancies up to 2.7% occurred in cases with dental implants, which cause artifacts in the sCT images. For OARs, mean dose deviations were within ±0.3%. Gamma passing rates resulted 97.8% and 100% for 1%/1mm and 3%/3mm, respectively. There were no significant differences in translational and rotational matches between CT-CBCT and sCT-CBCT registrations. Mask and couch registration using markers lead to a mean dose difference of -0.5%. Geometric distortions for targets and OARs remained below 1mm, as required for radiotherapy purpose.

Conclusion
sCT provides dosimetric accuracy comparable to standard CT for both targets and OARs, even when dental artifacts are present, although caution is required when artifacts are significant. The high gamma passing rates and minimal geometric distortions support the use of sCT in radiotherapy planning.

S-05* Simultaneous optimization of multiple non-coplanar plans within one treatment course for temporally feathered radiation therapy

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Introduction
In radiation therapy, the same plan is conventionally delivered in multiple fractions throughout the entire treat- ment. Temporally feathered radiation therapy (TFRT) is a new technique involving multiple iso-curative plans (sub-plans) within one treatment course, aiming for a high-to-low dose modulation (feathering) on selected organs-at-risk (OARs) to favor repair between fractions. Currently, the sub-plans must be manually and inde- pendently generated. We developed a simultaneous dosimetrically optimized pathfinding (DOP) and simultane- ous direct aperture optimization (DAO) of multiple sub-plans, using non-coplanar partial photon arcs, to exploit different beam directions in combination with TFRT.

Methods
DOP considered the entire collision-free 4-pi space of a C-arm linac. Apertures were iteratively added to the sub-plans. In each iteration, one aperture was selected for each sub-plan and only the addition leading to the lowest total objective function value was accepted. The total objective function combined objectives on each sub-plan's dose and on the total plan's dose. This allowed the inclusion of OAR feathering in the objectives of each sub-plan, while additionally controlling the total plan's dose. DOP resulted in a different non-coplanar arc setup for each sub-plan. A subsequent simultaneous DAO yielded deliverable sub-plans. Five TFRT sub-plans were generated for a head-and-neck case. The sub-plan objectives aimed at feathering five selected OARs (both parotid glands, pharynx, larynx, oral cavity) with homogeneous target coverage. One single plan using the same DOP, DAO and total dose objectives was created as reference plan.

Results
Feathering of the selected OARs was achieved with a mean dose difference between the high-dose sub-plan and the average of the low-dose sub-plans of 4.1% (1.8%-7.4%) of the prescription dose on average (range). In the total plan's dose, the mean dose to the feathered OARs was 0.6% (0.1%-1.3%) of the prescription dose lower on average (range) compared to the reference plan. The homogeneity indices (HI = D98%/D2%) were 0.92 for four sub-plans and 0.94 for one sub-plan, the total plan, and the reference plan.

Conclusion
Simultaneous DOP and simultaneous DAO were developed, generating multiple iso-curative sub-plans with OAR feathering for the considered case.
This work was supported by Varian, a Siemens Healthineers Company.

S-06* The CCR7-CCL19/CCL21 immune cell homing axis in response to irradiation

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Background
Immune checkpoint inhibitors (ICI) have revolutionized oncology by achieving durable responses in previously treatment-resistant cancers. The propensity of radiotherapy to act as an in situ tumor vaccine motivated the introduction of radiotherapy-ICI combinations to overcome treatment resistance. Yet, clinical outcomes have not met expectations. Common practice of concomitant lymph node irradiation is one of the major culprits, as lymph nodes are crucial for the cancer-immunity cycle and for the vaccination effect of radiotherapy. At the same time, lymph nodes are a common site of early metastatic spread, making sparing them infeasible for patients with nodal metastases.
Using murine tumor models, our group demonstrated delayed (adjuvant) lymph node irradiation as a highly promising approach to maximize radioimmunotherapy efficacy. Moreover, we identified disruption of the CCR7-CCL19/CCL21 immune cell homing axis upon tumor-draining lymph node irradiation.
Here, we aimed to conduct a more thorough investigation into the kinetics of CCL19/CCL21 secretion relative to lymphocyte depletion in response to irradiation.

Methods
In vivo irradiated lymph nodes of C57BL/6 mice were analyzed for multiplex cytokine assessment and flow cytometry-based immunophenotyping.

Results
Quantitative chemokine analysis on day 2 post-irradiation revealed a significant decrease of CCL19 in lymph nodes irradiated with 10, 15 and 20 Gy, but not 5 Gy, when compared to sham-irradiated lymph nodes. By day 9, CCL19 levels remained reduced exclusively in lymph nodes irradiated with 20 Gy. Concurrently, immunophe- notyping of irradiated lymph nodes on day 2 post-irradiation showed reduced numbers of CD8+, helper, and regulatory T cells, regardless of the dose applied. By day 9, significant T cell reduction was still observed in lymph nodes irradiated with 20 Gy, with a trend towards decreased T cell counts in those exposed to lower doses.

Conclusions
The homeostatic chemokines CCL19 and CCL21, which are constitutively produced by lymph node stromal cells, guide the migration of CCR7 receptor-expressing T cells into lymph nodes. Our findings suggest irradiation- induced functional changes in the stromal cell subsets crucial for the integrity of the CCR7-CCL19/CCL21 axis. A disrupted axis might subsequently result in the inability of the lymph node to overcome irradiation-induced lymphopenia and to resume its immunological function.

S-07 Update on Quality of Life and neurological disease control of the Swiss Study IOSI RT 001 on stereotactic irradiation in patients with 1-3 brain metastases from solid tumors: a multicenter Phase II single arm trial

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AIMS
To update on the mature results of the IOSI-RT001 single-arm, multi-center, phase-II prospective study on post- operative single/multiple fraction radiosurgery(SRS) for patients with 1-3 brain metastases(BM) after main lesion resection. We will report on quality of life(QOL), overall survival (OS), toxicity outcomes, and SRS- dosimetric analysis.

METHODS
Patients ≥ 18 years old with a maximum of 3BM of which one was surgically resected, with WHO-PS 0-1, sta- ble/decreasing corticosteroids, and stable systemic disease were included in the trial. Based on BM volume, a single fraction of 17-18 Gy or a fractionated SRS of 5 to 7 Gy in 5 fractions was delivered to the BM. Follow-up time was 52 weeks; visits were planned at 2 weeks after SRS and every 3 months thereafter, with brain-MRI at week 6 and subsequently every 3 months. The primary endpoint was local control. Secondary endpoints were toxicity(CTCAEv4.03), QOL(EORTC-QLQC30, EORTC-BN20), OS, neurological progression (i.e. local+distant brain progression, solid and lepto-meningeal(LMM)), and systemic progression.

RESULTS
From 03.2014 to 12.2022, 56 eligible patients(48 evaluable) were enrolled. The most common primaries were NSCLC(43%), melanoma(15%), breast(9%), and gastrointestinal(7%). Thirty-eight patients received fractionated SRS on the resection cavity, and single-fraction SRS was delivered to 10 patients. CTV/GTV volumes ranged be- tween 0.9 and 9.6cc for single fractions and 3.5 to 33.3cc for fractionated treatments. The healthy brain V12Gy or V24Gy ranges were [4.9,8.8]cc or [5.4,61.3]cc for single fractions or fractionated treatments, respectively. Acute toxicity was reported in 15 patients(31%), mostly grades 1 and 2. Among the reported serious adverse events, 3 were possibly related and 3 related to the treatment (3 seizures; 3 radio-necrosis). At 52 weeks of median follow-up, overall neurological progression was observed in 43%, while systemic progression was observed in 50% of the patients. The OS at 1 year was 79% in the 48 evaluable patients. LMM was observed in 7/48 (14.6%) evaluable patients. MMSE and QOL tests did not show significant deterioration in the observation period.

CONCLUSION
This update confirms that SRS of the surgical cavity of BM(+1-2 lesions), with single or multiple fractions, is an effective therapy, showing good tolerability without detrimental effects on QOL and neurological functioning.

S-08*

COMPORT: Compartmentalization in Postoperative Radiotherapy for head and neck squamous cell carcinoma – A Phase II Clinical Trial

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Aims

The rationale and retrospective results of our de-escalation strategy (COMPORT) in patients with head and neck squamous cell carcinoma (HNSCC) were presented in the SASRO 2023 and recently published (Riggen- bach et al. Front Oncol. 2024;25:14:1362025). However, prospective validation is needed. The primary aim of the COMPORT study is to assess the safety and efficacy of a compartmentalized approach to postoperative ra- diotherapy (PORT). Specifically, the study seeks to determine the rate of tumor and/or lymph node recurrence in omitted (non-irradiated) compartments, which would traditionally be included in standard PORT protocols. Secondary objectives include assessing loco-regional control (LRC), progression-free survival (PFS), overall sur- vival (OS), physician-rated toxicity burden, and quality of life (QoL).

Methods

COMPORT is a multicenter, Bayesian single-arm phase II trial designed to investigate the outcomes of de-escalated PORT in HNSCC patients who have undergone primary surgery. The study includes patients with ECOG performance status 0-2, aged 18 and above, with histopathologically confirmed, surgically treated HNSCC. Fifty patients will be recruited. Key inclusion criteria are standard indications for PORT, as determined by a mul- tidisciplinary head and neck tumor board. Exclusion criteria include the presence of distant metastases, prior radiation to overlapping target volumes, and significant co-existing disease. Patients will receive compartmen- talized PORT, with target volumes and doses defined by the study protocol, while omitting either the primary tumor-bed, parts or all of the lymphatic neck target volumes, depending on risk stratification. The primary out- come is the rate of recurrence in omitted compartments within 30 months post-accrual. Secondary outcomes include LRC, PFS, OS, physician-rated toxicity (using TAME methodology proposed by Trotti et al. [Lancet Oncol 2007] based on CTCAE v.5), and QoL (measured by EORTC C30 and HN43 questionnaires).

Conclusions

The COMPORT study aims to provide a comprehensive assessment of the safety and efficacy of compartmentalized PORT in HNSCC patients. By focusing on a de-escalation strategy, the study seeks to reduce treatment-related toxicity while maintaining effective oncological control. The findings from COMPORT could establish a new paradigm in the postoperative management of HNSCC, potentially leading to more personalized and less toxic treatment protocols, ultimately improving patient outcomes and quality of life.

S-09*

Radical Thoracic Re-Irradiation and Repeat Organ Irradiation for Non-Small Cell Lung Cancer: A Retrospective Single-Center Study

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Introduction and Aim

To study outcomes and characteristics of NSCLC patients treated with a second course of radical thoracic radiotherapy.
Methods: This retrospective study at University Hospital Zurich included NSCLC patients receiving a second course of thoracic radiotherapy with a dose of ≥40 Gy EQD2 from 01/01/2015 to 30/06/2023. Cases were classi- fied by ESTRO EORTC criteria: re-irradiation type 1 (overlap of 50% isodose line), re-irradiation type 2 (cumu- lative doses exceeding constraints for first course), and repeat organ irradiation (others). Kaplan-Meier curves estimated overall survival (OS) and progression-free survival (PFS). Toxicities were graded per CTCAE v5.0.

Results

Of 1212 patients screened, 150 (12.4%) were included, median age was 68.0 years (range 36-87), and 93 (62.0%) patients were men. Treatments were re-irradiation type 1 (n=72, 48.0%), re-irradiation type 2 (n=14, 9.3%), and repeat organ irradiation (n=64, 42.7%). Disease stages treated in the second course of thoracic ra- diotherapy were metastatic (n=63, 42.0%), locoregional recurrence (n=54, 36.0%), new primary (n=14, 9.3%), or combinations (n=19, 12.7%). Radiotherapy involved peripheral (n=88, 58.7%), ultracentral (n=45, 30.0%) and central (n=17, 11.3%) locations. Most patients (n=95, 63.3%) received systemic treatment before or during radio- therapy. Forty-three patients (28.7%) received further courses of thoracic radiotherapy, two up to four courses. Starting from the second course of radiotherapy, median OS was 26.3 months (CI 95%: 24.0-37.8) and median PFS was 5.3 months (CI 95%: 3.3-6.7). No significant differences between re-irradiation type 1, re-irradiation type 2 and repeat organ irradiation for OS (p=0.38) and PFS (p=0.9) were found.
Grade ≥3 toxicities occurred in 14 cases: 4 in re-irradiation type 1 (5.6%), 3 in re-irradiation type 2 (21.4%) and 7 in repeat organ irradiation (10.9%). Most common toxicities were dyspnea (n=8, 5.3%) and pneumonitis (n=4, 2.7%), followed by bronchopulmonary hemorrhage (n=2, 1.3%).

Conclusion

This is the first study using the ESTRO EORTC classification for repeat thoracic radiotherapy, assess- ing outcomes and toxicity in different groups. NSCLC patients treated with a second course of radical thoracic radiotherapy achieved favorable OS with mostly tolerable side effects.

S-10* Mixture of Hidden Markov Models for Predicting Lymphatic Progression Across Subsites in Head and Neck Cancer

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Aims
We previously developed an interpretable probabilistic model for predicting lymphatic spread in oropharyn- geal squamous cell carcinoma (SCC) [1]. It models every lymph node level (LNL) as hidden binary random vari- able (involved or healthy) and learns the spread probabilities from the tumor to and among the LNLs. Here, we extend this model to cover additional tumor locations including the oral cavity. We develop a model to predict the risk of occult involvement of LNLs, taking into account the detailed tumor subsite specified via ICD codes, in addition to T-category, and clinically observed nodal involvement.

Methods
Instead of naively building one model for each primary tumor location, we use a mixture of two such models. The mixture is trained with multi-institutional SCC involvement data [2] containing 1242 patients across five oral cavity and three oropharynx subsites using an expectation-maximization (EM) algorithm.

Results
The mixture model assigns one component to subsite C03 (gums) and one to C01 (base of tongue). All other subsites are described as combinations of these two models. E.g., C04 (floor of mouth) mixes 82% gums-model with18% base-of-tongue-model, encoding its anatomical position between the two subsites and its proximity to the gums. For comparison, we trained two independent models separately for oral cavity (C02-C06) and oropharynx (C01, C09, C10). Its predictions are comparable for the most common subsite (base of tongue, C09, 452 patients). However, the mixture better describes involvement in cases of rarer subsites anatomically lo- cated between oral cavity and oropharynx: For example, the data prevalence of LNL II involvement in patients with palate tumors (C05) was 48% (29/61). The independent model predicts 32% ±2%, while the mixture more accurately predicts 46% ±2%.

Conclusion
Mixture models are a natural choice for problems describing subpopulations; in our case tumor subsites. Ex- periments confirm this choice as suitable to predict lymphatic progression in head and neck SCC. In particular, it can refine predictions for nodal involvement in relatively rare tumor subsites by precisely tuning the compo- nent assignment.

References

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S-11* Fraction-variant intensity modulation for gynecological cancers

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Aims
Increasing the number of arcs in volumetric modulated arc therapy (VMAT) allows for better intensity modulation and thereby improves the dosimetric plan quality. However, this also leads to a longer delivery time, which may cause patient discomfort and increase the risk of intra-fractional motion. In this study, we investigate the use of different VMAT arcs in different fractions to improve dosimetric quality and delivery efficiency.

Methods
A direct aperture optimization algorithm has been developed, which allows for simultaneous opti- mization of different VMAT plans to be delivered in different fractions, based on their cumulative physical dose. Each VMAT plan (defined by different aperture shapes and MU weights) is constrained to deliver a uniform dose within the target volume, such that the entire treatment does not alter the fractionation scheme and is robust against inter-fractional setup errors. This approach has been retrospectively evaluated for two patients with cervical cancer (28x1.8Gy) and vulvar cancer (24x2.2Gy), respectively, and benchmarked against treatments that deliver the same VMAT plan in every fraction.

Results
For the cervical cancer patient, a treatment that delivers 7 different 2-arc VMAT plans in 4 fractions each reduces the mean bladder dose from 11.3 Gy to 7.5 Gy and the mean bowel dose from 14.1 Gy to 12.3 Gy compared to a treatment that delivers the same 2-arc VMAT plan in every fraction, for a similar delivery time of 120s per fraction. A treatment that delivers the same 3-arc VMAT plan in every fraction, instead, achieves a mean bladder dose of 9.3 Gy and mean bowel dose of 12.4 Gy, but at the cost of a longer delivery time (180s per fraction). Similar results have been obtained for the vulvar cancer patient, for whom a treatment delivering 6 different 2-arc VMAT plans in 4 fractions each outperforms a treatment delivering the same 3-arc VMAT plan in every fraction (mean bladder dose: 14.1 Gy vs 16.8 Gy, mean bowel dose: 16.8 Gy vs 16.1 Gy), while reducing the delivery time (120s vs 180s).

Conclusion
Fraction-variant intensity modulation has the potential to achieve an excellent dosimetric quality while keeping the delivery time viable.

S-12* Performance evaluation of Radixact MLC using real-time optical sensor feedback system

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Aims
To quantify the extent of clinically encountered MLC LOT errors on the current Radixact MLC system.
Methods: Five hundred and eight patient plans were delivered during pre-treatment plan-specific QA measure- ment (PSQA) and their MLC optical sensor data were recorded by the Delivery AnalysisTM (DA) workstation. DA software (vers. 2.3.0.2) reconstructed the treatment leaf open times (LOT) using the optical sensor data ac- quired during PSQA to produce the delivered sinogram (SRECON,DA) for each patient treatment. The SRECON,DA and the planned treatment sinogram (SPLAN) for all patient deliveries were exported from DA for MLC LOT error evaluation. MATLAB software (vers. R2022b) was used for analysis of the SRECON,DA and SPLAN to measure the mean MLC LOT latency errors for each delivery and to estimate the resulting difference in mean target dose using Equation (2) provided in the AAPM Task Group Report 306.

Results
A systematic shift in the mean LOT error was observed that measured 1.9 msec (SD = 0.4 msec) for the cohort of 508 patient plan deliveries. As a percentage of the individual patient plan projection the mean LOT error measured 0.6% (SD = 0.2%). The resulting estimated mean target dose difference due to the MLC LOT latency errors was 0.9% (SD = 0.4%).

Conclusions
The systematic shift in mean LOT error was determined to be due to MLC calibration parameters within the machine archive not being accounted for by DA. These default MLC offset event values are applied to all treatments, including during plan-class specific reference machine calibration, and therefore the system- atic shift in mean LOT error (1.9 msec) and its resulting average dose difference (0.9%) are not indicative of an actual dose offset from the machine calibration. However, this should be interpreted as an optical sensor mis- calibration between the DA software and the TPS. The measurement standard deviations should be considered accurate representations of the treatment LOT error uncertainty (0.2%) and of the resulting mean target dose uncertainty due to these MLC LOT latency errors (0.4%).

S-13* Electron radiotherapy in magnetic fields: Characterization of enhanced beam confinement and other potentials

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Aims
Clinical electron beams have a finite range in tissue but generate more laterally spread dose distributions than photon beams. Previous theoretical studies suggested that combining electron radiotherapy with magnetic fields could reduce this lateral spread, decreasing dose to healthy tissue. This study investigates electron beam characteristics within longitudinal (LMF) and transverse magnetic fields (TMF) relative to the beam direction and their potential impact on treatment plan quality.

Methods
Dose calculations for broad, monoenergetic electron beams in a water phantom were conducted using Electron Macro Monte Carlo (EMC) simulations. LMF and TMF were employed to confine electron beams using two different concepts. In LMF, the Lorentz force causes scattered electrons to spiral around the central axis, increasing beam confinement, while TMF bend the entire beam perpendicular to its propagation direction. In TMF setting, a confined beam can be achieved by combining two beams with an offset and magnetic fields of opposite polarity. Two-dimensional dose distributions, depth dose curves, and lateral profiles of 8-20 MeV beams in homogenous 0 to 3 T fields were analyzed. Different combinations of energies, magnetic fields, and beam offset distances were used to optimize dose distributions in clinically motivated situations.

Results
Compared to conventional beams, the lateral dose fall-off of a 16 MeV beam at a depth of 6 cm decreases from 2.2 cm to 1.6 cm with a 1.5 T LMF, and further to 0.8 cm with a 3 T field. Similar trends are observed for other energies. Applying a 3 T LMF resulted in 10% more dose remaining confined to the initial beam size (5x5 cm^2). Using TMF, unconventional dose distributions can be created. By choosing a suitable offset distance between beams, the surface dose at central axis decreased while increasing the dose at a defined depth. In the considered phantoms, LMF and TMF decreased the healthy tissue's mean dose by 10% and the mean dose to a proximal OAR by 27% while improving target conformity.
Conclusions: Magnetic fields can enhance the confinement of electron beams, helping spare healthy tissue. The potential of TMF was shown by the ability to irradiate around proximal OARs.

S-14* Tissue Sparing Effects of Microbeam Radiation Therapy on Murine Liver

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Aims
Radiation-induced liver disease is a major complication of radiotherapy and an obstacle to its use as a standard treatment for liver cancer, particularly hepatocellular carcinoma, known for its treatment resistance and high metastatic rate. Our group at the University of Bern is investigating microbeam radiotherapy (MRT), an advanced spatially fractionated radiotherapy technique. MRT has demonstrated improved normal tissue tolerance in preclinical studies involving skin, bone, lung, and brain tissues. For the first time, this study aims to understand the underlying cellular processes in normal mouse liver tissue following MRT.

Methods
The livers of C57BL/6 mice were subjected to partial MRT irradiation at the European Synchrotron Radiation Facility and the Australian Synchrotron. The irradiation parameters were 400 Gy peak dose, 6.2 Gy valley dose, 50 µm beam width, 200 µm spacing and dose rate of about 12,000 Gy/s. Immunohistochemical analyses were performed on liver tissue samples collected at various time-points up to 6 months post-MRT to assess cellular processes including cell death, proliferation, and fibrosis.

Results
Using several markers for cell death and glycogen staining, we tracked irradiated hepatocytes satu- rated with yH2AX along the microbeam paths within 72 hours post-MRT. Proliferation was observed predomi- nantly in the microbeam paths within 48 hours post-MRT, with some activity also noted in the adjacent valley regions (Fig.1). Additionally, 48 hours post-MRT, we detected Vimentin expression along the beam path areas, indicating colocalizing hepatic stellate cells, together with activated macrophages which had been previously observed infiltrating the microbeam regions (Trappetti, Fazzari et al., 2022). These initial cellular responses sug- gest the initiation of a rapid tissue repair process. Remarkably, at 6 months post-MRT, hepatocyte functionality appeared fully recovered, with no signs of fibrosis.

Conclusions
Our results suggest that MRT induces efficient liver repair processes, preventing late fibrosis. MRT has the potential to treat liver malignancies while preserving liver tissue integrity after irradiation.

S-15* / P 59* Evolution of Skills and Responsibilities of Radiation Therapists in Adaptive Radiation Therapy

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Aims
Since the implementation of adaptive treatment in September 2023, the responsibilities and skills of radiation therapists have evolved. This study aims to evaluate these changes after seven months of treating twenty-four pelvic patients, focusing on improvements in interprofessional cooperation and overall treatment efficiency. Methods:
Radiation therapists (RTT) underwent extensive training before managing their first patient. This included internal sessions with medical physicists, doctors, and dosimetrists, as well as external sessions with application engineers. Practical workshops, such as contouring training on clinical cases and treatments on phantoms, were conducted to understand the adaptive workflow and acquire the necessary skills.

Results
The presence of doctors and physicists was reduced due to the increased expertise of technicians. This workflow redefinition allowed for the treatment of six adaptive cases per half day and resulted in a 10-15% reduction in the time required for contouring organs at risk (OAR) and preparing the adaptive plan.
It was observed that adaptive case management is highly patient-dependent, necessitating the evaluation of the balance between the precision of OAR contours and the speed of execution to minimize intrafraction anatomical changes. Our findings indicate that RTTs, due to their knowledge and daily patient monitoring, are best qualified for this task, acting as a crucial link between the patient and various professionals.

Conclusion
Adaptive treatment has redistributed some medical and physical responsibilities to technicians, equipping them with new skills and roles. This shift has enhanced patient care understanding and bolstered professional ap- preciation among technicians. As technology advances, technician expertise is expected to further evolve with improvement in adaptive treatment processes.

S-16*

Open-face vs. closed masks: a randomized trial assessing patient comfort in fractionated cranial radiotherapy

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This trial investigated patient comfort and preference for open-faced masks compared to closed masks in pa- tients undergoing partial or whole brain irradiation for fractionated cranial radiotherapy.

Methods
This single-centre randomized self-controlled clinical trial involved patients receiving two immobilization masks with identical treatment plans, each used for 50% of the prescribed treatment. The order of mask us- age was determined by randomization. The primary endpoint was patient comfort, measured as the absence of discomfort, anxiety, and pain using a Visual Analogue Scale (VAS) after the first fraction and weekly thereafter. Patients reported the anatomical location of any pain on a diagram. After the final fraction, patients indicated their mask preference.
The secondary endpoint assessed inter-and intra-fraction stability. Daily kV-imaging was used to evaluate inter- fraction set-up uncertainties. An SGRT system was employed with open-face masks for intra-fraction motion reporting and patient positioning. Intra-fraction mask stability was assessed using SGRT real-time deltas and weekly kV-imaging post-treatment.

Results
30 patients with primary or secondary brain tumors participated, with 29 completing treatment to a median radiation dose of 54 Gy. Discomfort VAS scores were significantly lower for open-face masks (mean VAS score 0.5, SD 1.0) compared to closed masks (mean VAS score 3.3, SD 2.9), P<0.0001. The median discomfort VAS score was 0 (range 0-5) for open-face masks and 3 (range 0-10) for closed masks. Anxiety (mean VAS 0.2, SD 0.6 vs. 1.2, SD 1.8) and pain (mean VAS 0.2, SD 0.6 vs. 1.7, SD 2.5) scores were also significantly lower for open-face masks, P<0.0001. Closed masks caused increased discomfort in infraorbital (P<0.001) and maxillary (P=0.02) areas. Only two patients preferred the closed mask.
Mean longitudinal, roll, and yaw shifts were larger for open-face masks: 2.2±5.8 mm, 0.8±0.60, and 0.8±0.70, re- spectively, versus 1.7±1.7 mm, 0.7±0.60, and 0.8±0.60 for closed masks. Inter-fraction and intra-fraction system- atic errors were small for both masks, except longitudinal shifts for open-face masks. No significant difference in intra-fraction variability was observed.

Conclusions
The trial demonstrated significantly reduced discomfort, anxiety, and pain with open-face masks. No significant difference in stability was noted. Open-face masks could be preferred for immobilization in cranial radiother- apy.

S-17

Systematic review and meta-analysis of treatment approaches for non-metastatic small cell bladder cancer

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Introduction
Small cell bladder cancer (SBCB) is an aggressive subtype of bladder cancer and represents one of the most common extrapulmonary small cell carcinoma. For patients diagnosed with non-metastatic SCBC, treatment options include surgery, chemotherapy and radiotherapy. However, the optimal treatment approach remains unknown.

Methods
A comprehensive search was conducted in four electronic databases (PubMed, Scopus, Web of Science, and Cochrane Library) from inception until March 2024. Eligible papers reported treatment and overall survival (OS) of non-metastastic SCBC patients. A meta-analysis was conducted comparing treatments with radical cystectomy-based (RC) and radiotherapy-based (RT) approaches. Additionally, a network meta-analysis was performed comparing local treatment only, chemotherapy only, and the combination of both. Main outcome was OS in each analysis.

Results
In total, 12 articles with 1814 non-metastatic SCBC patients were included in this systematic review, of which eight articles with 1228 patients were included in the meta-analysis comparing RC- and RT-based treatments. Seven studies with 1327 patients were included in the network analysis. We observed no statistically significant OS difference between the RT-based and the RC-based treatment (MD = 5.41; 95%-CI: -9.18, 19; p=0.44, I2=69%, p=0.002). Furthermore, the combination of local treatment and chemotherapy was associated with a higher OS compared to local therapy only or chemotherapy only (Combination vs. local therapy: MD: 28.48 [10.27, 46.69], p<0.05; Combination vs. chemotherapy: MD: 29.74 [10.91; 48.58], p<0.05). No significant OS difference was found between local therapy only and chemotherapy only (MD: 1.26 [-19.37; 21.90], P>0.05).

Conclusion
No OS difference was observed in patients undergoing RC-based or RT-based treatments. The addition of chemotherapy to local therapy seems to improve OS. However, given the high heterogeneity of the included studies, these results should be interpreted cautiously.

S-18 Microbeam radiotherapy as potential new tool for melanoma treatment: the first comprehensive transcriptomic study of the immune mechanisms

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Aims
Melanoma, the deadliest skin cancer, is resistant to radiotherapy (RT). We have shown that Microbeam Radio- therapy (MRT), innovative spatially-fractionated RT modality, delays melanoma growth and even ablate it in a preclinical setting. We found that Cytotoxic T cells (CTLs) locally infiltrate tumors 7 days post-MRT and are essential for tumor control, since depletion of this population abrogated the therapeutic effect post-MRT. We found that CTLs are also essential for locoregional metastasis progression. Our aim was to fully characterize the immune status of melanomas treated with MRT vs. uniform RT, and to identify novel therapeutic markers and/or targets.

Methods
C57BL/6J mice were implanted in the ears with B16F10 melanoma cells. The European Synchrotron Radiation Facility (France) was used to deliver the irradiations: MRT (400Gy peak dose, 6.2Gy valley dose, 50μm beam width, 200μm spacing) and uniform RT (6.2Gy). We analyzed 5 different groups (unirradiated control, 2 and 7 days post-MRT, and post-uniform RT, respectively) with a 785-gene panel using the NanoString nCounter tech- nology. The genes in the panel are involved in immune activation and suppression in the cancer microenviron- ment. The costs for the analysis were partially covered by the SASRO research grant 2023.

Results
Gene expression levels of the entire panel showed a unique gene profile belonging to the MRT group at 7 days post-treatment in comparison to all the other groups, characterized by increase of almost all genes. Gene Ontol- ogy enrichment analysis revealed specific positive regulation of leucocyte activation and T cells proliferation, but also showed increased activity in cytokine receptor binding for the MRT group at the same time point. Transcripts for proteins known to participate in CTL-dependent elimination of tumour cells were found over- expressed in the MRT group coinciding with melanoma volume shrinkage. Underlined markers for predict- ing efficacy of MRT treatment were Ccl3, Ccl4, Icam1 and surface receptors, such as Cd28 and Cd80. Immune checkpoints and CTL-exhaustion markers were also overexpressed at 7 days post-MRT, being possible targets for combinatory treatment.

Conclusions
To our knowledge, this study is the most detailed to date investigating the immune mechanisms behind MRT efficacy in a preclinical cancer model.

S-19* Assessment of volumetric changes in daily positioning images to support the decision for replanning in head and neck cancer cases.

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Aims
Weight loss in head and neck cancer patients during radiotherapy may induce the need for adjustments of their treatment plans. This study aims to support the decision for replanning by investigating indicators related to changes in the patient's external contours, which are extracted from daily scans used for patient positioning.

Methods
The study retrospectively investigated 17 patients with head and neck cancer, of whom 12 required treatment replanning as directed by their physicians during ongoing therapy. The treatments were performed using a Radixact (Accuray) and the ClearRT imaging system with prescribed doses ranging from 50 to 70 Gy. The planning and subsequent analysis were conducted using RayStation (RaySearch). In a first step, the patients' external contours on the planning CT (pCT) and the replanning CT (rCT) were divided into slices of the same height to determine the overall change in volume from the sternum up to the eyes and to pinpoint regions with substantial alterations. Subsequently, after evaluating the volumetric changes on daily ClearRT scans, thresholds were established by comparing the days on which replanning occurred, as well as distinguishing between patients who were and were not replanned. Finally, a workflow was implemented to assess volumetric changes to the pCT based on daily scans up to a specific day, flagging the need for replanning if the thresholds were exceeded.

Results
The study showed that the volume loss from the pCT to the rCT ranged from -0.6% to -8.3% with the most significant reductions noted in the neck region. The implemented flagging algorithm successfully identified 100% of the patients who underwent replanning, with an average of 6 ± 4 days away from the physician's call to replan. Additionally, among the five analyzed patients who did not require replanning, none were falsely flagged.

Conclusions
A workflow to support the decision for replanning is successfully implemented using thresholds for volume loss determined on daily positioning images.
This work was supported by RaySearch Laboratories.

S-20* Uncertainty Estimation in Deep Learning-Based Brain Metastases Auto-Segmentation: Toward Trustworthy Clinical Implementation

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Aim
In recent years, deep learning models have achieved performance comparable to that of expert groups in different medical image analysis tasks specifically for the task of auto segmentation. However, despite the promising results, there are still concerns regarding the safety of the real world clinical applications of these models. In some situations, a model produces overconfident predictions even for erroneous classifica- tion/segmentation. Therefore, for safe clinical decision making it is crucial to quantify model uncertainty and refer uncertain cases to physicians for correction. The overall aim of our study was to investigate model uncer- tainty for auto-segmentation of brain metastases.

Methods
The baseline model in our study was 3D-Unet with residual blocks. For model uncertainty estimation we implemented the ensemble approach. The model was trained with different random parameter initializa- tion and two different loss functions were used including dice loss and binary cross entropy. 158 T1 contrast- enhanced MRI scans of patients with brain metastases were included in this study (124 for training and 34 for validation). For each case, the model predicted 10 different outputs. Instead of a binary segmentation mask, the probability maps which are the output of the Sigmoid layer of the model were used for uncertainty quan- tification. For each case, the voxel level uncertainty was calculated using variance and entropy.

Results
Considering the dice score the average performance of all 10 models on validation set was 0.701 [0.655-0.711]. Reviewing the uncertainty map shows that the model has the highest certainty or lowest vari- ance/entropy in the central part of the metastases. However, approaching the peripheral areas and voxels near the border of the tumor and healthy tissue the model uncertainty increases. Our results also indicate that there is a correlation between metastases volume and intensity homogeneity with model uncertainty. Less homo- geneity and smaller metastases volume lead to higher model uncertainty.

Conclusions
Using ensemble approach we could quantify model uncertainty and investigate the areas and metastases that require physician intervention. As a future study, we will focus on calibrating model based on the uncertainty estimation and using this approach in an active learning workflow to reach a high-performance model.

S-21* MET receptor S1014 phosphosite deficiency in mice affects their health status post-DNA damage exposure

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DNA damage provoked by ionizing radiation (IR) is a harmful event for genome integrity. Upon exposure to IR, the cells activate the complex DNA damage response (DDR). Interestingly, many studies highlighted the role of receptor tyrosine kinase (RTK) systems in the DDR, especially the RTK for hepatocyte growth factor (HGF) called MET. Binding of HGF activates MET, which induces the recruitment of many intracellular signalling molecules involved in cell proliferation, cell growth, and survival. Thus, the proto-oncogene MET leads to tumour for- mation and proliferation when overexpressed. Within the MET juxtamembrane domain, which features auto- inhibitory function, we recently identified a previously unreported phosphorylation on the Serine1014 residue (S1014). This site is involved in the DDR-MET interface as it gets phosphorylated by DNA-dependent protein kinase (DNA-PK), a DNA repair protein. Here we investigated the impact of S1014 phosphorylation deficiency on DDR in a knock-in (KI) FVB mouse model featuring a Serine to Alanine substitution. Ten-week-old mice un- derwent 6Gy of whole-body irradiation and their life span and general health status were monitored for up to 2 years or until reaching the euthanasia criteria. Upon euthanasia, histological examination of the organ status was performed. Preliminary results show a higher incidence of tumor formation in KI animals. Specifically, colon adenocarcinomas were found in 2 KI mice approximately 150 days post-IR and in one 2-years old non- irradiated KI animal. No such malignancies were found in WT animals. We also observed a decrease in weight gain in the mutant mice compared to WT after IR. Taken together, these first results suggest that MET S1014 phos- phorylation deficiency jeopardizes correct DDR activation post DNA damage and therefore the general health status and the lifespan of the mice.

S-22* Lymphatic Spread in HPV-positive versus HPV-negative Oropharyngeal Squamous Cell Carcinoma: Insights from a Multi-Center European dataset

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Aims
HPV-associated oropharyngeal squamous cell carcinoma (OPSCC) have been reported to show higher preva- lence of lymph node metastases compared to HPV-negative patients. Nevertheless, current guidelines for elec- tive nodal irradiation (ENI) don't differentiate between HPV+ and HPV- patients. We provide an analysis of lymph node involvement in HPV+ versus HPV- OPSCC using multi-institutional datasets to investigate if ENI should differ.

Methods

We collected data on lymph node involvement per lymph node level (LNL) in OPSCC from four European cen- ters, resulting in a dataset containing 785 patients. The data is publicly available on the web-based platform https://lyprox.org. 59% of tumors were p16+, a biomarker used as surrogate for HPV status. In 382 patients, both clinical involvement (based on imaging) and pathological involvement after neck dissection were avail- able.

Results
In early T-stage patients (T1/T2), involvement of ipsilateral LNL II was significantly higher in HPV+ patients (80%) compared to HPV- patients (55%)(p=0.02). For advanced T-stages (T3/T4), the difference in LNL II involve- ment is smaller and not significant (83% versus 71%). This aligns with the clinical narrative that HPV-associated OPSCC are often diagnosed due to lymph node involvement while the primary tumor is still small.

However, involvement of other LNLs was not significantly different, e.g., contralateral LNL II for lateralized tumors (8% versus 9%), or involvement of ipsilateral LNL IV when LNL III is not involved (3% versus 3%).

The rate of occult metastases can be estimated from the subset of patients in whom both clinical involvement (based on imaging) and pathological involvement was available. Given by the total number of clinically negative resected LNLs that were pathologically positive divided by the total number of clinically negative resected LNLs. The rate of occult metastases was 8.7% for HPV+ and 11.0% for HPV- patients, resulting in a non-significant difference.

Conclusions
Patients with HPV-associated OPSCC more frequently present with lymph node metastases compared to HPV- patients. However, only ipsilateral LNL II shows significantly higher involvement. The data doesn't indicate that the risk of occult metastases in other LNLs differs between HPV+ and HPV- patients for the same clinical LNL involvement, T-stage, and primary tumor location.

S-23* The impact of thermal dose on pathological complete response in locally advanced rectal cancer patients treated with deep regional hyperthermia combined with neoadjuvant chemoradiotherapy: a multi-institutional propensity score matched analysis

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Purpose
To investigate the impact of thermal dose expressed as cumulative equivalent minutes at 43°C(CEM43) on clinical outcomes in locally advanced rectal cancer patients (LARC) treated with neoadjuvant chemoradio- therapy (CRT) and deep regional hyperthermia (HT).

Patients and methods
This multinational retrospective study included 257 LARC patients (cT2-4, cN0-2, M0-1) treated at four European clinical centers between April 2003 and March 2020. All patients were treated with a total radiotherapy dose of 45-56 Gy in combination with concomitant chemotherapy and weekly HT sessions. Patients were subdivided into "low" CEM43 and "high" CEM43 groups by the HT session with median CEM43 <3.5 min and ≥ 3.5 min, respectively. The primary outcome was pathological complete response (pCR), secondary outcomes were local progression free survival (LPFS), disease free survival (DFS) and overall survival (OS). We compared the oncological outcomes between "low" and "high" CEM43 groups by applying propensity scores using full- and nearest-neighbor- matching methods. Propensity-matched groups were evaluated for covari- ate balance with absolute standardized differences ≤0.1 deemed acceptable. Uni- and multi-variable regression analyses were performed.

Results
The median follow-up of patients (165 male, 92 female) was 57 months [95%CI:54-60], the overall pCR rate was 26%[95%CI:20-32]. The 5-year LPFS, DFS and OS were 93% [95%CI:0-97], 67%[95%CI:61-74] and 83%[95%CI:78-88], respectively. The pCR rate was significantly higher in patients treated with "high" CEM43 compared to "low" CEM43 in the full-matched cohort (11%[95%CI:7-19] vs 28%[95%CI:19-39], p=0.01) and in the nearest-neighbor-matched cohort (11%[95%CI:6-20] vs 27%[95%CI:18-38], p=0.04). The uni- and multi-variable logistic regression analyses in full-matched cohort showed that pCR was significantly associated with "high" CEM43 (odd ratio(OR):1.2 [95%CI:1.1-1.3]), lymph node involvement status (OR:1.3 [95%CI:1.1-1.6]) and mod- erately or poorly differentiation grade of the tumor (OR:0.7 [95%CI:0.5-0.9]). These results were confirmed in the nearest-neighbor-matched cohort, reaffirming the association between "high" CEM43 and pCR. No signifi- cant difference was observed between "low" and "high" CEM43 groups in full-matched and nearest-neighbor- matched cohort for 5-year LPFS, DFS and OS.

Conclusion
High CEM43 (CEM43≥ 3.5 min) was associated with significantly higher pCR rate for LARC patients treated with neoadjuvant CRT+HT. This combined treatment approach should be investigated in prospective clinical trials with organ preservation strategy

POSTER PRESENTATIONS

P-01* A newly identified phosphorylation site of the MET receptor tyrosine kinase, Ser1016, in mediating cancer therapy resistance

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MET receptor tyrosine kinase plays essential roles in regulating several processes such as cell proliferation, survival, and motility. Although necessary in physiological conditions, abnormal activation of MET leads to tu- mour progression. Phosphoproteomic analysis performed on cancer cell lines treated with MET inhibition and irradiation revealed a previously unreported phosphorylation site on MET, Serine 1016. We recently showed that Ser1016 is a direct substrate of the catalytic subunit of the DNA-dependent protein kinase and its ablation leads to a radiosensitizing effect. The current project aims to dissect the function and regulation of Ser1016 of MET in light of its oncogenic role. We established two cell line models either incapable of being phosphorylated on Ser1016 (phosphoablative) or constitutively phosphorylated on Ser1016 (phosphomimetic). We hypothesized that Ser1016 status influences therapy response towards DNA damage-inducing therapeutic drugs commonly used in the clinic. We found that ablation of Ser1016 residue renders the cells more responsive towards cisplatin compared to a condition in which Ser1016 is constitutively active. Moreover, immunoblot and immunofluores- cence analysis revealed different dynamics of DNA damage response (DDR) upon chemotherapeutic drug treat- ment. This could indicate a diverse kinetics of DNA repair between the phosphorylation isoforms. Transcrip- tomic data revealed that Ser1016 status affects mitochondrial functions and protein homeostasis. Moreover, immunoblot analysis suggests a role for Ser1016 in affecting receptor stability, activation, and degradation. The characterization of MET Ser1016 will extend our knowledge of MET biological functions, with a particular inter- est in its crosstalk with the DDR machinery, whose activation has been largely described as one of the limiting factors in cancer therapy outcomes.

P-02* Exploring Homologous Recombination Deficiency and Its Implications on Drug-Radiotherapy Sensitivity in Head and Neck Squamous Cell Carcinoma

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Head and neck squamous cell carcinoma (HNSCC) is a highly prevalent and rapidly progressing cancer with significant implications for morbidity and mortality. Despite advancements in surgery, chemotherapy, radio- therapy (RT), and targeted therapies, the prognosis remains poor due to treatment resistance. Approximately 30-40% of HNSCC patients experience locoregional recurrence, demonstrating aggressive characteristics.
We hypothesize that DNA damage response deficiencies can contribute to this aggressive phenotype of HNSCC by enabling tumor cells to acquire increased genomic instability. Furthermore, defects in homologous recombination (HR)-based repair of DNA double-strand breaks can impact the success of DNA damage-based anticancer treatments. For example, breast cancer cell lines deficient in HR significantly respond to PARP inhibitors.
This study aims to understand underlying molecular mechanisms of invasion and therapeutic resistance by identifying predictive markers of HR deficiency (HRD) in HNSCC, to establish new targeted therapies and pre- treatment stratification of patients.
Genomic profiling of a panel of HNSCC cell lines revealed differences in the presence of HR-related mutational signatures between cells derived from primary tumors and their patient-matched metastatic and recurrent disease. To phenotypically evaluate the sensitivity and resistance of these cell lines to PARP inhibition, ATM inhibition, and RT, cell viability assays were conducted. HR efficiency was assessed by immunofluorescence of RAD51 foci formation post-RT.
Preliminary data reveals that the HNSCC cells UM-SCC-17A/B, UM-SCC-74A/B and UM-SCC-81A/B, harboring mutational signatures in HRD, exhibit increased sensitivity to the PARP inhibitor Olaparib and form only a few or no RAD51 foci upon irradiation.
Next, these phenotypic data will be correlated with the transcriptomic and genomic profiles of these cell lines to establish a HRD scoring system for HNSCC.

P-03 Considerable tissue specific differences in pretreatment thermophysical properties and in oxygen availabilities to tissues, decisive in combined hyperthermia/re-RT of locally recurrent breast cancers: Update of reliable key data

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Aims
Control of locally recurrent breast cancer can be achieved using thermo-radiotherapy. This treatment option uses localized mild hyperthermia (39-43°C, 60 min), immediately followed by radiotherapy. Treatment efficacy is distinctly influenced by thermophysical properties and the oxygenation status of the respective tissue. Knowledge of these parameters in the various multilayer tissues of the female breast is crucial for computational modelling of the treatment field and therapy planning.

Methods
Pretreatment data on key thermophysical parameters and the oxygen supplies of the various tissue layers exposed to HT + reRT of breast cancer are compiled. Pretreatment tissue water content (C_W), thermal conductivity (k) and thermal diffusivity (α), blood flow (BF), oxygen partial pressure (pO_2), O_2 diffusivity (Do_2), hypoxic fraction (HF, $pO_2 \leq 10$ mmHg), oxygen enhancement ratio (OER) and tissue temperature (T_t) are pre- sented for the different tissue layers, healthy fibro-glandular breast, breast cancer and pectoralis muscle. These tissues are all exposed to irradiation during the treatment of recurrent breast cancer and exhibit quite different values for the properties listed.

Results
C_w and C_P are lowest in epidermis and reach maxima in cancers. Due to higher C_w-values, thermal conductivity (k) and thermal diffusivity (α) are highest in cancers. Average pretreatment T_t is ≈33.5°C in super- ficial dermis, ≈ 35°C in subcutis, adipose tissue and normal breast vs. ≈36°C in cancers. Mean BF-rates are ≈ 0.08 ml/g/min in dermis, 0.01 ml/g/min in subcutis and adipose tissue, 0.03 ml/g/min in pectoralis muscle, and 0.06 ml/g/min in normal breast vs. 0.24 ml/g/min in breast cancer. Average pO_2 values are approx. 30 mmHg in the pectoralis muscle, 35 to 50 mmHg in dermis, subcutis and adipose tissue, 65 mmHg in healthy fibro-glandular breast, and only 10 mmHg in cancer. HF is 50% in cancers vs. <5% in normal breast or subcutis. OER is 2.80-2.85 in healthy tissues vs. 2.35 in cancer. Do2 rises with tissue water content. With the exception of HF, all param- eters listed for cancers increase upon mild hyperthermia. HT also augments mitochondrial ROS production in cancers, fostering radiosensitivity and apoptosis

Conclusions
Thermophysical and oxygenation properties vary between tissues considered in modelling and treatment planning.

P-04* Stereotactic body radiotherapy for oligometastatic urothelial cancer: an updated systematic review and insight of future directions

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Aim
Stereotactic body radiation therapy (SBRT) is one of the most commonly used metastasis-directed therapy (MDT) for oligometastatic urothelial carcinoma (omUC). Open questions remain concerning the role of MDT, use of biomarkers, imaging, and combination with systemic therapies. Aim of the present systematic review is to provide an updated overview of the current clinical evidence on SBRT for omUC, with a focus on controversial areas and future directions on this emerging field.

Methods
With a systematic approach, following the PRISMA guidelines, we searched PubMed/Medline and ClinicalTrials.Gov databases. The search strategy and review protocol have been registered to the international Prospective Register of Systematic Reviews (PROSPERO ID: CRD42024522381). We identified articles published between January 2006 and March 2024 reporting the use of SBRT for omUC with or without concomitant sys- temic therapies.

Results
Eight studies were selected for data extraction and 293 omUC patients treated with SBRT were col- lectively analyzed. The heterogeneity in terms of patients selection, and SBRT dose-fractionation did not allow for a robust meta-analysis. SBRT delivered with ablative doses (BED_{10}≥78Gy) was associated with 2year-OS rate 50.7% (95% CI 35.1-64.4) in metachronous omUC patients. In omUC previously treated with cystectomy and receiving SBRT as MDT one study showed a median overall survival reaching 51 months (95% CI not cal- culable) versus a median OS 4.5 (95% CI 1.0-8.9) with palliative MDT RT (p = 0.002). Use of sub-ablative SBRT doses (BED_{10}=43.2Gy) in combination with immunotherapy did not demonstrate significant clinical outcome improvement in two prospective studies. Overall tolerance was good, with only one study exploring SBRT in combination with immunotherapy reporting a toxicity of grade 3 or higher.

Conclusions
SBRT is an effective and widely available MDT option in omUC, although based on a limited number of studies. Despite the attempt to use SBRT as an immune response trigger in combination with im- munotherapy, no significant improvement in survival outcomes has been observed. New systemic agents have shown extremely promising results and further studies as well as real world data on possible combinations may depict a complete new scenario for omUC

P-05* Mono-centre, prospective, placebo-controlled, double-blind randomized clinical trial to evaluate the effectiveness of hyaluronic acid 0.2% cream for the prevention of skin toxicity in breast cancer patients treated with post-operative radiotherapy.

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Aim
This study aims to investigate the efficacy of a hyaluronic acid (HA) 0.2% cream in reducing the development of grade 2 or higher radiation dermatitis during adjuvant breast radiotherapy (RT) compared to a neutral com- parator cream.

Methods
A prospective double-blind randomised trial enrolled women with breast cancer post-lumpectomy scheduled for whole-breast RT. Participants received either conventional fractionation (50 Gy, 2 Gy/fr + 10 Gy 2 Gy/fr tumor bed boost) or hypofractionation (40 Gy 2.667 Gy/fr). They were randomly assigned to apply either the HA cream or a placebo twice daily, starting two weeks before RT, continuing during, and until two weeks post-RT. Blinded physicians graded weekly dermatitis using the RTOG scale. The primary endpoint was the incidence of grade 2 or higher dermatitis. Skin changes were also assessed with skin reflectance spectrophotometry (SRS).

Results
Of the 86 enrolled patients, 79 completed the study as planned: 40 in the HA cream group and 39 in the placebo group. Among patients undergoing hypofractionated RT, 41.7% in the HA group and 57.7% in the placebo group developed grade 1 dermatitis by the end of RT. No patients in the hypofractionation group developed >grade 2 dermatitis, whereas 10 patients under conventional fractionation did. The primary endpoint analysis showed no significant difference between the two groups (p=0.3477).
Clinical RTOG scores and SRS evaluations of acute radiodermatitis followed similar patterns in both treatment groups. Time to onset of dermal toxicity (RTOG ≥ G1) was comparable between groups, with a shorter onset in the hypofractionation schedule. SRS values increased rapidly from week 1 of RT, continuing throughout, and decreased post-RT more notably in the conventional fractionation group. The ANCOVA model indicated no significant differences between treatment groups or RT schedules. Changes in SRS values and RTOG scores were similar across the study period.

Conclusions
The extremely low incidence of grade 2 or higher radiodermatitis failed to show a significant benefit from use of a topical hyaluronic acid-based cream. Future studies are recommended to further evaluate the performance of HA based-cream.

P-06* Diagnostic Value of MRI for Post-Treatment Surveillance of Early-Stage (I-II) Glottic Larynx Cancer

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Aim
There is no uniformity across various guidelines for early-stage (I-II) glottic squamous cell carcinoma of the larynx (EGL) regarding the modality and frequency of follow-up, particularly radiological imaging. Our objec- tive was to conduct a retrospective study to assess the diagnostic performance of MRI-based, post-treatment surveillance to detect EGL recurrences and metachronous head and neck malignancies within the first two years post-treatment.

Material and Methods:
We included patients diagnosed with EGL that were treated at our institution with curative intent between Jan- uary 2006 and November 2021 using radiotherapy or surgery. We analyzed radiological follow-up two years post-treatment. Out of 178 patients screened, 83 met the eligibility criteria. At least one MRI was performed during the 2-year follow-up period. MRI examinations with preceding endoscopic evaluation within one month were excluded to avoid bias. MRI results were categorized as no recurrence, local failure, locoregional failure, second primary malignancy, and indeterminate according to STARD guidelines[1]. Diagnostic performance met- rics (sensitivity, specificity, positive predictive value, negative predictive value, and accuracy) were calculated for MRI, using clinical and endoscopic examinations as the reference standard.

Results
In total, 173 eligible MRIs of 83 patients were analyzed. Tumor stage consisted of cT1a (68.7%), cT1b (21.7%) and cT2 (9.6%) tumors. Of those, 22.9% were treated with primary surgery +/- adjuvant radiotherapy and 77.1% with primary radiotherapy. Four local, 2 isolated nodal recurrences and no second malignancies were diagnosed. Recurrences were identified with a sensitivity of 75% and a specificity of 99.36%. The positive predictive value was relatively low due to the infrequency of recurrences and second primaries, with approximately 35 MRIs needed to detect one event.

Conclusions
MRI demonstrates high specificity and acceptable sensitivity in the post-therapeutic surveillance of EGL. How- ever, the limited positive predictive value, due to the rarity of events, questions the efficiency of MRI as a stan- dalone surveillance method and suggests a potential reconsideration of follow-up protocols.

1: Cohen, J.F., et al., STARD 2015 guidelines for reporting diagnostic accuracy studies: explanation and elaboration. BMJ Open, 2016. 6(11): p. e012799.

P-07 Radiotherapy for Benign Conditions: A Swiss Patterns of Care Survey

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Aims
Radiotherapy is an effective treatment option for a wide range of benign conditions; however, high-level evi- dence is mostly lacking resulting in inconsistent treatment concepts. A pattern-of-care survey was conducted to assess the current clinical use of radiotherapy for benign diseases in Switzerland.

Methods
A standardized digital survey was distributed to all 34 radiation oncology departments and consisted of 63 questions paired with predefined answers, including 31 different treatment indications grouped into 7 disease categories. We assessed institutional characteristics, rough yearly patient numbers for each benign treatment indication, and treatment strategies for selected entities.

Results
A total of 23 institutions (68%) responded and were included in this analysis: 11 cantonal hospitals (48%), 7 private institutions (30%) and all 5 university hospitals (22%). Precise overall patient numbers were available in 83% of participating institutions. A total of 1236 patients were treated for a benign indication in these de- partments per year, which made up 7% of all treated patients (range, <1% - 25%).
Rough yearly estimates of each treatment indication were available for 96% of the centers. Most centers performed radiotherapy for treatment or prevention of heterotopic ossification (90%), keloid scars (87%), gynecomastia (86%) and plantar fasciitis (85%), whereas a minority of centers irradiated patients for trigeminal neu- ralgia (23%) lymphatic fistula (22%), refractory cardiac arrhythmias (14%) or pterygium (14%).
Meningiomas were treated in 76% of the centers, with a regular frequency (defined as more than 10 cases per year) in 31% of treating institutions, occasionally (5-10 cases per year) in 19%, rarely (1-5 cases per year) in 31%, and very rarely (a maximum of 1 per year) in the remaining 19%. Similarly, plantar fasciitis was treated regularly (35%), occasionally (47%), rarely (6%), or very rarely (12%).

Conclusions
This is the first comprehensive study reporting patterns of utilization of radiotherapy for benign conditions in Switzerland. All participating institutions treat patients for benign conditions; however, a wide range of treated indications, frequency of use and treatment strategy was observed. Results from this initiative enable us to prioritize entities for future clinical research and provide a foundation for establishing a Swiss network on this topic.

P-08 Optimizing Radiotherapy: Enhancing Patient Education and Communication across Multidisciplinary Teams

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Aim
Technological advances have improved treatment outcomes, but patient engagement remains crucial. Effec- tive patient education requires consistent communication within the Multidisciplinary Team (MDT), placing patients at the center of care. This study assessed RTTs' knowledge of departmental patient care, side effect management advice, and available MDT resources for radiotherapy patients. It also aimed to highlight com- mon patient inquiries related to treatment management.

Method
In May 2023, an anonymous questionnaire was distributed to all 23 RTTs at the University Hospital of Zürich. Eight questions covered advice RTTs give patients regarding skin care, holistic support, nutrition, and bowel/bladder preparation. Responses were categorized into levels of understanding:

1. Complete understanding of hospital guidance
2. Partial understanding of hospital guidance
3. Understanding of non-protocol guidance
4. No understanding of hospital guidance

To identify gaps in patient knowledge, two additional questions focused on patient understanding and common inquiries. Following data collection, a Continuous Professional Development (CPD) session was conducted for RTTs, and resources from the outpatient clinic were made available in the radiotherapy waiting room and on the hospital intranet. In September 2023, the questionnaire was redistributed to the same RTTs for evaluation.

Results
In May 2023, 20 RTTs participated. Responses indicated an average of 13% complete understanding, 28% partial understanding, 11% understanding of non-protocol guidance, and 48% no understanding of hospital guidance. Common patient inquiries included side effect management, creams, appointments, and diet. In September 2023, 19 RTTs participated, showing an increase to 89% complete understanding, 7% partial understanding, 4% understanding of non-protocol guidance, and 0% no understanding. The average understanding of hospi- tal guidance improved significantly from 13% to 89%. Notably, understanding of non-protocol guidance for bowel/bladder preparation dropped from 57% in May to 0% in September.

Conclusion
This study highlights the importance of multidisciplinary education for seamless and consistent patient com- munication. While RTTs must work within their scope of practice, they play a vital role in addressing daily patient inquiries. Emphasizing this topic has led to MDT discussions and process revisions. Regular CPD ses- sions, MDT update meetings, and accessible written patient information can facilitate consistent education, promoting shared understanding and encouraging patient participation in their treatment.

P-09 CBCT-based Online Adaptive Radiotherapy as part of neoadjuvant treatment for esophageal cancer: pathologic complete response (pCR) rates, toxicity profile and dosimetric analysis

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Aims
Using radiotherapy for esophageal cancer (EC) arise concerns due to toxicities resulting from the proximity of organs at risk (OAR) and daily target coverage affected by inter-fractional changes in anatomy and organ motion. Online adaptive radiotherapy (oART) has the potential to improve target coverage and minimize OAR exposure. We present our data for CBCT-based oART in neo-adjuvant setting for EC.

Methods
Between 2022 and 2024, 20 patients underwent neo-adjuvant radio-chemotherapy (RCT) with prescribed dose of 50.4Gy delivered in 28 fractions. Pathological response (PR) was evaluated directly after surgery, while toxicities were assessed within three months post-completion of RCT and after surgery. Furthermore, we performed a dosimetric analysis of 10 patients for scheduled and adaptive treatment plans.

Results
Nineteen patients (95%) presented with adenocarcinoma, while one patient had squamous cell carcinoma of the esophagus. Following the completion of RCT, four patients (20%) experienced acute toxicity of grade 3 or higher. However, postoperative toxicities were more prevalent than post-RCT, with a total of 18 grade 3 or higher events recorded at a median follow-up of 8.6 months (range: 2.6-15). Complete and near-complete (<10% vital tumor) PR were observed in 30% (6 patients) and 40% (8 patients) of cases, respectively. Dosimetrical analysis for scheduled and adaptive plans (280 fractions in total) showed following results: $D99\%_{PTV}$ and $D99\%_{CTV}$ could be increased from 79.7% to 94.1% and 93.4% to 98.2%, respectively. Similarly, with adapted plans a gain from 92.4% to 97.3% and 97.8% to 98.9% of the $D95\%_{PTV}$ and $D95\%_{CTV}$ was observed, respectively. Furthermore, a reduction of mean heart dose from 18.5 to 16.8Gy and $V20_{Gy}$ of both lungs from 15.9% to 13.6% was achieved with adapted plans.

Conclusions
In this single-center retrospective study, we have shown an excellent pathological response in 70% of patients undergoing oART as part of neo-adjuvant treatment for EC. Patients exhibited acceptable rates of toxicity upon completion of RCT. Despite being resource-intensive, oART for EC is feasible and leads to increased target cover- age and sparing of OAR. A prospective trial is currently underway to assess whether the dosimetric advantages of oART will decrease radiation-induced toxicities and imrove oncological outcomes.

P-10* Moderate Hyperthermia in Switzerland – A Survey among Swiss Radiotherapy Centers on Current Practice, Obstacles and Opportunities of hyperthermia

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Aims
Growing interest in moderate hyperthermia (HT) is observed in Switzerland. The Swiss Hyperthermia Network (SHN) coordinates HT activities on a national level. On its behalf, an anonymous survey among Swiss radiother- apy (RT) centers was conducted to assess the current opinion on HT, the interest of adopting HT and to identify obstacles to its implementation.

Methods:
All head of departments of the 30 independent Swiss RT-centers were invited to take the survey. A 25-item questionnaire was sent to the centers currently not offering HT, while a more detailed 36-item questionnaire was sent to the centers having at least one HT device. Thirteen identical items were implemented to detect differences between HT-center and non-HT-centers.

Results:
The responses from 21/30(70%) Swiss RT-centers received by June 23, 2024 were taken into account. Ten (33%) centers have a HT unit. Of the 11 centers without HT, the majority is either interested in implementing HT (n=4, 36%) or is planning to consider it in the future (n=3, 27%) and 3 (27%) do not intend to implement HT. Lack of staff (44%) and a too substantial initial investment (44%) were the most frequent reasons for not offering HT. But all 21 centers stated to believe in the benefit of HT. All non-HT-centers reported to refer 1-5 patients per year for HT, most commonly due to re-irradiation(90%), radioresistant histologies(50%) or for increasing the like- lihood of organ preservation(50%). Correspondingly, HT-centers selected re-irradiation(100%), radioresistant histologies(70%) and bulky/hypoxic tumors(60%) as most beneficial indications for HT. 90% of non-HT-centers and 70% of HT-centers believe that there is enough data in the literature to support the wide use of HT, while 19(90%) respondents believe more randomized phase III trials with HT should be conducted. All non-HT-centers and 60% of HT-centers state that a national hyperthermia database would enhance HT legitimacy.

Conclusions:
Ten RT centers in Switzerland offer HT and at least 4 more are interested to implement HT. Re-irradiation and radioresistant tumors seem to be well accepted indications for hyperthermia in the whole RT community. More randomized phase III trials and a national HT database would further promote legitimacy for HT.

P-11* Patient recruitment into clinical studies of solid malignancies during the COVID-19 pandemic in a tertiary cancer center

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Background and Purpose
To analyze clinical trial activities and patient recruitment numbers into prospective clinical studies for solid malignancies during the COVID-19 pandemic in a tertiary cancer center.

Materials and Methods
Patient recruitment numbers in prospective clinical studies of solid malignancies were retrospectively analyzed for the years 2019 – 2021 at the Comprehensive Cancer Center Zurich (CCCZ). Changes in recruitment numbers were tested for association with organ-specific subunits, as well as organizational and treatment-related trial characteristics. To assess differences between categorical variables, Chi-squared test was used. For uni- and multivariate analysis, Cox proportional hazards were calculated.

Results
In 2019, there were a total of 107 studies (registry trials, clinical phase I-III trials, and translational studies) recruiting 304 patients at the CCCZ. During the COVID-19 pandemic in 2020 and 2021, there were 120 and 125 active trials with a total recruitment of 355 and 666 patients, respectively. No significant differences between the subunits and study characteristics in changes of patient recruitment in clinical phase I-III trials were identified when the year prior to the COVID-19 pandemic (2019) was compared to the first year of the pandemic (2020) and to 2020-2021.

Conclusions
Despite healthcare systems around the world have experienced significant disruption due to the COVID-19 pan- demic, data from our tertiary cancer center showed that clinical trial activities were maintained at a high level during the pandemic.

P-12* Detailed patterns of lymphatic spread in hypopharyngeal and laryngeal squamous cell carcinoma

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Aims
To provide detailed information on regional lymphatic spread patterns in hypopharyngeal and laryngeal squa- mous cell carcinoma (SCC), considering T-stage, location and lateralization of the primary tumor, as well as in relation to the involvement of adjacent lymph node levels (LNLs) with the goal to develop a more individualized definition of clinical target volumes (CTV).

Methods
Patients with hypopharyngeal or laryngeal SCC treated at the University Hospitals Zurich between 2013-2021 and Groningen (UMCG) between 2006-2023 were retrospectively analyzed. Baseline characteristics and clini- copathological data were recorded. Lymph node involvement per level was assessed based on imaging and, if available, pathology. Patterns of LNL involvement will be visualized on www.LyProX.org.

Results
The study was composed of 1343 patients including 338 (25%) patients with hypopharyngeal-SCC and 1005 (75%) with laryngeal-SCC. Regional lymphatic metastases were diagnosed in 80% (hypopharynx) and 26% (larynx) of patients.
Ipsilateral levels II and III were most commonly involved for both hypopharyngeal-SCC (level II:66%, level III:55%) and laryngeal-SCC (level II:21%, level III:16%).
In hypopharynx-SCC, ipsilateral level III involvement was 50% for T1-2 and 58% for T3-4 tumors. In larynx-SCC, this was 5% for T1-2, compared to 26% for T3-4.
Contralateral level II was more frequently involved if the tumor extended across the midline. For hypopharynx- SCC, contralateral level II was involved in 34% when the tumor crossed the midline compared to only 9% when not. Comparable results were found for larynx-SCC: 14% (midline extension) versus 1% (no midline extension). In hypopharynx-SCC, ipsilateral level IV was involved in 34% of patients when ipsilateral level III was involved, but only in 14% when level III was not involved. In larynx-SCC, this was 26% versus 2%. Contralateral level III was involved in only 5% (hypopharynx) and 2% (larynx) of patients in whom contralateral level II was negative. Conclusions
Regional lymph node metastases are common in patients with hypopharyngeal and laryngeal SCC. The highest rates of positive LNLs are in levels II and III. We aim to personalize the elective nodal CTV and/or neck dissection by detailed reporting of LNL involvement and subsequent risk prediction of lymphatic metastases, depending on macroscopic LNL-involvement and clinicopathological factors.

P-13 Testing the feasibility of image matching prostate radiation therapy with online 2D-coplanar MRI CINE imaging

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Purpose/Objective
The objective of this study is to evaluate the feasibility of matching prostate cancer (Clin- ical Target Volume, CTV) using 2D coplanar MRI images (CINE images) on a ViewRay 0.35T MR-Linac with the A3i System, and to compare it with the standard method using 3D True Fast Imaging with Steady-State Free Precession (TRUFI) scans with a resolution of 0.15 cm.

Methods
Patients undergoing standard adaptive SBRT on the ViewRay 0.35T MR-Linac for prostate cancer were analyzed. The treatment regimen consisted of 5 fractions with doses of 7-7.5 Gy to the prostate, with or without an escalated dose of 8 Gy to the dominant intraprostatic lesion. The standard treatment workflow included initial patient positioning, initial positioning verification with a TRUFI scan, contour and planning adaptation, final positioning verification with CINE images, a final TRUFI scan, and standard IGRT assessment. To assess the feasibility of using CINE images for IGRT, corrections based on CINE images were applied first, followed by a final TRUFI scan to record any residual corrections. Fractions where CINE image corrections exceeded 0.20 cm were excluded from the analysis, and a TRUFI scan was directly acquired. The following data was recorded daily: IGRT corrections from the CINE images, IGRT corrections from the TRUFI scan, total length of treatment, and the fractionation scheme.

Results
A total of 112 fractions from 37 patients were analyzed. The mean magnitude of the 3D correction vec- tor was 0.16 cm (±0.21 cm) for CINE images and 0.30 cm (±0.27 cm) for TRUFI images. In 22% of fractions, TRUFI scans required corrections greater than 0.30 cm, indicating residual corrections after CINE image matching. The median treatment length for all patients across all fractions was 48 minutes (±7.48 minutes).

Conclusion
The mean IGRT corrections from the TRUFI scans reflect the residual IGRT corrections needed after CINE image matching. Since 22% of the fractions required IGRT corrections greater than 0.30 cm, TRUFI images will continue to be a part of our clinical workflow. Further investigation is needed to understand the reasons for these remaining corrections

P-14 High Dose Rate Brachytherapy in carcinoma of the lip: Treatment Parameters and Clinical Outcome

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Aims:
Cancer of the lip is one of the most common malignant tumours affecting the head and neck region. Brachyther- apy (BT) is an alternative but less used treatment option due to historical reasons and diagnostic “gatekeeper effect” by surgeons. We report treatment parameters and oncological outcomes of our cohort of patients with carcinoma of the lip treated with high dose rate BT.

Methods:
This retrospective study includes patients with carcinoma of the lip treated with definitive or adjuvant high dose rate BT in our institution from 2004-2022. The implant procedure was performed under local or general anesthesia using plastic catheters to allow a better adaption to round surfaces and buttons on the extremes for fixation. Patient, tumor and procedural characteristics, toxicity and oncological outcome with actuarial time- to-event analyses were assessed.

Results:
Eighty patients with primary or recurrent carcinoma of the lip were included in this analysis: 68 patients (85%) received definitive HDR-BT alone while 12 patients (15%) were treated with surgery and adjuvant BT. Treatment was most commonly performed using 9 fractions with 4 Gy, delivered over 5 days (82.5%). A median of 3 plastic applicators (range: 1-8) were used to cover a median target volume of 7.37 cc (range: 1.72-43.27cc). After a mean follow-up of 47 months (range: 1-225) no case of soft tissue or bone necrosis was recorded. The 3-year local and loco-regional control was 85.4% and 73.8% respectively. Progression-free survival and overall survival were 58.6% / 72.1% at 3 years and 46.1% / 55% at 5 years.

Conclusions:
High dose rate BT is an effective treatment option that allows organ-preservation in the majority of cases. In- cidence of major complications is low with contemporary treatment techniques. An additional quality of life analysis and comparative effectiveness study with surgical mono-therapy options are ongoing to further opti- mize patient selection.

P-15* Deep hyperthermia and radiotherapy: A promising palliative treatment option for patients with recurrent, bulky tumors

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Aims
Bulky tumors represent a major challenge in cancer therapy. Due to significant hypoxic areas, systemic ther- apies and radiation alone are often of limited effectiveness. However, hyperthermia has shown to effectively target these hypoxic areas in bulky tumors. We combined deep radiative hyperthermia with radiation ther- apy (dHT+RT) as a palliative treatment option for patients with uncontrolled, recurrent bulky tumors aiming to increase treatment response.

Methods
All patients treated in a palliative intent at our institution with dHT+RT with (i) 16x2.5Gy, (ii) a GTV larger than 200cc and (iii) at least one diagnostic follow-up CT were included. Patient and treatment characteristics, toxicity and follow-up CT data for radiologic tumor volume assessment were analysed.

Results
From 08/2022 until 03/2024, nine patients were included with a median age of 59 years (range 56-80) and an ECOG of 0-2. The most prevalent tumor type was soft tissue sarcoma (5 out of 9 cases), with all tumors lo- cated in the abdomen or pelvis. Mean pretreatment GTV volume was 1464cc (range:215-5169cc) and 17.7cm (range:6.4–25.6cm) in diameter. Several patients (4/9) had at least two previous systemic treatment lines. Based on volumetric assessment during a median CT follow-up time of 7 months (range 1-11 months), seven of 9 pa- tients (77%) achieved a tumor volume reduction of 40% or more. Mean tumor volume reduction was 53% (range 5.2%-100%). Two soft tissue sarcoma patients with an initial tumor volume of 3102cc and 5169cc, showed only a volume reduction of 20% or a tumor progression requiring systemic treatment, respectively. There was no treatment-associated grade 3/4 toxicity. The median number of dHT sessions was 6 (range 3-7).

Conclusion
With a well tolerated dHT+RT schedule, we observed in most of our cases with recurrent either radio-resistant or highly pretreated bulky tumors a significant tumor volume reduction of at least 40% or more during the CT follow-up time. Despite limitations in case numbers, short follow-up time and heterogeneous tumor entities, the results are promising. We suggest to expand this analysis to a retrospective multicenter study within the Swiss Hyperthermia Network and to compare its results to a historic control group treated with RT only.

P-16 MRI-based characteristics of pelvic lymph node metastases as prognostic indicators in stage IIIC1 cervical cancer.

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Aims:
Stage IIIC1 FIGO 2018 remains a heterogeneous cohort not considering number or morphology of metastatic lymph nodes. We assessed the prognostic value of MRI-based radiological features of pelvic lymph node metas- tasis (PLNM) in this patient group.

Methods:
A total of 371 patients with cervical cancer were treated with radiotherapy between 2011 and 2022. Of these, 117 patients were staged as IIIC1 after re-classification according to the FIGO 2018 system. PLNM were staged either radiologically, with sentinel lymph node biopsy or pelvic lymphadenectomy. Treatment encompassed definitive chemo-radiotherapy to the pelvis with simultaneously integrated and sequential boost to positive lymph nodes, followed by brachytherapy to the primary. Patients not adhering to the treatment or without pre-therapeutic MRI were excluded, resulting in 96 patients eligible for analysis. Pelvic lymph node features such as presence of central necrosis, diameter of largest lymph node and overall number of PLNM were retrospectively reviewed on the pre-therapeutic MRI by an experienced radiologist and according to the Guidelines of the European Society of Urogenital Radiology.

Results:
Median follow-up was 3.4 years. Three-year DFS and OS were 60 % and 67.8 %, respectively.
Higher number of visible PLNM (>2) was associated with shorter DFS and OS in univariate analysis (UVA), main- taining a trend in multivariable analysis (MVA) (DFS-UVA: p=0.01; DFS-MVA: HR 1.82, 95%-CI [0.89-3.7], p=0.1; OS-UVA: p<0.01; OS-MVA: HR 2.1, 95%-CI [0.94-4.49], p=0.07).
Central necrosis was significantly associated with shorter DFS and OS in UVA, and showed a trend in OS (DFS- UVA p=0.04; DFS-MVA HR 1.6, 95%-CI [0.7-3.8], p=0.26; OS-UVA: p<0.01, OS-MVA: HR 2.38, 95%-CI [0.98-5.75], p=0.06). Similarly, larger short-axis diameter of PLNM (>1.5 cm) was associated with shorter DFS and OS, but did not show significance in MVA.
Pelvic lymphadenectomy was not associated with improved DFS or OS compared with sentinel lymph node biopsy (DFS-UVA: p=0.17; OS-UVA: p=0.29).

Conclusions
MRI-based radiological features might have prognostic value for outcomes of patients diagnosed with stage IIIC1. However, only trends were observed in the adjusted analysis of this cohort. Thus, further studies with larger sample sizes and refined imaging criteria are warranted to stratify this group of patients.

P-17 Benefit and feasibility of planning with reduced margins in daily adaptive proton therapy (DAPT) treatments

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Aims
Daily adaptive proton radiotherapy (DAPT) offers significant advantages by directly addressing inter-fractional anatomical and positioning variability, enabling more precise dose conformity to the target volume and reduc- ing the irradiation of normal tissues. However, optimal margin settings for DAPT remain unknown. This study investigates the extent to which margins can be reduced while maintaining predefined target coverage.

Methods
We included five patients previously treated with DAPT, with planning and daily CTs acquired during their treatment. The clinically delivered DAPT plans were optimized with a conservative CTV+4mm margin. Retro- spective calculations were performed using a hybrid robust optimization approach with a 3% range robustness setting on targets with different margins (CTV+1mm, CTV+2mm, CTV+3mm). Three different DAPT treatments were simulated by re-optimizing the plans with these margins settings on the daily anatomy. These new DAPT treatments were compared to a non-adaptive approach (plans recalculated on daily anatomy) and the clinically delivered DAPT treatment, both considering a conservative margin approach, i.e., CTV+4mm.

Results
All daily adapted treatment plans on reduced margins fulfilled the predefined prescription and clinical goals in terms of V95% target coverage, e.g., showing less than 1.5% and 1.6% coverage reduction for GTV and CTV for the most advanced plan optimized with a 1mm margin, respectively. Critical organs-at-risk (OARs) doses showed substantial sparing, with reductions for the chiasm (-6.1% to -13.5%), left optical nerve (-2.0% to -6.2%), and right optical nerve (-5.6% to -9.8%) across the 3mm, 2mm, and 1mm scenarios, respectively. Notably, sig- nificant reductions were observed in single cases for the left optical nerve (-14.5% with 3mm) and the chiasm (-22.1% with 2mm and -34.6% with 1mm). The difference in integral dose, compared to conventional treatment simulation, achieved on average 1.8%, -5.7%, and -11.7% for the 3mm, 2mm, and 1mm scenarios, respectively. In summary, the results indicated that all daily adapted treatment plans with reduced margins met the predefined prescription and clinical goals for V95% target coverage and doses to OARs.

Conclusions
In conclusion, reducing margins in DAPT spared critical OARs while maintaining target coverage, supporting the potential clinical benefits of this approach.

P-18* Impact of a post-simulation therapy room visit on patient anxiety in radiotherapy: feasibility study

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Aim
Patients often experience various socio-emotional stresses, most notably anxiety, which can be exac- erbated by a lack of understanding of the treatment and its process. This study explores the feasibility of a post-simulation visit to the control and treatment room. Objectives include measuring recruitment and reten- tion rates, gauging participant acceptability and satisfaction with the intervention, as well as evaluating its feasibility.

Method
Conducted in the radio-oncology department of Fribourg Cantonal Hospital, this study employed a quantitative case study approach involving 20 adult patients diagnosed with primary cancer scheduled for cu- rative radiotherapy. The cancer sublocation included 9 breast, 5 prostate, 2 anal canal, 2 esophagus, 1 rectum and 1 uterine. Data collection focused on recruitment and retention rates, intervention reproducibility, and re- sources mobilization. Patient acceptability and satisfaction were assessed using a questionnaire, while a second questionnaire evaluated the feasibility of the intervention from the perspective of RTTs (Radiation Technolo- gists).

Results
High recruitment and retention rates were observed, alongside positive patient acceptability and sat- isfaction. In terms of resources, the implementation of the intervention required a low investment and a short duration. The overall feasibility outcome from the perspective of RTTs is positive, although this score did not reach the level observed in a previous study.

Conclusion
The findings of this study carry potential implications for clinical practice and enhancement of the patient radiotherapy experience, actively incorporating the role of RTTs. Future research could include randomized clinical trials with control groups and standardized anxiety assessment. Qualitative surveys would provide a deeper insight into the acceptability and feasibility of the intervention from both patient and RTTs perspectives.

P-19* Hypofractionated radiotherapy for tumors near the brachial plexus: a single-institutional experience

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Aims
This single-institution analysis evaluates subjective and objective outcome following ultrahypofractionated ra- diotherapy using a simultaneous boost (uhRT-sib).

Methods
31 pts with 3 primary (9.7%) and 28 metastastic (90.3%) tumors near or in contact with the brachial plexus (13x Adeno-Lung, 41.9%; 10x Adeno-Breast, 32.3%; Others, 25.8%) were treated with uhRT-sib (33/24 Gy in 6 fractions) between 03.2022–06.2024. Pts were reassessed post-treatment and during follow-up (FU). Objective response included GTV measurement in FU-CT scans, brachial plexopathy (pain, sensibility, weakness) was graded per CTCAE. Subjective response was categorized as symptoms improvement/stability/worsening.

Results
19/31 tumors (61.3%) had direct contact with the plexus (tangential (9), semicircular (2) or circular (8) infiltra- tion/encasement). 12/31 (38.7%) tumors showed no direct contact. The plexus mean/median D0.03cc was 31.1/32.1 Gy (24.4–34.5), the mean/median PTV33Gy overlap with the plexus was 1.9/0.22cc (0–25.5).
After a mean/median FU of 4.6/3.2 months (0.2–24.3), 20/31 pts (64.5%) were still alive. PROMS were avail- able from 29/31 pts (93.5%): 11/29 (38%) no change/benefit, 18/29 (62%) improvement/size reduction after mean/median 25.7/8.5 days.
17/31 pts (54.8%) initially exhibited pain, plexopathy or both: 10x pain (58.8%: 7x G1, 3x G2), 1x plexopathy (5.9%: 1x G1), 6x both (35.3%: 3x G1, 3x G2). After a mean/median of 24/8 days after RT start, 6/10 pts with pain (60%) improved: CR (G0) in 3/7 pts with pain G1 (42.9%), 3/7 pts (42.9%) had persisting mild pain (G1), 1 pt (14.3%) was lost in FU. 3/3 pts with G2 pain improved to mild pain (G1). 1/1 pt (100%) with neuropathy experienced CR (G0). Each 2/6 pts with both sy (each 33.3%) had CR, persisting G1 and G2 sy. Subjective improvement was achieved in 14/17 symptomatic pts (82.4%) after mean/median of 25/8 days.
Imaging-FU was available from 22/31 pts (71.0%): 18/22 with radiological regression (81.8%), 2 each with sta- ble (9.1%) and progressive disease. The mean/median GTV volume decreased from 65.9/34.0cc (4.8–381.6) to 32.8/8.8cc (0–210.9) after mean/median 5.9/5.2 months post uhRT-sib. No significant long-term toxicity (G1-G3) was reported.

Conclusions
The used uhRT-sib regime resulted in 82.4% subjective symptom improvement and 81.8 % objective radiological tumor regression, with no severe long-term side effects reported to date.

P-20 Integration of electronic documentation and evaluation of radiation-induced toxicity and patient-reported outcomes into daily practice.

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Aims
Radiation-induced toxicities should be recorded and evaluated according to common toxicity criteria for ad- verse events (CTCAE) to optimise clinical practice. Furthermore, it is recommended to integrate patient related outcomes (PROs) and to adapt data infrastructures with electronic PRO (e-PRO) systems to ensure PRO data can be better responded to in real time[1]. To address these unmet needs, we developed an in-house solution for CTCAE evaluation and acquired a commercial e-PROs software (Noona, Varian) that interface with our clinic information system (ARIA, Varian).

Methods
A software program was written to graphically represent the CTCAE toxicities recorded in ARIA by the doctors at baseline, at end of radiotherapy and at follow-up according to our schedule. The novelty of this work is the extraction of the existing data from the database and combination in a normalized query using SQL language. With the help of a Business Intelligence (BI) tool, the structured data from the SQL query can be displayed in different views. Noona was integrated by creating Noona-labelled activities in the ARIA carepaths to activate the electronic mailing of organ-specific (e.g. EORTC) quality of life questionnaires prior to appointments, in addition to the Noona symptom questionnaires. Patients can also use Noona to alert the team to changes in symptoms in real time.

Results
Interactive frequency histograms of toxicity grade according to ICD code and toxicity were generated using the BI tool. We evaluated 2572 data entries by 11 doctors for 116 patients with prostate cancer in the first 6 months. There were 4 grade 3 toxicities at the end of RT. 1 case of diarrhoea resolved by 3 months. Of 3 cases of erectile dysfunction at 3 months, 2 were present prior to RT, thus there was 1 new grade 3 toxicity, possibly due to androgen suppression. Uptake of Noona has been high (8/8 patients 4 weeks after going live) and is actively used by registered patients and monitored by the team.

Conclusion
We have successfully developed a toxicity evaluation tool and integrated this, along with an e-PRO software, to inform and optimise our practice.

Reference
1. https://www.europeancancer.org/resources/365:time-to-acclereate-proms-oncology.html

P-21 The importance of the season of biopsy on the Gleason score on biopsy- does exposure to sunshine have an influence?

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Introduction
Shift workers are at increased risk of developing prostate cancer. The circadian clock is strongly influenced by the sun exposure and prostate cancer has been shown to be inversely proportional to it. Montreal, Canada shows large variations in sunshine throughout the year. We investigated whether prostate cancer aggressive- ness differs over the months during or following potentially longer exposure to sunlight.

Introduction and Objective
We analyzed our institutional database of patients treated with primary radiotherapy for localized prostate cancer. We investigated whether the month where diagnostic biopsy was performed was associated with a more frequent diagnosis of a primary Gleason score (pGS) of 4 or 5. The average sunshine in Montreal from May to August is >220h/month whereas it is <140h October-February. We grouped the months of biopsy into quarters: Q1, January – March; Q2, April – June; Q3, July – September; and Q4, October – December. Multivariable logistic regression was used to predict a pGS of 4, adjusted for age and whether the year of biopsy was before or after 2005 (year where ISUP changed the attribution of certain patterns).

Results:
A total of 3447 patients' charts who underwent radiotherapy alone were available for analysis. The biopsies were performed between 1995 -2023. There were significantly (p=0.027) fewer biopsies with pGS 4 in Q4 (19%, n=171/900) than in Q1-3 (22.9%, n=651/2847). Age, PSA level, and the number of positive biopsies were not significantly different between Q4 vs. Q1-3. In multivariate logistic regression analysis, a biopsy in Q4 was significantly predictive of a lower risk of pGS 4 (OR 0.77, 95%CI 0.63-0.93, p=0.007) and older age (OR 1.09, 95%CI 1.07-1.10, p ≤ 0.001), but not if the patient had a biopsy after 2005 (p=0.76).

Conclusions:
We found that patients biopsied during the last three months of the year (Q4) had a 23% lower risk of a pGS 4 on diagnostic biopsy than those biopsied during the previous nine months. The fact that these three months follow the months with the most sunshine in the year is not a proof of causality. Other unknown causes and undetected biases should be considered.

P-22 Magnetic resonance guided stereotactic reirradiation in locally recurrent prostate cancer: A series of cases

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Aims
Reirradiation of prostatic bed (PB) for prostate cancer (PC) local recurrence is an emerging challenge for current radiotherapy. Salvage Stereotactic Body Radiotherapy (re-SBRT) delivers high doses, with curative intent and Magnetic Resonance guided Radiation Therapy (MRgRT) allows an accurate online adaptive workflow through enhanced soft tissue contrast. This monocentric retrospective analysis evaluates the feasibility and efficacy of PB re-SBRT, using an Elekta 1.5T MRI linear accelerator (MR-Linac).

Methods
Patients with local recurrences of PC in PB proven by PSMA PET-CT and treated with re-SBRT at our institution between January 2020 and June 2022 were retrospectively collected. They were treated by radical prostatectomy and had salvage external beam radiotherapy of the prostatic bed (70 Gy) for biochemical recur- rence. Prior to re-SBRT, the mean increase of PSA level was 3.64 ng/ml. Taking into account the re-irradiation, the dose constraints were V25Gy < 0.03cc for the rectum, V27Gy < 5cc for the bladder and V25Gy < 10cc for the bowels. Care was taken not to exceed a maximum (EQD2/α/β = 3Gy) given to the rectum, bowels and bladder of 100Gy. SBRT plan was computed with the Monaco treatment planning system. We report dosimetric param- eters, toxicity according to CTCAE v 5.0 and treatment response were assessed at the end of treatment and at follow-up.

Results
Four patients were included in this analysis. Selection of total re-SBRT dose (5×5, 5×6, or 6×6 Gy) was based on dose-limiting toxicity. Daily dosimetric readaptation was performed, according to real-time MRI imag- ing. The median follow-up was 38 months. None of the 4 cases experienced acute or chronic gastrointestinal (GI) toxicity or acute (genitourinary) GU toxicity. Chronic GU toxicity was at maximum grade 2 for a single patient, requiring medical management and resolving 3 months later.

Conclusion
There is no standard treatment for patients with local recurrence after initial PB radiotherapy. The online adaptive planning workflow and the high definition of MRI treatment images allow accurate delivery of SBRT to PTV while efficiently sparing organs at risk (OARs). Re-SBRT using the MRI-Linac system with daily dosimetric adaptation appears to be a promising tool without major urologic or rectal complications.

P-23 First experience with adaptive pelvic radiotherapy

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Introduction
The Varian Ethos system allows for on-treatment-table plan adaptation with the aid of artificial intelligence and automated contouring. Herein, we report our first experience with this system.

Methods
We analyzed the first 19 patients treated from October 2023 to February 2024 for primary or recurrent prostate cancers or cancer of the bladder and urethra. We calculated the time from CBCT use for adaptive planning to the choice of treatment plan as an indicator of the learning curve. Total treatment time was calculated from the first CBCT scan used for replanning until the end of the treatment. Patients whose seminal vesicles were treated in addition to the prostate were considered to have 2 different PTVs. Patients with positive lymph nodes were considered to have separate PTVs. To analyze, whether the order of patients treated correlated with the time until a treatment plan was chosen, we used the Spearman's rank correlation test.

Results
In total, 391 treatments were administered. Patients received a median of 20 (range 5-33) treatments. Mean time from the first CBCT scan to the choice of the treatment plan was 17.2 min (SD 6.1). It did not correlate with the order of patient treatment (p=0.4). The mean duration of treatment was 26.6 min (SD 7.7). The number of separate PTVs was 3 in 10 patients, 2 PTVs in 5, and 1 PTV in 4 patients. The number of PTVs strongly correlated with the mean and median treatment duration (r=0.86, p<0.001). The mean treatment duration was 19 min (SD 2.5) for 1 PTV, 22 min (SD 2.3) for 2 PTVs, and 30 min (SD 3.6) for 3 PTVs, and was not correlated with the order of patient treatment (p=0.4).

Conclusion
In the first 19 patients treated with the Ethos adaptive treatment, we found that the delay from the first CBCT scan to the end of treatment depended strongly on the number of separate PTVs and ranged from 19-30 to min. Time elapsed to choice of treatment plan did not seem to decrease with the order of the patients treated, showing that diligent preparation before starting adaptive treatments is essential.

P-24*

Acute and Chronic Adverse Events of Hypofractionated Radiotherapy for Localized Prostate Cancer: A Retro- and Prospective Analysis

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Aims
Large randomized controlled trials (RCTs) showed noninferiority of hypofractionated radiotherapy compared to conventionally fractionated radiotherapy for localized prostate cancer. The aim of this study was to analyze the adverse events and outcomes of hypofractionated radiotherapy in a real-world setting.

Methods
A cohort of 81 men with localized prostate cancer (cT1-cT3b cN0 cM0) who had hypofractionated radiotherapy (Total Dose (TD): 60 Gy or 63 Gy; Single Dose (SD): 3.0 Gy) between 09.2018 and 04.2021 was retrospectively examined based on electronic patient records. The adverse events were determined based on the “Common Terminology Criteria for Adverse Events” (CTCAE v5.0, 2017) grading system. Furthermore, a quality-of-life questionnaire (EPIC-26) was sent out to the patients once after completion of treatment.

Results
Median Age (range) was 75 (61-86) years and median follow-up was 31 (22-38) months. Overall survival (OS) after 3 years was 89.9% (95% CI 78.2-95.5) and the progression-free survival (PFS) after 3 years was 91.1% (95% CI 77.8-96.6). Median Androgen Deprivation Therapy (ADT) duration was 6 (0-18) months. Irritative cystitis CTCAE Grade ≥2 was 38.8% in the acute phase and 8% in the chronic phase. Proctitis CTCAE Grade ≥2 was 22.5% in the acute phase and 17.9% in the chronic phase. Direct comparison showed a statistically significant higher chronic incidence (25% vs. 4.3%; p=0.046) of proctitis in patients who received a TD 63 Gy compared to 60 Gy. Median EPIC-26 questionnaire scores were 100 (87.5-100) for the Urinary Incontinence Domain, 95 (85-100) for the Urinary Irritative Domain, 87.5 (79.2-100) for the Gastrointestinal Domain, 16.7 (8.3-44.5) for the Sexual Domain and 85 (75-95) for the Hormonal Domain. The EPIC-26 questionnaire return rate was 55.6%.

Conclusion
Observed rates of OS, PFS and adverse events correspond to current literature. Rectal toxicity was significantly increased by dose escalation. Dose escalation must be limited to aggressive cancers carrying a higher potential of local failure.

P-25*

Influence of recurrence frequency and recurrence pattern on survival and post-therapeutic progress in patients with primary head and neck cancer after definitive chemoradiotherapy or adjuvant radio- (chemo-) therapy

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Aims
Squamous cell carcinoma of the head and neck (HNSCC) has been a very common malignancy in the last years. All treatment options show a similar, but still very limited outcome in terms of long-term survival. The aim of this study was to analyse patterns of recurrences in patients with HNSCC treated with Radiotherapy and/or Chemoradiotherapy and generate a map showing the regional distribution of recurrences. Furthermore, we aimed to find out if some tumour and patient characteristics increase the risk for recurrence, to make future Radiotherapy more aggressive, i.e. by individual radiation dose mapping.

Methods
Eligible were all patients with histologically proven HNSCC treated between January 2014 and December 2019 at University hospital of Basel with a curative intent. Radiotherapy had to be part of the therapy. All analysis has been done retrospectively. We performed a subgroup analysis to look for correlations between the cancer treatment and the findings of the tumour recurrences. As endpoint we defined death and occurring of recur- rence. The association of tumour stage with locoregional and overall recurrence is assessed using a univariable logistic regression model.

Results
197 patients were analysed. Stage IV is the most frequent UICC-Staging for all patients. The 2-year overall survival was 76%, the 5-year overall survival 62%. 16 regional recurrences occurred in total. Most of the recur- rences occurred in the level II, level III and level IV lymphnode levels. The 2-year recurrence-free survival was 83%, the 5-year recurrence-free survival was 74%.

Conclusions
In our analysis the side of the primary affected lymphnodes showed a more significant prognosis for the oc- currence of regional recurrences than the side of the primary tumour. These recurrences occur in areas with a mean dose of 64 Gray, as foreseen by the treatment planning process. Therefore, a decrease in regional re- currences may only be achieved by a higher dose of radiotherapy or/and chemotherapy, which also requires the acceptance of more overall and severe adverse events. In our study, we have a similar overall survival rate although we have more of a mix of early and late stagings compared to literature.

P-26* Preoperative ultrasound and core needle axillary lymph node biopsy in breast cancer patients: reliability and false positive/ negative rates in a board-certified breast cancer center

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Aims
In the treatment of breast cancer and lymph node metastases, there is an increasing trend towards minimally invasive approaches. Patients with non-suspicious axillary lymphnodes usually undergo sentinel node biopsy during breast conserving surgery. We aimed to assess the accuracy of pre-operative axillary ultra- sound in the investigation of lymph nodes as well as the accuracy of preoperative axillary lymph node biopsy.

Methods
Axillary ultrasounds and lymph node core needle biopsies of 1380 patients treated for 1426 carci- nomas between 2019 and 2020 were retrospectively analyzed for their nodal status. All patients underwent ultrasound. 284 patients underwent lymph-node biopsy. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated for both ultrasound and lymph-node biopsy in compari- son with postoperative lymph node histopathology as the gold standard. Potential associations between nodal status and tumor characteristics such as molecular subtype, tumor stage, and hormone receptor status were analyzed.

Results
Regarding preoperative ultrasound we calculated a sensitivity of 46.2% and specificity of 96.1% in detecting lymph-node metastasis. The sensitivity and specificity of lymph node biopsies was 95.1% and 100%, respectively. The negative predictive value of lymph node ultrasound was higher for pT1 cancers than for higher tumor stages.

Conclusions
Axillary biopsies validate the sonographic findings. Combining both methods can help avoid unnecessary invasive procedures in the treatment of breast cancer.

P-27 Left breast cancer radiation therapy: heart dosimetry with Radixact system compared to DIBH

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Aim
Irradiation of left-sided breast cancer is well-known to improve local control and overall survival, but also in- creases the risk of late ischemic cardiac events. This study evaluates heart dosimetry obtained with the Accuray optimizer VOLO™Ultra for the Radixact system at Clinica Moncucco in Lugano and compares with published data for the Deep Inspiration Breath Hold technique (DIBH).

Methods
Left breast treatments were randomly selected, with both direct (TD) and helical (TH) techniques, using standard- (50 Gy/25 fx) and hypo-fractionation (42.4 Gy/16 fx). Required coverage to the target and constraints to organ at risk (OARs) were based on both international and internal guidelines.

Results
A sample of 66 treatment plans included 59% TD (41% TH), and 56% hypo-fractionated (44% standard). Beam-on- time was 168.8±26.5 sec for TD and 400.6±74.7 sec for TH. D_{mean} covering the target was 99.5±0.4% and 99.9±0.5%, $V_{95\%}$=96.1±1.7% and 95.9±1.4%, $V_{107\%}$=0.2±0.3 cc and 0.4±1.1 cc for TD and TH, respectively.
Generally, TD gave lower mean dose and higher near-maximum dose to heart and substructures. Considering the two techniques and fractionations together, referring to DIBH dosimetry reported in Wolf et al. (2023), the heart D_{mean} ranged between 1.0 and 2.0 Gy and was comparable to DIBH value 1.3 [0.5-3.6] Gy. Similarly, the near-maximum dose $D_{0.03cc}$ was between 20.0 and 29.9 Gy including the DIBH value D_{max}= 21.2 [3.6-56.0]. Dosimetry to LAD was slightly higher than the reported DIBH value but was within its range (4.3≤ D_{mean}≤ 5.0 Gy versus 4.1 [1.2-33.3]), while the $D_{0.03cc}$ varied between 12.6 and 17.4 Gy, including the DIBH value of 16.3 [2.1- 55.2] Gy. For the left ventricle, D_{mean} ranged between 1.2 and 1.8 Gy, consistent with the DIBH dose 1.5 [0.6-4.5] Gy, and 10.6 ≤ $D_{0.03cc}$ ≤ 18.4 Gy includes the DIBH value 11.2 [2.1-54.1] Gy.

Conclusion
Dosimetry to the heart and its substructures is largely comparable with that reported in the literature for DIBH (Wolf et al.). TD and TH treatments in free breathing may be a good alternative to DIBH when it is not possible, especially performing surface guidance in set-up and monitoring during the therapy.

P-28* Is there a clinical consequence of CTV omission in SBRT of NSCLC?

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Aims
The use of CTV margins for lung-SBRT is not standard practice due to historically high local control (LC) rates and concerns for toxicity. However, comprehensive data evaluating the necessity of defining a CTV are lacking. We analyzed LC in patients treated with lung-SBRT and its association with dose coverage in a hypothetical CTV margin.

Methods
This retrospective study included 126 patients (median age: 72; range: 53–89) with 140 pulmonary lesions treated with histopathologically confirmed (46%) or clinically diagnosed (54%) primary lung cancer. Patients with a BED < 100 Gy were excluded. Most patients had stage I (70.6%) and stage II (17.5%) NSCLC. Hypothetical CTVs (hCTV) were generated with a margin of 6 mm for squamous cell carcinoma and 8 mm for adenocarci- noma or clinical diagnosed lesions. The hCTVs were expanded to hypothetical PTVs (hPTV). GTV was subtracted from hCTV to generate a ring structure (rCTV) representing the hCTV- margin. For statistical analysis, DVH parameters of the original target volumes, the hypothetical target volumes and the ring structure were used. Local failure was defined based on pathology reports, where available, or alternatively, on multidisciplinary tumorboard decision based on imaging.

Results
SBRT was performed with a median BED of 124 Gy (range: 100 Gy – 151 Gy). After a median FU of 22 months, median OS was 42 months for stage I and 19 months for stage II NSCLC. 3-year LC rates were 83.3%, 80.5%, 66.9% and 71.0% for lesion diameters ≤ 10 mm, 11–20 mm, 21–30 mm and ≥ 31mm, respectively. Coverage by BED ≥100 Gy (α/β= 10 Gy) in the initial PTV was 98.8%. Univariable (HR 0.97, 95%-CI 0.95 – 0.99, p=0.002) and multivariable analysis (HR 0.94, 95%-CI 0.91–0.97, p<0.001) demonstrated a statistically significant association between the percentage of rCTV receiving BED ≥100 Gy and LC rate, but not with any other original or hypothetical volumes. Conclusions:
Our results demonstrate a correlation between tumor size and LC. Additionally, we could demonstrate a sta- tistically correlation between BED ≥100 Gy coverage in the rCTV and LC, suggesting that the omission of CTV margins may negatively influence LC in lung-SBRT.

P-29 Dosimetric advantage of adaptive pelvic radiotherapy for prostate cancer

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Introduction:
We investigated which patients could potentially benefit the most from adaptive radiotherapy for prostate cancer.

Methods:
After having gained sufficient experience with 18 patients with the Varian Ethos system, we compared the dosimetry of the adapted plan to the original treatment plan in the four subsequent patients. Patients were treated from March to April 2024 for primary or recurrent prostate cancer.
After, the first CBCT was performed for the treatment plan choice, radiation therapists adjusted the contours of organs at risk. Following this, radiation oncologists adjusted the CTV, and the treatment system created an alternative treatment plan, called the adaptive plan. This plan was compared to the original treatment plan and the best plan was selected. The time from the first CBCT scan to the choice of treatment plan was measured. D98% was analyzed for the CTV and PTV. We calculated the treatment time as the time from the CBCT scan to the end of the treatment.

Results:
We analyzed 73 treatments (range 14-25) in four patients. There were 2,3,4 and 4 different CTVs that minimally included the prostate/prostatic bed as well as the elective lymph nodes, and could additionally include the semi- nal vesicles and radiologically positive lymph nodes. The median treatment time ranged from to 21-34 minutes, depending on the number of CTVs. For all but one treatment, an adaptive plan was chosen. The presence of rectal air was noted individually in 19-87% of the treatments. An improvement of ≥5% in the D98% of the PTV and CTV (calculated together) between the original and adaptive plans was observed in 10-35%. This improve- ment was much smaller for patients with two (13%) and three (10%) different CTVs than for patients who had 4 CTVs. These patients had an improvement of ≥5% in 28% resp 35% of both the CTV and PTV

Conclusion:
After gaining sufficient experience with the adaptive system, we found, that the largest benefit of adaptive planning was seen in patients with four distinctive CTVs. However, even in patients with only 2 CTVs, the difference in dosimetry was important enough to justify the use of adaptive treatment.

P-30 Dose escalation to 54 Gy in rectal adenocarcinoma patients using Elekta's Unity MR-Linac is safe and feasible

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Aims
Dose escalation trials in rectal cancer up to 54 Gy have shown improved outcome. MR Linac Unity's precise imaging and adaptative planning further facilitates dose escalation. We aimed to evaluate the feasibility and safety of sequential MR rectal boost up to 54 Gy.

Methods
Radiotherapy was delivered in two phases: 45 Gy in 25 fractions to the rectum and pelvic nodes with an SIB of 50 Gy to gross disease on Versa HD (Elekta) using VMAT followed by a sequential boost of 4 Gy in 2 fractions delivered to residual gross disease, by IMRT on Unity MR-Linac (Elekta). Target volumes were defined as per RTOG guidelines. The following dose constraints were applied: sigmoid Dmax < 54 Gy, bowel V40Gy< 200cm^3 and Dmax < 54 Gy, cauda equina Dmax < 50 Gy.

Results
Ten patients received dose escalated radiotherapy up to 54 Gy. All patients received concurrent capecitabin, five of whom had prior induction chemotherapy by FOLFOX. All aforementioned dose constraints were respected, 95% of the dose was delivered to at least 98% of the volume as per institution guidelines. Adapt to Position (ATP) was used for all patients except for one who received Adapt to Shape (ATS) for one fraction. Mean duration of ATP was of 18 min, and 30 min for ATP. Treatment tolerance was comparable to standard rectal irradiation: patients presented G1-2 dermatitis, G1-2 gastrointestinal toxicity and G0-2 urinary toxicity. Patients underwent MRI, PET and rectoscopy restaging on average 56, 68 and 113 days after radiotherapy. At time of analysis, mean follow up was 16 months. One patient presented partial response and underwent APR 151 days after completing radiotherapy. One patient presented distant metastasis 69 days after completing treatment. All other patients presented radiological CR and/or biopsy proven pCR and benefited from a "watch and wait" attitude.

Conclusion
Sequential rectal boost up to 54 Gy on Unity MR-Linac is safe and feasible. This escalation is suf- ficient to produce and maintain CR in 80% of patients 16 months after treatment, cancelling the need for a potentially morbid rectal surgery. Further dose escalation to 60 Gy is under evaluation.

P-31 Kidney oligometastases management using 1.5 T MR-guided and daily adapted SBRT

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Aims
To assess the feasibility of Stereotactic Body Radiotherapy (SBRT) using the Elekta 1.5T MRI linear accel- erator (MR-Linac) for the treatment of kidney metastasis in 2 patients with oligometastatic lung carcinoma.
Patients & Methods: Between August 2022 and June 2023, 2 patients with isolated clinical/radiological lo- cal progression in the kidney, confirmed by biopsy and FDG PET-CT, received SBRT. The age of patients was 64 and 60 year-old. The first patient was initially treated by the immuno-chemotherapy with carboplatin- pemetrexedpembrolizumab, followed by pembrolizumab maintenance. The second patient had a first line EGFR-targeted therapy by osimertinib, and at the time of progression a new endobronchial ultrasound biopsy showed a small cell neuroendocrine carcinoma transformation, treated by carboplatin-etoposide. Due to persis- tent right kidney metastasis, as confirmed by biopsy and after institutional Tumorboard decision, SBRT directed to the isolated kidney metastasis using the MR-Linac was offered. Dosimetric goals respecting organ at risk dose constraints were achieved. The SBRT plan was computed with the Monaco treatment planning system. We re- ported dosimetric parameters, acute and chronic toxicity according to CTCAE v 5.0 at 22 and 12 months after SBRT completion, for patients 1 and 2, respectively.

Results & discussion
A total dose of 40 Gy was delivered in 5 fractions to the isolated kidney metastasis volume in both patients. Four-dimensional CT scanning was used for treatment planning to account for respi- ratory motion. Treatment was delivered using the MR-Linac with daily dosimetric readaptation based on daily MRI imaging and real-time MRI motion monitoring. Neither patient experienced acute gastrointestinal (GI) or genitourinary (GU) toxicity. At 14 months post-SBRT, patient 1 did not experience chronic GI or GU toxicity. Re- nal function, as assessed by estimated glomerular filtration rate (eGFR) and serum creatinine level, remained unchanged after SBRT.

Conclusion & perspectives
While other local treatments such as cryoablation (CA) or radiofrequency ablation (RFA) exist, SBRT, particularly when using the MR-Linac, is an emerging noninvasive option that provides high- precision radiotherapy requiring few outpatient visits. It represents a safe and effective management option for isolated renal metastasis.

P-32 Hypnotherapy-Assisted Vaginal Brachytherapy: Overcoming Pain-Induced Treatment Barriers in Radiation Oncology

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Aim
Anxiety and pain are often significant challenges in radiation oncology, affecting both treatment deliv- ery and patient outcomes. While conventional pharmacological interventions are commonly used to manage these symptoms, they carry inherent risks and may not be suitable for all patients. Hypnotherapy, as a non- pharmacological intervention, has emerged as a promising approach to alleviate anxiety and pain in oncological settings. Here we report the case of a patient with severe vaginismus who was treated with vaginal brachyther- apy in conjunction with hypnotherapy.

Methods
A 63-year-old woman presented in August 2023 with postmenopausal vaginal bleeding 10 years after her last gynaecological examination due to a severe case of vaginismus. A complete gynaecological examina- tion under general anaesthesia, uterine curettage and pelvic MRI revealed FIGO IA endometrial adenocarci- noma. In September 2023, the patient underwent hysterectomy, bilateral salpingo-oophorectomy and sentinel lymph node biopsy, which revealed FIGO IIA endometrial adenocarcinoma with favorable pathological and ge- netic features; adjuvant brachytherapy alone was proposed after discussion in the onco-gynaecological tumour board. At the patient's initial consultation in the radio-oncology department, a physical examination was initially deemed impossible due to pain. However, with the aid of local xylocaine in the vaginal tract, acupuncture for relaxation and pain relief, and hypnosis administered by a trained radiotherapist, a clinical examination and measurements for vaginal brachytherapy were possible at a subsequent visit.

Results
Four weekly sessions of vaginal iridium-192 brachytherapy were administered, delivering a total of 20 Gy to the end of the vaginal canal (5 Gy per session). The patient inserted a xylocain wick intravaginally one hour before the procedure. She arrived 30 minutes prior to each session for initiation of hypnotherapy, which continued during treatment delivery.

Conclusion
This case report highlights the promising role of hypnotherapy in facilitating treatment in patients with pre-existing pain conditions such as vaginismus. The successful completion of the treatment illustrates its usefulness in a radiotherapy department, allowing a procedure that would normally require general anaesthesia to be carried out in a patient unable to tolerate even a speculum examination without heavy pre-medication.

P-33 Prognostic significance of mEPE score in intermediate risk prostate cancer patients undergoing ultra-hypofractionated robotic SBRT

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Objective
To evaluate the prognostic significance of MR parameters on biochemical failure free survival (BFFS) in patients diagnosed with intermediate prostate cancer and treated with robotic ultra-hypofractionated SBRT without ADT.
Methods/Material: We conducted a retrospective analysis of patients with intermediate risk prostate cancer. Robotic SBRT was delivered in five fractions with a total radiation dose from 35 to 36.25 Gray. Primary end- point was biochemical failure defined by the phoenix-criteria. Radiological assessment was conducted by both an experienced radiation oncologist and radiologist, with final scores being determined through mutual agree- ment. Among others, the assessment included T-Score, PIRADS, mEPE-score (multiparametic magnetic reso- nance imaging based extra-prostatic extension), and prostate volume. Moreover, clinico-pathological data, such as gleason-score and PSA-levels before and after radiotherapy, were collected.

Results
Between 2014 and 2023, 74 patients with intermediate risk prostate cancer were treated with robotic SBRT. None of the patients received androgen deprivation therapy. Median age at treatment was 72.2 years and median prostate volume was 47.8 cubic centimetre. Fifty four and 17 and patients were diagnosed with gleason score 7a and 7b, respectively. In total, 40 patients were classified with unfavourable intermediate risk prostate cancer according to AUA/ ASTRO/ SUO guidelines. Median follow-up was 2.5 years. A total of 12 (16.2
%) biochemical failures were reported, encompassing 5 intraprostatic recurrences and 7 recurrences involving lymph node and/ or distant metastases.
In univariate analysis, mEPE-score (score 5) and PSA-nadir (>1 ng/ml) were associated with lower BFFS. How- ever, in multivariate analysis, only PSA-nadir remained statistically significant, while mEPE-score showed a strong trend (PSA-nadir - BFFS: univariate: p=<.001, multivariate: p=0.02; mEPE - BFFS: p<0.001, multivariate: p=0.09). Furthermore, both factors were associated with lymph node or distant metastases in univariate analy- sis, while maintaining a trend in multivariate analysis (PSA nadir – metastases: univariate: p<0.01; multivariate: p=0.11; mEPE – metastases, univariate: p=0.01; multivariate: p=0.24).

Conclusion
Patients diagnosed with intermediate risk prostate cancer with high mEPE-score are more likely to experience biochemical failure after SBRT. Treatment intensification measures, such as short-term androgen deprivation therapy, should be considered.

P-34 5-year development of patient participation in healthcare communication with providers

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Aims
Epic®'s patient engagement platform MyChart® empowers patients to take ownership of their healthcare. It keeps patients connected to healthcare providers, allows them access to health records, and provides tools to manage their care. In this study, we examine the willingness of radiation oncology patients at both sites of Luzerner Kantonsspital (LUKS) in Lucerne (main site) and at Zuger Kantonsspital (ZGKS) in Baar (satellite) to open a MyChart account. Starting with Epic in daily clinical practice in September 2019, the patient portal MyChart was introduced in mid-2020.

Methods
The flexible reporting tool Reporting Workbench was used to examine data and trends related to MyChart par- ticipation in our department. Both sites were considered separately as the satellite at ZGKS represents an Epic island within a non-Epic environment at ZGKS.

Results
In the last quarter of 2020, 8.0% of patients with a consultation visit to the Department of Radiation Oncology in LUKS or ZGKS had a MyChart account. Their mean age was 56 years (range 26-88), compared to 66 years (range 19-99) for all radiation oncology patients in the fourth quarter of 2020. Due to the growing proportion of MyChart patients from 8.0% to 60.8% until end of June 2024, mean age increased over time from 56 to 64 years. No obvious difference in MyChart participation could be found between both sites at the end of 2020: 82 MyChart patients out of 950 patients who referred to LUKS (~9%) and 16 out of 275 (~6%) to ZGKS (p=0.165). However, the proportion of MyChart patients in Lucerne was significantly higher than at ZGKS as of 2021. This significance remains unchanged during the following years with Epic (p<0.05) by end of June 2024 (63.2% at LUKS versus 53.7% at ZGKS).

Conclusions
Although the proportion of MyChart patients has increased significantly over the years. there is room for im- provement and patient support in using this opportunity as communication or notification preferences can be individually configured. Assuming that continuous involvement of patients using MyChart is a substantial building block for patient-centered care, the results found are promising but remain a challenge, particularly for our satellite.

P-35 Is there an increasing need of conflict mediation in Swiss Oncology Departments?

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The Swiss Health Care system is in a turmoil. The challenges for all involved stakeholders are increasing. A healthy balance between finances and provided patient and staff quality is one keyfactor in a competitive en- vironment. To guarantee best patient care and secure critical staff positions within the department, conflicts must be resolved with high priority and with a long lasting, positive effect. These factors are relevant for conflict solutions a) within the department, b) amongst different departments and c) between the (political, strategic, operational) hospital leadership and the oncology department.

Material/Methods
We (as other institutions) offer the tool of group mediation as one option in complex conflict situation resolutions within a clinical department and a third party (within or outside the hospital). For the mediation, we propose a dual leadership of mediatiors (one lawyer, one health care staff), both with broad experience, within the Swiss Health Care system. The mediation follows the structures of mediation process (see literature). Mediation changes if one party withdraws, or stops completely if all involved parties withdraw from the mediation process. The mediation process stops also with a subsequent legal escalation. Mediators must not advise (e.g. as lawyers) one selected, former conflict mediation group in a subsequent legal conflict. Results: So far we mediated both major and minor group conflicts within the Swiss Health Care system (Hos- pitals, Medical Societies, Health Insurances). In an anonymous manner we will present and discuss the start, the process and the result of selected mediation processes. Key factors for a successful mediation, based on our preliminary experience, are: 1) Start separately, with each conflict party to discuss their interests and needs, 2) conduct at least 3 mediation rounds with at least 2 participants from each conflict party, 3) key decisions includ- ing responsabilities and f/u are agreed in written by all participants, 4) plan at least 3 f/u meetings to monitor the implementation.

Conclusion
Group Mediation in Swiss Health Care deserves a platform because it 1) Strenghtens the involved department (active decision management, self responsability) 2) Needs less resources 3) Minimises direct and collateral damage compared to a legal conflict solution.

P-36 Breast tumor bed irradiation using the 1.5T Unity MR-Linac

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Aims
Using MR-linac, better visualization of the tumor bed, organs at risks, and on-table adapted radiotherapy is possible. Interactions of secondary electrons within the magnetic field in particular air electron stream effect (ESE) and the electron return effect (ERE) should be considered. We wanted to assess clinical feasibility of breast tumor bed irradiation (BTBI) in 2 patients using Elekta 1.5T MR-linac.

Methods
Two women (73y and 70 y) with unifocal carcinoma NST of the left breast pT1b pN0 M0 G1 and micro-invasif carcinoma of the right breast pT1mi pN0 M0 G3, were treated by lumpectomy and SLNB. Tumor- bed boost was performed due to close margins and G3 respectively for patient 1 and 2. The clips had migrated and the tumor bed was not visible on the planning CT. 42.4 Gy in 16 fractions was delivered with a Elekta Versa HD linac on the whole beast and the boost of 10.6 Gy in 4 fractions on the tumor bed with the Elekta Unity 1.5T MR-Linac. In vivo dosimetry was performed using thermoluminescent dosimeters (TLD) placed on patient's chin and compared to the dose simulated by the treatment planning system.

Results
BTBI using the 1.5 T MR-Linac was successfully performed with a 7 MV photon IMRT step-and-shoot plan using a Monaco TPS. The MRI- guided radiotherapy allows better visibility of the tumor bed. Daily dosi- metric adaptation was done based on real-time MRI imaging. Using in vivo dosimetry, a dose of 4.3 mGy was measured at the level of the chin. The calculated dose with the 1.5T field was 5.5 mGy. The plan with 1.5T field showed a skin D2% of 7.11 Gy compared to 6.8 Gy without magnetic field. At the lung/ chest wall interface, the doses were respectively D2% 3.54 Gy and 3.91 Gy. The treatment was well tolerated. Dose from ESE and ERE were low and not associated with an increased risk of acute toxicity

Conclusions
Improving the visualization of tumor bed reduces irradiated breast tissue volume and therefore the risk of late treatment-related toxicity. This should open up prospects for partial breast irradiation in selected patients with this novel technology.

P-37 Impressive Tumor Volume Reduction in Fungating Bulky Breast Cancer Following Combined Palliative Radiotherapy and Hyperthermia: A Case Series of Two Patients

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Aims
The treatment of fungating bulky tumors of the breast is challenging. Based on a phase lll randomized study with locally advanced breast cancer patients treated with definitive radiotherapy (RT) (Overgaard, 2024), lo- cal control can be significantly improved by adding hyperthermia why we offered that to patients with bulky, fungating breast tumors.
Methods
All patients treated in our institution from 04/2022 until 06/2024 with fungating bulky inoperable breast tumors with (i)definitive HT+RT, (ii) an initial GTV larger than 200cc and (ii)at least one diagnostic follow-up CT at 3 months were included. Patient and treatment characteristics and CT follow-up data for tumor volume assess- ment were collected.

Results
Two patients fulfilled the inclusion criteria. A 36-year-old woman with a bulky (GTV 2946cc) fungating triple negative breast cancer tumor (cT4 cN3 cM1, stage IV) was treated with neoadjuvant chemotherapy with pacli- taxel and pembrolizumab wih insufficient response. Systemic treatment was stopped and palliative RT+HT with 39 Gy/13 fx was initiated. After observing an accelerated tumor shrinking, additional 20Gy/10fx were ap- plied to a total dose of 66Gy EQD2 (a/b3) concurrently with 10 HT sessions in total (A4000, Med-Logix, Italy) and followed by epirubicin. We observed a massive GTV reduction during RT+HT of 55% at 3 weeks after start of RT+HT, 88% at 12 weeks and 92% at 19 weeks. The other patient was a 78year-old woman with a hormonal receptor positive fungating inoperable breast tumor (GTV 216cc) with brain metastasis (cT4 cN0 cM1, stage IV). She was treated with palliative RT+HT with 52Gy/14fx (EQD2 50.4Gy) combined with 5 session hyperthermia (A4000, Med-Logix, Italy) and aromatase inhibitors. Again, we observed a fast GTV reduction during and after RT+HT of 91% at the 11 weeks follow-up CT and 95% on the 25th week. Both patients tolerated RT+HT well and subjectively reported improvement of pain, odor and quality of life.

Conclusion
In both patients with bulky fungating breast cancers we observed an accelerated tumor volume regression of about 90% within the 3 months after start of RT+HT. This combination seems to be an effective and well tolerated treatment option which can be considered in comparable patients.

P-38* Consequences of Successful Radiotherapy of an Extended Breast Cancer Metastasis to the Skull: A Case Report

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Aim
We here report the case of a young female patient who was treated in our clinic for a wide-ranging bone metas- tasis of the skull after being diagnosed with advanced breast cancer.

Method
In March 2024, a 43-year-old female patient was referred to the emergency room at the City Hospital Zurich with severe frontal headache and nausea, but without any focal neurological symptoms. The patient had noticed a retraction of the nipple on her left breast for more than four years, but she did not want to have this investi- gated further. Additional examinations finally revealed late stage breast cancer with metastases to lymph nodes, lungs and multiple bones. Specifically, prominent bone metastases were located in the left hemi cranium, in- filtrating the dura mater and causing midline brain displacement. The patient declined systemic therapy and opted for localized palliative radiotherapy. A regimen of 10 x 3 Gy was administered, including coverage of C2, accompanied by an oral glucocorticoid therapy.

Result
The initial symptoms completely vanished within three weeks after completion of the radiotherapy leading to cessation of the glucocorticoid treatment. The only side effect observed from radiotherapy was localized alopecia. Clinical examination and a follow-up CT scan revealed a complete loss of the protective skull dome at the frontoparietal cranium as a result of the excellent response to radiotherapy. Consequently, a cranioplasty was performed to repair the resulted wide-ranging skull defect.

Conclusion
This case report highlights an exceptional treatment response of the extended cranial bone metastasis to local irradiation, ultimately requiring a cranioplasty to protect the brain. The brief treatment time and the rapid tissue response and relief of symptoms are major advantages of radiotherapy compared to slower acting anti- hormonal treatments. Nevertheless, the combination of radiotherapy with long-term systemic therapies re- mains the preferred treatment approach whenever feasible.

P-39 Friedrich Dessauer (1881 –1963)- the end of a career in medical physics in Switzerland

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Introduction
Today, the Name Friedrich Dessauer is nearly forgotten however, his scientific, social, and political works make us proud of our specialty. He finished his career in Fribourg, Switzerland.

Methods:
We searched the internet and pubmed for information about Dessauer. We read books and articles written by and about him and went to the archives of the University of Fribourg.

Results
Dessauer's professional career began as a young professor and first chair of biomedical physics in Frankfurt in 1922. He was a technical inventor and established laws that dealt with the effects of radiation on cells. He postulated that dose-homogeneity was important for the therapeutic ratio and laid the foundations for the "Treffertheorie" or "hit-theory". In this theory, the effect of radiation is a function of the absorbed dose and the effect is a probability. Politically active as a devout Catholic, Dessauer was an early political opponent of National Socialism in the Reichstag. After the Nazis came to power, he was thrown into prison. Einstein tried to help him to escape Germany. He was able to leave Germany in 1934 for Istanbul, thanks to his appointment as director of a large institution. He built the modern Radiology and Biophysics Institute from the scratch. A recent article in the Journal of Radiotherapy and Oncology celebrated his important contributions to Turkish radiology. After his contract in Istanbul expired in 1937, he left for the small University of Fribourg in Switzerland. There, he wasn't able to continue his scientific research in radiology and radiation-oncology because of his radiation-induced squamous-cell carcinoma on the hand and the small financial resources at his disposal in Fribourg. He remained in Fribourg until his retirement in 1953. Dessauer wrote textbooks as well as political and philosophical books and attempted to bridge the gap between Catholicism and science.

Conclusion:
After the war he began to teach again in Frankfurt. In photos, Dessauer's radiation-induced skin changes on the face and hands were clearly visible. Towards the end of his life, he received many medals and honors for his achievements in Germany, some of them posthumously.

P-40 Dose prediction model-suggested planning objectives vs manual optimization for prostate cancer radiotherapy: a comparative study

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Aim
Auto-planning systems and dose prediction tools are increasingly used to reduce the iterative and expertise-dependent nature of manual planning. This study compares the performance of a dose prediction solution against standard manual-based plan optimization for prostate cancer VMAT planning.

Methods and Materials
The study utilized datasets from ten prostate cancer patients, each planned for a 20- fraction moderate hypofractionated VMAT using 4 SIB dose levels (48, 57.6, 60, and 67 Gy to the distal and proximal seminal vesicles, prostate, and intraprostatic dominant lesion, respectively). Baseline plans were generated with manual optimization (Varian Eclipse™ V16, Acuros dose calculation algorithm) using a 2 full arcs 6MV-FFF VMAT technique applying stringent in-house adapted dose constraints for organs at risk (OARs). Alternative plans were generated with the same beam configuration using model prediction-based planning objectives without human interaction (MVision AI Dose+ beta version, Finland).

Results
Target volume coverage was comparable between manual- and model-optimized plans, with D2% and D98% median dose differences less than 1 Gy, adhering to protocol-defined PTV dose constraints. The model- optimized plans demonstrated equivalent performance for rectum and penile bulb. Bladder dose optimization was similar for high doses but slightly less optimal for V25Gy (median difference of 4%), though still within protocol constraints. Model-optimized plans achieved lower mean doses to femoral heads by 1.5 Gy but showed less favorable dose profiles for urethra (5% difference for urethra V62.4Gy) and pudendal arteries (mean dose 11 Gy higher). The absence of these structures in the model led to exceeded local protocol dose constraints for these OARs, with model-optimized plans delivering a median of 100 more MU than manual plans.

Conclusions
The model prediction-based planning approach demonstrated the ability to generate high-quality prostate cancer VMAT plans, comparable to those achieved through manual optimization. Incorporating ure- thra and pudendal arteries into the model is expected to further enhance its performance. We see significant potential for time savings and reduction in inter-planner variability by adopting such technology. Future work will focus on quantifying these aspects, particularly the extent of time/human interactions saved in the planning process and the degree to which plan quality is standardized across planners.

P-41* Rethinking the Elective Target Volume: Assessing the Dosimetric Effect of Patient-tailored Elective Target Volumes in Patients with Unilateral Oropharyngeal Cancer

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Aim
This study investigates patient-tailored elective target volumes by selectively omitting lymph node levels (LNLs) associated with lowest risk of harbouring metastatic lymph nodes (LNs). The aim is to determine if a dosimetric benefit can be achieved by omitting the LNLs associated with the lowest risk of harbouring metastatic cancer.

Materials & Methods
In this retrospective study, 25 patients with unilateral oropharyngeal cancer were in- cluded for analysis. Two treatment plans were created. The first, a clinical plan, follows DAHANCA guidelines by excluding LNL Ib, and only including LNL IV in instances of malignant LNs. The second, a risk-based plan, utilises a probabilistic framework to calculate the likelihood of LN metastases, with risk probability criterion of ≤10% for omitting LNLs. All PTVs were expanded with a 3 mm CTV-to-PTV margin, with doses prescribed at 68/66 Gy for high-risk, 60 Gy for intermediate-risk, and 50 Gy for elective target volumes. The study reported mean doses to 13 OARs along with Normal Tissue Complication Probability (NTCP) to assess the probability of moderate to severe xerostomia and dysphagia.

Results
Among the 25 patients analysed, four had no LNL involvement, 16 had involvement of LNL II, and five both LNL II and III. For N0 patients, LNL III and IV were omitted from the elective target volume. Similarly, patients with involvement of LNLs II and/or III, LNL IV was omitted. The dosimetric analysis between clinical and risk-based treatment plans suggested significant reduction in mean dose to 3/13 OARs: esophagus (9.6 Gy vs 2.8 Gy, CI: 4.4-10.4 Gy), glottic larynx (9.5 Gy vs 7.3 Gy, CI: -1.5-5.1 Gy), and thyroid (25.3 Gy vs 7.1 Gy, CI: 12.8- 21.0 Gy). No difference in mean dose was noted for the remaining 10 OARs, and NTCP estimations showed no difference across all 13 OARs.

Conclusion
Our findings suggest that selectively omitting LNLs associated with the lowest risk of harbouring metastatic cancer significantly reduces irradiation of OARs located in the inferior regions of the neck. Rethink- ing current guidelines to include volume-deescalated radiotherapy may be considered, as a strategy to decrease both the incidence and severity of short-term toxicity and long-term morbidity.

P-42 Dosimetric Commissioning of Ethos TPS 1.1 System Using Preconfigured Beam Data

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Aims
Ethos 1.1 (Varian, a Siemens Healthineers Company) was installed at the Hirslanden Clinic. Both the Eclipse dose-calculation-based IGRT workflow and the Ethos Adaptive Workflow were commissioned. We present here the dosimetric commissioning results specifically for the workflow using the Ethos Treatment Planning System (TPS).

Methods
Verification plans were produced in the Eclipse TPS, including square and rectangular fields, end-to-end (E2E) IMRT plans with CIRS thorax/pelvis phantoms, and Chess and Chair IMRT test plans with the PTW Octavius phantom. Plans were calculated in the Ethos TPS 1.1 using preconfigured beam data with Acuros XB 1.1.1001 algorithm, 2.5 mm dose grid resolution. Dose distributions and point doses were measured with a PTW Semi- flex3D 31021 and a PTW Microdiamond 60019 in a PTW BeamScan water phantom. E2E tests were performed using point dose dosimetry. IMRT test plans were verified using a PTW Octavius 729 detector. Calculated and measured percentage depth doses (PDD), profiles, and output factors were compared using gamma evaluations and point doses.

Results
The mean agreement between measured and calculated PDDs was 0.8%, with a RMS standard deviation of 1.26%. PDD deviations and their dispersions differed for rectangular fields > and ≤ 4x4 cm², with means of 0.69% and 1.02%, respectively ($p=0.044$), and the RMS standard deviation was 0.99% and 1.45%, respectively ($p<0.001$). The profiles' mean dose difference was 0.14%±1.12% for all fields at depths of 5 and 10 cm combined, and 0.26±0.18 mean gamma value, with significant differences for fields above and below 4x4 cm². The mean deviation of the output factors was 0.08%±0.50%, with a significant difference between fields > and ≤4x4 cm² (-0.05%±0.8% vs. 0.92±0.40% ($p=0.004$)). The gamma passing rates of the IMRT Chair/Chess tests were 99.2%/97.5%, respectively. The E2E thorax test demonstrated a point dose deviation of -0.2%, and the pelvis test a 1.0% deviation.

Conclusions
The Ethos TPS demonstrated acceptable results for planning targets of conventional sizes (>4cm²). For smaller tumors, especially in SBRT settings, a resolution of 2.5 mm is not sufficient and, thus, a non-adaptive workflow with high-resolution planning in Eclipse is advisable.

P-43* Optimizing an Arterial Spin Labeling Magnetic Resonance Imaging sequence at a 0.35 T MR-Linac

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Aims
During radiation therapy on an MR-Linac, functional imaging can be used to evaluate alterations in both the tumor and its surrounding tissue, a concept still being researched. The application of arterial spin labeling (ASL), a technique allowing imaging of blood perfusion without contrast agents, has not been documented on an MR-Linac before. ASL could be used to assess a tumor's response to radiation therapy. This work aimed to demonstrate the feasibility of ASL on an MR-Linac.

Methods
An ASL sequence with a flow-sensitive alternating inversion recovery (FAIR) technique and a balanced steady- state free precession (bSSFP) readout was adapted for a 0.35 T MR-Linac (ViewRay, Denver, CO, USA). The se- quence parameters were optimized theoretically for the 0.35 T situation by extending an existing signal model for bSSFP to account for the FAIR preparation. T1 and T2 values of blood were estimated based on literature The optimal sequence parameters, with respect to signal-to-noise ratio, were determined using a grid search within a range of achievable parameters. The dependence of the signal to the sequence parameters around the optimum was investigated with measurements on two healthy volunteers at the MR-Linac.

Results
The theoretical signal dependencies with regards to the repetition time, flip angle and time between measure- ments were confirmed in the volunteer experiments. The number of prescans and the optimal inversion time showed slightly different behaviour than expected due to limitations in the model and subject's specific param- eters. The optimization yielded different parameter settings compared to the recommended settings at 3 T with a higher optimal flip angle (90°-110° compared to 70°) and a substantially shorter time between measurements (below 2s compared to up to 10s). A scan duration of roughly 6 minutes was achieved for a single 2D slice.

Conclusions
ASL was feasible on an MR-Linac at a low field and the adjusted settings for a low field deviated from conven- tional recommendations A more detailed comparison of the image quality to a conventional ASL image is still required. Additionally, it is unclear to what degree the optimized sequence is sensitive to changes in the tumor tissue and should therefore be investigated.

P-44 Heating through intact bone cortex with a radiative deep hyperthermia system: A proof-of-concept phantom study

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Aims
There is no experimental and clinical data available whether a region within an intact bone cortex can be heated with moderate radiative hyperthermia. In clinical routine, this leads to the pragmatic assumption that tumors surrounded by an intact cortex might not be heated to required therapeutic temperatures. This early phantom study aims to provide initial insights into the achievable heating rates within an intact bone cortex.

Methods
A phantom was built that closely mimics an in vivo situation of an upper thigh, using a polypropylene cylinder (length 50cm, inner diameter 19.4cm, outer diameter 20cm) filled with minced meat (dielectric properties of a human muscle) and a pig femur placed in the center aligned the longitudinal axis of the cylinder. The intact bone cortex had a thickness of 5mm. Six catheters were embedded in the phantom to accommodate the tem- perature probes, one in the center of the bone marrow, two on the cortex surface outside the bone and three in the space between femur and cylinder wall. A planning CT was performed and treatment settings were cal- culated using the planning software EasyPlan (Med-Logix, Italy). The phantom was centered in the radiative deep hyperthermia system (ALBA 4D, Med-Logix, Italy) between the four antennas. A heating pattern with two phases was repeated three times in succession. During the first phase, each antenna was supplied with 150W for 5 minutes, followed by a second phase where all antennas were off for 15 minutes.

Results
Average heating rates in the bone marrow, on the bone surface and in the minced meat are 0.6°C/min, 0.64°C/min and 0.8°C/min, respectively. In the second phase, the temperature of the bone marrow initially drops first but then starts to rise whereas all other thermocouples either exhibit an exponential temperature drop or stable temperature levels.

Conclusions
Based on our pilot experiment in a model without perfusion, a space completely covered by intact cortex bone seems to be heatable without a substantial time delay. We further observed that heat conduction from sur- rounding bone and meat might play an additional role. Further investigations, nevertheless, are mandatory to validate this early promising result.

P-45* Assessing Eddy Current Effects for Diffusion Weighted Imaging at a 0.35 T MR-Linac

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Aims
Diffusion weighted imaging (DWI) at MR-Linacs is being explored for response assessment during treatment. In DWI, eddy currents induced by the gradient magnetic fields may cause image distortions and inconsistent diffu- sion sensitivities. We compared eddy current effects with DWI sequence between a 0.35 T MR-Linac (ViewRay, Denver, CO, USA) and a 1.5 T scanner (Siemens Healthineers, Erlangen, Germany).

Methods
We imaged a phantom (HQ imaging, Heidelberg, Germany) containing a liquid compartment with a calibrated apparent diffusion coefficient (ADC) value of 1200 µm^2/s using two b-values: 0, 800 s/mm^2 and three orthog- onal diffusion directions. We investigated monopolar and bipolar diffusion gradient schemes and, at the MR- Linac, six different gantry angles (0°, 60°, 120°, 210°, 270°, 330°), and with or without the gantry angle specific correction for the gradients implemented by the vendor.
We affinely registered the individual diffusion direction images to the b=0 image and extracted the translation in phase encoding direction, which originates from eddy current induced off-resonance. Then the observed b-value was calculated for every voxel based on the signal decay between the two b-value images and assuming the calibrated ADC. We report the relative deviation of the observed b-value from the nominal one.

Results
For the MR-Linac, the eddy current induced translation without the gantry angle specific correction reached up to 4.1 mm for bipolar gradients and 6.5 mm for monopolar gradients. With correction, translations were below
0.4 mm in all configurations except for two.
For the 1.5 T scanner, the distortion was below 0.2 mm in all configurations except for monopolar gradient in head-feet direction, where it reached 0.6 mm.
Median b-values at the MR-Linac deviated from the nominal value by up to 30% before correction and up to 2% after correction. At the 1.5 T Scanner the deviation was up to 4%.

Conclusions
Eddy currents are a major concern for DWI at MR-Linacs at some gantry angles and need to be mitigated. In current practice, bipolar gradients are used to compensate eddy current effects, but we could show that the gantry angle specific corrections are effective for monopolar gradients, which may allow shorter echo times.

P-46* Z-RAD: THE SWISS POCKET KNIFE FOR RADIOMICS

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Aims
Radiomics — quantitative features extracted from medical images, hold the potential to transform personalized medicine by enhancing diagnostic, prognostic, and predictive accuracy. Despite this promise, widespread application is hindered by existing radiomics extraction software challenges, such as the necessity of programming skills and only partial adherence to the Image Biomarker Standardization Initiative (IBSI). To address these limitations, we developed Z-Rad, a user-friendly software designed to make radiomics accessible to medical professionals without programming expertise while ensuring compliance with IBSI standards.

Methods
Z-Rad features a graphical user interface (GUI) and application programming interface (API), both written in Python. It supports CT, PET, and MR data modalities in DICOM and NIfTI formats. Z-Rad offers com- prehensive preprocessing, image filtering, and radiomics extraction. The GUI consists of three tabs: Resampling tab supports resampling in 3D or 2D (axial slice-wise), with nearest neighbors, linear, B-spline, and Gaussian strategies or DICOM to NIfTI conversion without resampling.
Filtering tab supports mean filter, Laplacian of Gaussian, Laws kernels, and wavelets.
Radiomics tab includes intensity range truncation, outlier exclusion, intensity discretization by fixed bin width or size, and six texture feature aggregation methods covering 2D, 2.5D, and 3D.
The API mirrors the GUI's functionalities, allowing straightforward integration into Python-based research pipelines.

Results
Z-Rad's capabilities were demonstrated using MR brain metastases and PET/CT metastatic melanoma datasets. Z-Rad successfully performed resampling, filtering, and radiomics extraction from both DICOM and NIfTI files with various shape and volume ROIs. From each ROI, 160 parameters were extracted describing their shape, texture, and intensity characteristics. Together with 12 different image filters implemented in Z- Rad, 1920 unique radiomic features were generated and saved in an easily analyzable Excel file.
Additionally, Z-Rad was shared with other research groups, where researchers without programming skills found it intuitive, easy to use, and comprehensive, meeting all needs. Based on the feedback, common user errors were addressed, enhancing usability and reliability.

Conclusions
Z-Rad addresses key barriers in radiomics, making advanced image analysis accessible to users without programming skills. It supports diverse imaging modalities within a single framework, facilitating holistic patient data analysis compliant with IBSI, it is easily integratable and will soon be open-sourced.

P-47* Proof of Concept: Workflow design and end-to-end testing of superficial HDR-brachytherapy with 3D-printed applicators

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Aims
Superficial High-dose-rate brachytherapy (HDR-BT) is a simple and effective treatment option for malig- nant skin diseases providing advantages in dosimetry compared with external beam radiotherapy. Convention- ally used surface molds and flaps are challenging to fit to irregular shapes, may provide insufficient coverage and introduce uncertainties in positioning.
To standardize and overcome limitations of this treatment approach we designed and validated a workflow for customized 3D-printed applicators.

Methods
The developed workflow consists of five steps: First, the target volume and organs-at risk are con- toured on the patients CT scan in the Eclipse (Varian, a Siemens Healthineers Company) treatment planning system. Second, a cuboid mold encompassing the target is contoured. The mold comprises applicator tubes (4 mm diameter), which are placed manually, based on the best possible dosimetric outcomes. Third, the 3D mesh of the mold is exported using the Eclipse scripting API and converted into stl-format used for 3D-printing. Fourth, the mold is 3D-printed using PLA on an Ultimaker-4 and flexible implants for delivery are inserted in the applicator tubes. Fifth, the CT and structure set of the patient are imported into the Oncentra treatment planning system (Elekta) to design an intensity modulated brachytherapy plan based on the applicator tubes. The workflow is validated by an end-to-end test: A mold with two applicator tubes within 5 mm distance to a clinically-motivated skin lesion on the nose of an Alderson phantom is constructed and a brachytherapy plan is designed. The dose is calculated using TG-43. Plan delivery is verified on the Alderson phantom using film measurements and gamma passing rate (2% (global)/2 mm, 10 % threshold).

Results
Correct coverage of the PTV was achieved with the prescribed dose. The mold was printed with no visible deviations within 6 hours. It fits tightly on the surface of the Alderson phantom. Film measurements agree with the dose calculation by >99% gamma passing rate.

Conclusions
We successfully designed and validated a workflow for superficial brachytherapy with 3D-printed applicators for one phantom case. This treatment approach streamlines the applicator production process; re- duces manual work, increases reproducibility and allows optimized applicator positioning for complex super- ficial HDR-BT.

P-48* A TCP and NTCP based planning approach to elective nodal irradiation

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Aims:
Treatment of head&neck squamous cell carcinoma (HNSCC) includes the elective irradiation of lymph node levels (LNL) at risk of harboring occult metastases despite the absence of clinically proven tumor. Elective nodal irradiation increases regional tumor control probability (TCP) at the cost of increasing normal tissue complication probability (NTCP). We develop a TCP-model for electively irradiated LNLs for treatment plan optimization to balance TCP and NTCP objectives.

Methods:
The TCP of a LNL that is irradiated with an inhomogeneous dose distribution d is given by the product of TCP- values of all voxels that are part of the LNL, i.e. $TCP=\prod_i[(1-q_i)+q_iTCP_i(d_i)]$ where $(1-q_i)$ is the probability that voxel i does not harbor occult metastases, and $q_iTCP_i(d_i)$ is the probability that voxel i contains tumor but is controlled with dose d_i. The value of q_i is set such that the overall probability for the entire LNL to be involved is Q, which is in turn obtained from a previously developed lymphatic spread model [1]. The parameters of $TCP_i(d_i)$ are chosen based on the TCP-model of Okunieff[2].

Results:
Qualitatively, optimizing treatment plans based on the TCP-model yields dose distributions that reduce the dose near relevant OARs while delivering a curative dose to those parts of the LNL that are further away from OARs. If the overall probability of harboring occult metastases, Q, is low, the probability that occult metastases are located within the small volume abutting OARs becomes very small. Thereby, NTCP can be reduced with only a minor reduction in TCP. TCP based planning was investigated for representative oropharyngeal SCC patients.
E.g. for a cT2N0 tumor extending over the midline the risk of occult metastases in contralateral LNL II was estimated to be Q=5%. By compromising coverage near the parotid and submandibular glands, TCP near 98% can be maintained while reducing NTCP for xerostomia and sticky-saliva.

Conclusion:
In current practice, it is a binary decision whether a LNL is untreated or included in the CTV-N and homoge- neously irradiated to a dose of approximately 50 Gy. By allowing lower doses near relevant OARs, one may reduce NTCP while maintaining high TCP.

[1] Ludwig,SciRep,11,(2021).
[2] Okunieff,IJROBP,32(4),1227-1237,(1995).

P-49* Robustness Assessment of Radiotherapy for Breast Irradiation Under Deep Inspiration Breath-Hold Variations

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Aims
Deep inspiration breath-hold (DIBH) in radiotherapy for breast irradiation mitigates respiratory motion and leads to better heart sparing. However, uncertainties during delivery remain due to DIBH variations (inter- and intra-breath-hold variations). This work aims to demonstrate the feasibility of assessing the robustness of photon and electron breast irradiation radiotherapy plans against DIBH variations.

Methods
We developed a robustness assessment framework for radiotherapy plans for breast irradiation against DIBH variations. Using the numerical XCAT anthropomorphic phantom and B-Splines deformable image registration, a realistic phantom was generated with deformation vector fields (DVFs) simulating DIBH varia- tions. A PTV-based volumetric modulated arc therapy (VMAT) plan (target PTV) and a robust optimized dynamic photon and electron mixed-beam arc radiotherapy (DYMBARC) plan (target CTV) were created for left breast ir- radiation on the XCAT-generated DIBH CT (planning CT). DYMBARC is deliverable on a C-arm treatment unit with electrons modulated by the MLC. 42.4 Gy in 16 fractions are prescribed to the targets. The dose was recal- culated with deformable voxel geometry Monte Carlo simulations and the DVFs (deformed dose). The frame- work was applied to investigate the impact of a DIBH variation, with the chest wall moving up to 5 mm in the anterior-posterior direction on a single case.
Results
The electron CTV dose contribution of the DYMBARC plan was 49%. Compared to VMAT, DYMBARC re- duced the mean dose to the heart and the contralateral breast by 2.2 Gy and 1.5 Gy, respectively. DIBH variations decreased CTV coverage (V98%) by 11.5% for DYMBARC and 18.6% for VMAT. For both plans, DIBH variations led to OAR mean dose differences within 0.2 Gy.

Conclusions
We successfully developed a framework to assess the robustness of photon and electron breast irradiation radiotherapy plans against DIBH variations. It enables the generation of multiple simulated patient anatomies and the assessment of plan robustness against DIBH variations for future studies. It was possible to indicate better OAR sparing and target coverage robustness against DIBH variations of robust optimized DYMBARC compared to PTV-based VMAT for a first breast case.
This work was supported by the Stiftung für Klinisch-Experimentelle Tumorforschung and Varian, a Siemens Healthineers Company.

P-50* Validation of an in-house algorithm for reconstruction of treatment leaf open times on the Radixact system using MLC optical sensor logfile data

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Aims
To validate an in-house algorithm we developed for reconstruction of treatment leaf open times (LOT) on the Radixact system using MLC optical sensor (OS) logfile data as part of a measurement-less plan-specific QA (PSQA) workflow.

Methods
A preliminary study was performed to validate our LOT reconstruction algorithm. The raw MLC OS data was downloaded for 20 delivered patient treatments. OS data are stored in the logfiles as integers repre- senting the individual leaf states and are sampled at a frequency of 5500 Hz. MATLAB (vers. 2022b) was used to calculate the leaf open and close transition events and to reconstruct the delivered treatment LOT sinogram. The in-house reconstructed treatment LOT sinograms ($S_{RECON,IH}$) were compared with those reconstructed with the Accuray Delivery Analysis™ software (vers. 2.3.0.2) ($S_{RECON,DA}$).

Results
The mean LOT measured for the $S_{RECON,IH}$ and $S_{RECON,DA}$ methods differed -0.1 ± 0.1 msec (range: -0.4-0.0) for the 20 patient treatments. The individual LOT differences measured for the two methods were within ±3 msec for 95.3% of the sinogram beamlets.

Conclusions
Our in-house algorithm provides very similar estimations for the delivered treatment LOTs when compared to the vendor's Delivery Analysis™ software. The results are a preliminary validation of the algo- rithm for treatment LOT measurement.

P-51 Evaluation of delivery accuracy of O-ring linac SBRT plans for pelvic lymph node and lung metastases.

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Aims
Self-shielded O-Ring linear accelerators, characterized by minimal shielding and facility requirements as well as high throughput capabilities, have the potential to enhance the adoption of SBRT significantly. This investigation examines the dose delivery accuracy of Varian Halcyon/Ethos SBRT plans specifically for small pelvic lymph nodes and lung metastases.

Methods
21 pelvic and 18 lung clinical SBRT plans were replanned for Ethos/Halcyon in the Eclipse treatment planning system. The prescription dose range was 26-40 Gy for the pelvis and 39-54 Gy for the lung over the mean three fractions. Median PTVs were 3.6 cm^3 (range: 1.1-10.6) for the pelvis and 4.3 cm^3 (1.0-17.1) for the lung. Modulation Complexity Score (MCS) was evaluated for all plans. Plan delivery accuracy was assessed using film (Gafchromic EBT-XD, global gamma 1%/1mm, and 3%/1mm, 10% threshold) and ionization chamber (PTW TM31021, volume correction applied) dosimetry in a water-equivalent phantom, with recorded dose delivery times.

Results
Mean MCS values were 0.399±0.077 for the pelvis, 0.489±0.055 for the lung, and 0.441±0.081 combined. Cham- ber measurements deviated from calculations by -0.7±0.8%, 0.1%±0.7%, and -0.3%±0.8% for the pelvis, lung, and combined. The gamma passing rates 3%/1mm and 1%/1mm were 99.6±0.8% and 95.0±4.4% for the pelvis,
99.7±0.3% and 95.00±3.9% for the lung, and 99.7±0.6% and 95.0±4.1% combined. MCS > 0.365 predicted a dif- ference in chamber measurements (median -0.2%, IQR: -0.5 – 0.2% vs. -1.5%, IQR: -2.0 – 1.4%, p=0.003), without impacting gamma passing rates. The mean plan delivery time was 6.6±1.3 minutes.

Conclusions
Our dose verification study demonstrated promising results for Halcyon/Ethos in the delivery of pelvic and lung SBRT, particularly for small tumors. All SBRT treatment plans showed high delivery precision. Treatment delivery times were within acceptable ranges, even for busy clinics. However, further research is needed into intrafraction motion and motion management for the Halcyon/Ethos platform.

Conflict of Interest Statement for All Authors
This work is partially supported by Varian, a Siemens Healthineers company. Varian had no influence in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

P-52 Feasibility of a visual coached 4DCT and its impact on image and treatment quality

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Aim
Despite the availability of modern scanning protocols, the quality of 4D imaging is still highly dependent on patient compliance. The aim of this work was to determine under which conditions a visually coached 4DCT is feasible and whether visual coaching can offer an advantage for imaging and irradiation.

Methods
Between 04/2023 and 05/2024, 112 4DCT sessions were monitored and evaluated with a focus on patient com- pliance. From 08/2023, the process was adapted and all subsequent patients (78) were instructed with visual coaching (googles). In case of a noticeably deep inspiration (> 2 cm) and treatment in the lower lobe or abdomen, an abdominal belt was used to reduce the breathing motion. The 4DCT was performed with the marker block placed on the belt.

Results
For each of the 78 patients, the resting respiration was observed and the breathing range displayed to the pa- tient was derived from this. Stable and reproducible breathing was thus achieved for 74 patients. For two patients, the visual guidance was counterproductive (overloaded by the visual coaching) and two patients had contraindications (claustrophobia, dementia).
For 3 patients the abdominal belt was used. The mobility of the marker block was restricted to 1.0-1.5 cm. This amplitude allowed the system to continue to perform a 4DCT and the patient to continue to breathe normally (slightly increased frequency due to reduced lung volume). With additional visual coaching, inhalation in par- ticular became very reproducible. The positioning of the belt during irradiation was also easily reproducible. For patients with indications in the lower lobe or abdomen, a breath hold CT was performed directly after the 4DCT. The thresholds for the gating window (3 mm) were derived from the amplitude of the 4DCT. This moderate inspiration practically eliminated the previously disproportionately high feasibility problems at the treatment machine.

Conclusion
A visually coached 4DCT is the ideal basis for intrafractional motion management. The image quality was suit- able for the planning process without exception. Connecting the resting respiration to the 4DCT and the breath hold CT allows the optimization of safety margins in treatment planning and stabilizes irradiation.

P-53 Proposal for a workflow for technical quality assurance on water filtered infrared hyperthermia treatment devices

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Aims
Hyperthermia (i.e. heating at 40-43°C for an hour) is a potent sensitizer in combination with radiation therapy, enhancing the treatment outcome for malignant tumours. For large superficial tumours, water filtered infrared-A (wIRA) is a common technique of hyperthermia. The minimum requirements for such devices are defined in the published guideline of the European Society for Hyperthermic Oncology (ESHO) [1].In this work we propose a workflow to perform technical quality assurance (QA) for devices applying wIRA.

Methods
To test the abilities of the commercial wIRA device hydrosun-TWH1500 (heckel medizintechnik GmbH, Esslingen, Germany), a silicone-based phantom according to Lualdi et. al. [2] was produced. For the experiment the individual sheets of phantom material with 25 cm side length were piled to a stack of 2.5-4 cm thickness. The top layer of the stack was then irradiated with a single wIRA lamp for a total time of 6 minutes. The maximum hot spot temperature during the irradiation time was limited to 43 °C on the entire surface which resulted in a continuous on- and off-switching of the lamp after a warm up time. Immediately after the 6 minutes passed the lamp was turned off and high resolution infrared images (VarioCAM® HD,Dresden, Germany) of each layer were taken. For this the individual layers were removed fast one after the other.To determine the temperature rise in each layer the IR images were substracted pixelwise from IR images of same layers taken before the irradiation.

Results
With the described method recording of 5-7 layers was possible within 10 seconds. From the recorded images it was possible to determine the maximum temperature rise in 5mm depth, the thermal effective pen- etration depth (TEPD) and the thermal effective field size (TEFS) as 11.4 ± 0.71 K, 10.6 ± 0.62 mm and 357 ± 17 cm^2 respectively.

Conclusion
With the suggested procedure a fast and efficient method was established to determine the min- imum requirements for a superficial infrared heating device as defined by the ESHO guideline.However the properties of the used phantom need further investigations to evaluate its tissue equivalence.
Disclosure-This work was financially supported by the Dr. med. h.c. Erwin Braun Stiftung.

P-54 Clinical evaluation of prostate treatment planning driven by artificial intelligence dose prediction model

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Purpose
A treatment planning approach driven by an artificial intelligence (AI)-based dose prediction model for prostate cancer is evaluated considering plan quality improvement, time-saving in plan generation, and consistency between planners.

Method
Ten patients with prostate cancer randomly selected were retrospectively studied. AI dose predictions were generated for each patient, and the dose distributions were compared with previously approved clinical plans. The evaluation considered dose volume histogram (DVH) metrics, such as mean (Dmean) and near maximum doses (D1%) for organ-at-risks (OAR) and Planning Target Volumes (PTV) and D98% and D95% for the PTV. For lower predictions for the bladder and rectum, plans were recreated to evaluate the prediction capabilities of the proposed optimisation. The average planning times of the plans generated with and without AI were compared. The mean and standard deviation of the mean dose per OAR across five planners were recorded and compared to evaluate plan quality and variability differences.

Results
Predictions agreed with retrospective data for PTV DVH metrics, with an average dose difference of 2%. OAR prediction improved sparing for the bladder, rectum, and femoral heads. Recreated plans using AI predicted with a mean dose difference of 5%. The average treatment planning time with AI prediction was reduced by two times compared with the conventional manual process. Variability differences in treatment planning were reduced.

Conclusion
The developed model outperformed our treatment planning experience. Embedding AI dose prediction in treat- ment planning can increase plan quality and reduce treatment planning time while decreasing inter-planner variability.

P-55* Delta radiomic signatures during treatment for liver cancer patients treated with magnetic resonance-guided radiotherapy

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Aims
Radiomics describes the extraction of quantitative features from medical images, related to tumor shape, intensity and texture. Longitudinal analysis of tumor lesions can be achieved by investigating radiomic fea- tures at multiple timepoints over the course of treatment. This study aims to describe the temporal changes in radiomic features extracted from magnetic resonance (MR) scans of liver cancer patients treated with magnetic resonance-guided radiotherapy (MRgRT).

Methods
Data of 46 patients was collected, consisting of MR scans taken at every treatment session, from base- line (day 0) to the fifth fraction (day 20), and the contours. Radiomic features were extracted from the gross tu- mor volume (GTV) at all timepoints, using our in-house developed software, Z-Rad. Highly cross-correlated fea- tures (Pearson correlation coefficient > 0.95) were removed during pre-processing. Hierarchical agglomerative clustering was performed to group features with comparable evolution over the course of treatment. The aver- age trajectory for each cluster was calculated and the features most similar to it were identified. These features were subsequently used to cluster the patients to describe the changes over time for each group. Mann-Whitney and Wilcoxon signed-rank tests were used to identify features that significantly changed between timepoints.

Results
From 160 radiomic features extracted from the GTV, 82 were used in the analysis after data pre- processing. The clustering analysis identified three feature clusters, composed of 26 features (cluster 1), 38 features (cluster 2) and 18 features (cluster 3). The trajectories for each cluster were plotted. The closest to the average trajectory were two grey level distance zone features (entropy and high grey level zone emphasis) and one grey level co-occurrence feature (sum entropy), which were used to cluster patients into two groups: 36 patients (cluster 1) and 10 patients (cluster 2). There was a significant difference in the feature values on day 20 (p value < 0.01) in both groups of patients.

Conclusions
This work focused on the longitudinal analysis of radiomic features extracted from the GTV. We could identify two different patterns of radiomic signatures among the patients. Further investigation is needed to determine how this change in imaging translates to clinical endpoints.

P-56 Implementation of intracranial stereotactic radiotherapy in tomohelical technique: from dosimetry to treatment QA

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Introduction
Tomotherapy, firstly dedicated to large fields and extensive lesions treatments, is now increasingly used for stereotactic treatments. However, certain limitations for SRT delivery remain unchanged: a minimum longi- tudinal field width (FW) of 10 mm, a leaf width of 6.25 mm, and only coplanar irradiation. We report on the methodology used to implement this technique in terms of dosimetry and treatment plans quality control.

Material and Methods
Thirteen intracranial stereotactic plans previously treated on another machine (clinac Varian with HD-120 Mil- lenium MLC) were selected with PTV volume ranging from 0.5 to 20 cc (median: 2.9 cc). Tomohelical plans were generated in RayStation 12ASP2 TPS with the three available FW (10, 25 and 50 mm), a pitch between 0.150 and
0.200. Prescription (33 Gy in 3 fractions) and normalization were identical (80% isodose). New conformity and gradient indices were calculated as well as dose on the brain and compared using a Wilcoxon test (significant results for $p<0.05$). Treatment QA were performed using Delta4 phantom, dosimetric films and ion chamber measurements.

Results
A strong correlation between the lesion size and the GI value was observed with GI values varying from 7.2 for the smallest PTV to 3.8 for the largest one ($R^2 = 0.92$ determined with a power function). Significant better values were obtained with the 10 mm FW compared to 25 and 50 mm. nCI were better with the 10 mm FW though not significant and comprised between 1.3 and 1.2 for all plans. On brain, dose constraint of V20Gy<20cc was respected for all plans, and V23.1Gy<7cc for plans with a GTV<2cc. QA dose distributions respected a gamma criteria of 4%/1.5mm on both Delta4 and film analyses, with a mean absolute dose measurement of -1.0%.

Conclusions
Our study suggests that tomohelical technique is an option for SRT with clinically acceptable dose distribution and dose delivery validated by QA tools. However, results also showed that GI can be high for very small lesions. The clinical impact of this needs to be considered on a case-by-case basis depending on the patient's clinical context and the lesion proximity to organ at risk.

P-57 Implementing questionnaires for review and decision-making in a workflow for patients with 4DCT imaging

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Aim
Tumor localization, tumor motion and patient compliance are essential factors for the treatment of patients in whom intrafractional motion is to be controlled using a 4DCT. The aim of the work was to establish a work- flow that standardizes decision-making from the entrance examination through to irradiation, that ensures the quality of imaging, planning and therapy and systematically documents decisions.

Methods
For 112 patients with planned motion management (thorax/abdomen), the entire care path was monitored (med- ical physicist and RTT) and analyzed. For the entrance examination, CT-Session (imaging/coaching), image seg- mentation, treatment planning and treatment, all decisions regarding the 4DCT and their timing were recorded, scrutinized and optimized.

Results
With the help of the radio-oncology information system ARIA, a planning care path with two dedicated review tasks for medical physics and an encounter with four questionnaires were developed, which systematize the decision-making process and document it accordingly:

"4D-Clinic" (entry examination, physician): Information for the CT-Team such as general condition, lan- guage, pain, etc.
"4D-Session" (CT-Session, physicist): parameters from visual coaching and the breathing curve
"4D-Planning" (CT-Session, physicist): Information on assessment of image quality and feasibility of breath-hold control, recommendation for the physician on planning technique (Task "Review 4DCT").
"4D-Planning" (targeting, physician): final planning- and treatment-decision (simplified: planning on a mean value projection in free breathing or breath-hold technique) and documentation of the applied safety margins.
"4D-Planning" (review, physicist): quantitative determination of the 3D-movement of the target, correla- tion with the external 1D-movement and recommendation for an adjustment of the safety margins (Task "Review 4D-Planning").
"4D-Summary" (treatment approval, physicist): determination/definition of breathing thresholds, sum- mary of information relevant for irradiation

The workflow is additionally standardized by an entry-matrix (assignment of tumor location to imaging) and a decision-matrix (assignment of motion extent to treatment technique).

Conclusion
The standardization of the care path for planning and irradiation based on a 4DCT has made the individual steps transparent and has simplified related decisions for all professional groups. The new process is appreciated by RTTs, but requires the medical physicist to play a greater role in deciding on the best treatment strategy in the context of respiratory motion management.

P-59* / S 15* Evolution of Skills and Responsibilities of Radiation Therapists in Adaptive Radiation Therapy

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Aims
Since the implementation of adaptive treatment in September 2023, the responsibilities and skills of radiation therapists have evolved. This study aims to evaluate these changes after seven months of treating twenty-four pelvic patients, focusing on improvements in interprofessional cooperation and overall treatment efficiency. Methods:
Radiation therapists (RTT) underwent extensive training before managing their first patient. This included internal sessions with medical physicists, doctors, and dosimetrists, as well as external sessions with application engineers. Practical workshops, such as contouring training on clinical cases and treatments on phantoms, were conducted to understand the adaptive workflow and acquire the necessary skills.

Results
The presence of doctors and physicists was reduced due to the increased expertise of technicians. This workflow redefinition allowed for the treatment of six adaptive cases per half day and resulted in a 10-15% reduction in the time required for contouring organs at risk (OAR) and preparing the adaptive plan.
It was observed that adaptive case management is highly patient-dependent, necessitating the evaluation of the balance between the precision of OAR contours and the speed of execution to minimize intrafraction anatomical changes. Our findings indicate that RTTs, due to their knowledge and daily patient monitoring, are best qualified for this task, acting as a crucial link between the patient and various professionals.

Conclusion
Adaptive treatment has redistributed some medical and physical responsibilities to technicians, equipping them with new skills and roles. This shift has enhanced patient care understanding and bolstered professional ap- preciation among technicians. As technology advances, technician expertise is expected to further evolve with improvement in adaptive treatment processes.

P-60* Closing the gap: Optimizing the time interval between hyperthermia and radiotherapy

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Introduction
Hyperthermia (HT) involves heating tumors above normal body temperature, typically at 41-43°C for about an hour and is a potent radiosensitizer. HT enhances radiotherapy (RT) effectiveness by increasing tumor oxygena- tion and temporarily inhibiting DNA repair and by activation of immune responses. The time interval between HT and RT is crucial. Minimizing the HT-RT interval is desired to optimize biological interaction between both modalities and to reduce cancer cell survival. At the hyperthermia department of the Cantonal Hospital Aarau (KSA), we have documented time intervals for deep hyperthermia (dHT) and superficial hyperthermia (sHT) since December 2016. We present an overview of the time intervals observed over the years and the strategies used to improve them at our department.

Methods
HT prior to RT: at KSA, radiation is applied after hyperthermia to avoid the 30 minutes warm up phase needed to reach therapeutic temperatures. This results in reduced time intervals between the two therapies.
Managing external patients: to exclude unnecessary travel time, we coordinate with the referring hospital to obtain all the patient and treatment-date needed so that patients receive both HT & RT at KSA on the day of their HT treatment.
Communication & efficient department layout: In case of a delay on the LINAC we can extend the HT treatment by a few minutes. Transit times are short between the HT-Room and radiation room due to an efficient department layout.

Results
In total 412 patients were treated at KSA with dHT (229) or sHT (183) + RT from Dec 2016 until June 2024. We observed a reduction in the average time interval for dHT from 30 minutes during the period from 2016 - 2019 to a consistent 16-18 minutes in subsequent years. For sHT, the average time interval was reduced from 17 minutes to 13 minutes over the same period.

Conclusion
This significant reduction in time interval over the last 4 years, reflects our commitment to refining our protocols and overcoming logistical challenges. This coordinated approach is our standard practice and maximizes the therapeutic benefits for our patients.

P-61/ M 34 Spatially fractionated stereotatic body radiation therapy (Lattice): a general overview

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Not presented as a poster

P-63 Patient Setup Using a Surface Repositioning System

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The renewal of our department, including a change of treatment machine and the tools available for patient repositioning, prompted us to evaluate the correct procedures and their correlation. Therefore, we aimed to assess the repositioning of our patients with the recent implementation of the following systems: a next- generation tomotherapy system, Radixact by Accuray; RayStation by RaySearch Laboratories as the Treatment Planning System (TPS); and AlignRT by VisionRT for the surface repositioning solution. First, we selected 40 patients with different localizations: breast, pelvis, lung, and head and neck. For each of these patients, we collected data over 3 treatment sessions: residual shifts using AlignRT, table values in three directions before and after imaging, and these results were compared to the expected values from the TPS. The study mainly focused on the lateral (left-right) shift, as patient setup with tomotherapy involves a lateral table value of zero.
The analysis of these data allowed us to extract the percentages of patients by thresholds of residual lateral values after imaging:
-Lateral correction ≤ 1 mm: 40%
-1 mm < lateral correction ≤ 2 mm: 25%
-2 mm < lateral correction ≤ 3 mm: 25%
-Lateral correction > 3 mm: 10%
This study highlights the coherence between the different devices based on the obtained values. It allows us to better understand the AlignRT system, improving efficiency and reproducibility. While this work focused on lateral correction, it would be interesting to further investigate other collected values.

P-64*

Five fractions radiotherapy treatment for prostate cancer in the HFR Fribourg's Radio-oncology Department

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Prostate cancer (PC) is the most common cancer in men. Radiotherapy (RT) is a standard treatment modality for localized disease. The Radio-oncology Department of the Fribourg's Hospital (HFR) adopted a hypofractionated approach, reducing treatment times to only five fractions.

Before starting treatment, patients undergo a comprehensive consultation with their radiation oncologist (RO). These detailed discussions cover the benefits of treatment, potential side effects, and specific instructions for optimal treatment delivery.

After the patient agrees to proceed, he returns for a simulation computed tomography (CT) scan, adhering to the preparation guidelines explained by the RO during the consultation. This preparation includes maintaining a full bladder and an empty rectum, which not only reduces radiation doses to the bladder and bowel but also allows for the use of an endorectal probe to stabilize prostate movement during treatment delivery.

Based on the CT scan, meticulous treatment planning calculations (dosimetry) are performed based on the medi- cal prescription and focusing on minimizing radiation exposure to surrounding organs. Patients attend sessions every other day, following the same preparation procedures as on the day of their initial CT scan. This consis- tency is crucial to ensure that the delivered doses match the planned dosimetry. Cone beam CT images are taken before each session to verify patient and organ positioning.

By integrating technological innovations with patient-centered care, HFR's Radio-oncology Department exem- plifies advancements in PC treatment. Interdisciplinary collaboration ensures comprehensive care throughout the process. From initial consultations to treatment sessions, medical professionals at HFR prioritize patient safety and treatment efficacy.u

INDEX OF AUTHORS

First name	Last name	Numbering	Format
Carolina	Gomes da Silveira Cauduro	P 32	Poster
Thomas	Götzfried	M 20	Main talk
Benjamin	Hamm	M 24	Main talk
Byron	Heavens	M 26	Main talk
Hossein	Hemmatazad	P 09	Poster
Patrick	Janssen	P 60	Poster
Michèle	Keane	S 16*	Oral
zahra	khodabakhshi	S 20*	Oral
Michael	Krauthammer	M 14	Main talk
Enkelejda	Lamaj	M 17	Main talk
Mohamed	Laouiti	P 22	Poster
Mohamed	Laouiti	P 31	Poster
Kirsten	Lauber	M 15	Main talk
Simon	Legros	P 63	Poster
Hannes	Loebner	P 47*	Poster
Esmée Lauren	Looman	P 12*	Poster
Roman	Ludwig	S 10*	Oral
Claudio	Marabuto	P 61	Poster
Claudio	Marabuto Antunes	M 34 / P 61	Main talk / Poster
Dietmar	Marder	P 53	Poster
Zohra	Mazouni	P 36	Poster
Mary	McCormack	M 29	Main talk
Marco	Meinschad	M 04	Main talk
Lisa	Milan	S 04	Oral
Kristoffer	Moos	P 41*	Poster
Lucas	Mose	P 06*	Poster
Lucas	Mose	P 16	Poster
Lucas	Mose	P 33	Poster
Moritz	Neesen	P 15*	Poster
Markus	Notter	M 38	Main talk
Stephen	Obena	S 02*	Oral
Alina	Paunoiu	P 55*	Poster
Jan	Peeken	M 02	Main talk
Jan	Peeken	M 06	Main talk
Peter	Pemler	P 52	Poster
Peter	Pemler	P 57	Poster
Yoel	Pérez Haas	S 22*	Oral
Sophie	Perryck	M 25	Main talk
Samuel	Peters	M 11	Main talk
Primoz	Petric	M 30	Main talk
Maria Antonietta	Piliero	P 40	Poster
Nicolas	Pourel	M 23	Main talk
Chiara	Pozzato	P 01*	Poster
Gareth	Price	M 01	Main talk
Sabrina	Reichl	S 06*	Oral
Philipp	Reinhardt	P 28*	Poster
Elena	Riggenbach	P 07	Poster
Elena	Riggenbach	P 14	Poster
Andreas	Rimner	M 07	Main talk
Susanne	Rogers	P 20	Poster

First name	Last name	Numbering	Format
Fabian	Schüepp	M 16	Main talk
Elisabeth	Schültke	M 36	Main talk
Mohamed	Shelan	S 17	Oral
Mohamed	Shelan	P 33	Poster
Thierry	Spielmann	P 25*	Poster
Gabriela	Studer	M 32	Main talk
Maximilian	Sturz	P 19*	Poster
Emanuel	Stutz	M 22	Main talk
Tim Benjamin	Suppiger	P 24*	Poster
Alessandro	Taccogna	M 27	Main talk
Daniel	Taussky	P 21	Poster
Daniel	Taussky	P 23	Poster
Daniel	Taussky	P 29	Poster
Daniel	Taussky	P 39	Poster
Serena	Psoroulas	M 13	Main talk
Nathan	Torelli	S 11*	Oral
Verdiana	Trappetti	S 18	Oral
Verena	Trimmel	S 03	Oral
Slavisa	Tubin	M 37	Main talk
Olga	Unterkirhere	S 01	Oral
Sergejs	Unterkirhers	P 42	Poster
Sergejs	Unterkirhers	P 51	Poster
Peter	Vaupel	P 03	Poster
Jens	von der Grün	P 11*	Poster
Philipp	Wallimann	P 43*	Poster
Kira	Wang	M 39	Main talk
Tyler	Williamson	M 18	Main talk
Cheuk Ting	Wu	S 14*	Oral
Jinkang	Xiao	P 18*	Poster
Lucy	Zaccaro	S 07	Oral
Björn	Zobrist	P 49*	Poster

** Young papers*