

ACOMP PROFESSIONAL COURSE 2021: RADIOBIOLOGY IN THE ERA OF PRECISION MEDICINE

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Abstract— Radiobiology is a fundamental field in radiation therapy. There are limited radiobiology refresher courses being offered for medical physicists and related healthcare professionals in the ASEAN region. Hence, ASEAN College of Medical Physics (ACOMP) has taken the initiative to organize the 13th ACOMP Course: Radiobiology in the Era of Precision Medicine. The objective of the course was to provide basic understanding of radiobiology principles, its clinical applications and implementations in radiation therapy. Three two-hour free online sessions were held respectively on 9, 16, 23 April 2021. Six lecturers including one clinical oncologist and five medical physicists from Australia, Malaysia and Romania were invited. 250 participants attended in each session of the course. In conclusion, the course has created a new online learning platform to disseminate the knowledge and experiences in radiobiology which is useful and relevant in routine clinical works.

Keywords— Radiobiology, ACOMP, SEAFOMP, ASEAN, radiotherapy, nuclear medicine, online learning.

I. INTRODUCTION

Radiobiology is a field of clinical and basic medical sciences that involves the study of the interaction of ionizing radiation with biological tissues and living organisms. The field is heavily engaged with physics principles, mathematical algorithms and biology knowledge to estimate the probability of cells death and survival due to exposure to ionizing radiation. Radiobiology is usually integrated as a compulsory module in medical physics, radiation oncology, radiation dosimetry, nuclear medicine, diagnostic and interventional radiology programmes. However, this core module is often offered at the early semesters of the programmes and may not sufficiently cover all the knowledge and skills that are needed for advanced or practical application of radiobiology in clinical practice. There are also limited radiobiology courses offered for clinical medical physicists as a regular continuing professional development (CPD) course in the current settings especially in the ASEAN region. ASEAN College of Medical Physics (ACOMP) has taken note on this demand and hence decided to organize 13th ACOMP Course: Radiobiology in the Era of Precision Medicine. This radiobiology course was dedicated to clinical medical

physicists, oncologists, dosimetrists, radiographers, trainees, etc. Due to the current pandemic and the advantages of free online learning platform, we offer the course free.

II. STRUCTURE OF THE RADIOBIOLOGY COURSE

The course was co-organized by Associate Professor Dr. Chai Hong Yeong from the Taylors' University and Dr. Aik Hao Ng from the Kuala Lumpur Hospital, under the mentorship of Professor Dr. Eva Bezak. It was divided into three sessions, i.e. basic, intermediate and advanced, of two hours each and was conducted over three consecutive Friday afternoons (9th, 16th and 23rd April 2021). This was to allow participants a sufficient time gap to digest information and prepare for the next session. The course programme is shown in Table 1.

Table 1 Course programme

Date	Topics	Lecturers
9-Apr	Introduction of the course	Kwan-Hoong Ng
9-Apr	Radiobiology of tissue interaction with radiation	Aik-Hao Ng
9-Apr	L-Q model, TCP and NTCP calculation, Lyman-Kutcher, QUANTEC, Relative serial model (Emami / Burman data) + Bioplan+Sensitivity analysis	Eva Bezak
16-Apr	Clinical application of L-Q model, Radiobiology of altered fractionation (hypo, hyper), hypoxia, extension of L-Q for SABR	Wendy Phillips
16-Apr	Reirradiation, treatment interruptions and combined therapy	Fuad Ismail
23-Apr	MIRD formalism, diagnostic procedures	Jake Forster

Date	Topics	Lecturers
23-Apr	Latest development of the biomarkers and its clinical applications	Loredana G. Marcu
23-Apr	Course wrap-up	Chai-Hong Yeong

The online course was conducted using Zoom cloud meetings software (Zoom Video Communications, Inc, California, USA) and was broadcasted on YouTube ACOMP Channel (Fig. 1) via the following links:

Session 1:

<https://www.youtube.com/watch?v=mA3ObVNwLOo&t=1791s>

Session 2:

<https://www.youtube.com/watch?v=sJgo54f4NhE>

Session 3:

<https://www.youtube.com/watch?v=TBey3ODzsho&t=225s>

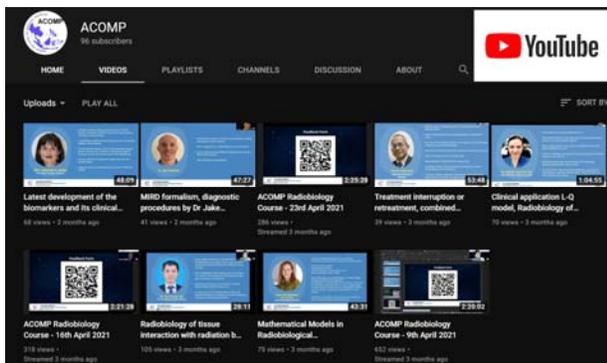


Fig. 1 ACOMP YouTube Channel containing links to access recorded lectures.

III. INVITED LECTURERS

We invited six experienced lecturers including one oncologist and five medical physicists from Australia, Malaysia and Romania. Their biographies are listed below:

Dr. Aik-Hao Ng, a senior medical physicist at the Department of Radiotherapy and Oncology, Kuala Lumpur Hospital and Nuclear Medicine Department, National Cancer Institute, Malaysia. He is the founder and current Chairman of the Malaysia Ministry of Health Medical Physics Research Task Force. He also serves as the Physics Advisory Editors for Medical Dosimetry Journal.

Professor Dr. Eva Bezak, a Professor in Medical Radiations and Director of the Translational Cancer Research Centre, University of South Australia. She is the current Secretary-General of the International Organization for Medical Physics (IOMP), Vice President of the Asia-Oceania Federation of Organizations for Medical Physics (AFOMP), former President of the Australasian College of Physical Scientists and Engineers in Medicine (ACPSEM),

and external member of the Affiliated Commission 4 (AC4) of the International Union of Pure and Applied Physics (IUPAP). Professor Bezak and her group are national leaders in radiation biology modeling using Monte Carlo algorithms. They have developed a new micro-dosimetry measurement technique for detection of alpha particles for use in targeted alpha therapy using the Timepix detector (which was developed in CERN) and became one of the most exciting micro-dosimeters in the market.

Dr. Wendy Phillips, a senior radiation oncology medical physicist at the Royal Adelaide Hospital, Australia. She served as a Radiation Oncology TEAP Public Preceptor and ACPSEM Advisory Forum in 2018–19. She was the recipient of the ACPSEM Kenneth Clarke Journal Award 2011 and Boyce Worthley Young Achiever Award 2012.

Professor Dr. Fuad Ismail, one of the pioneer radiation oncologists in Malaysia. He is the current Head of the Radiotherapy and Oncology Department at the National University of Malaysia Medical Centre. He founded the Master of Clinical Oncology programme at the University of Malaya. He is a member of the Evaluation Committee for Specialist Medical Qualifications for Oncology in Malaysia.

Dr. Jake Forster, a medical physics registrar at the South Australia Medical Imaging, specializing in nuclear medicine. He has a background in radiobiology and micro-dosimetry with interests in quantitative imaging and dosimetry for radionuclide therapies. He received the Best Medical Physics PhD award in Australia and New Zealand in 2019.

Professor Dr. Lorendana G Marcu, a Professor of Medical Physics at the University of Oradea, Romania and adjunct professor at the School of Health Sciences, University of South Australia. She is a radiotherapy medical physicist and her research interests include in silico modeling of tumour growth and response to treatment, radiobiology, targeted therapies, and the risk of second cancer after radiotherapy. She has involved in several professional activities within European Federation of Organizations for Medical Physics (EFOMP) and the International Union for Physical and Engineering Sciences in Medicine (IUPESM).

IV. PARTICIPANTS

289, 265 and 161 participants attended the live Session 1, 2 and 3, respectively. Fig. 2 shows the screenshots of the participants during the course. The ratio of Zoom:YouTube participants was approximately 2.5:1. 57% of the participants were medical physicists, 30% were students, 3% were radiographers and the remaining were oncologists, radiobiologists, regulators, radiation therapists, radiation protection officers, nuclear medicine physician, etc. Majority of the participants were from the ASEAN countries (Malaysia, Indonesia, Philippines, Singapore, Brunei, Cambodia, Vietnam) and some were from India,

Taiwan, Australia, Nepal, United Kingdom, Hong Kong and the United States.



Fig. 2 The screenshots of the participants during the course via Zoom platform

V. FEEDBACK AND COMMENTS

We received overall excellent ratings regarding the quality of the course. Details of the feedback are shown in Fig. 3-5.

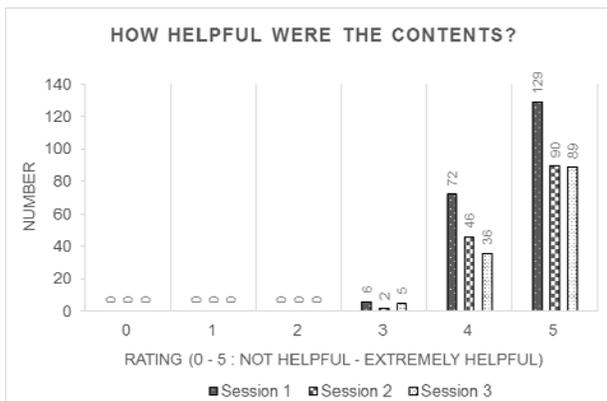


Fig. 3 Rating on the usefulness of the course contents

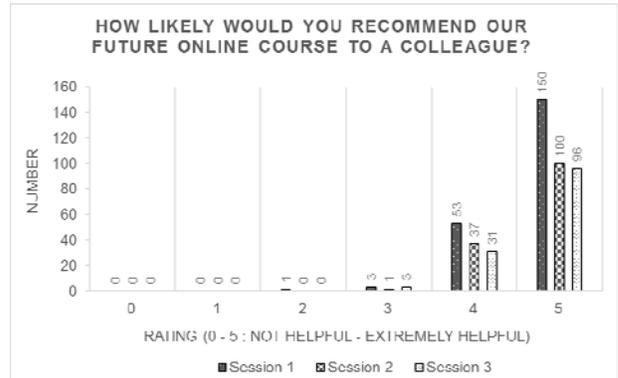


Fig. 4 Participants' feedback if they would recommend the future online courses to their colleagues

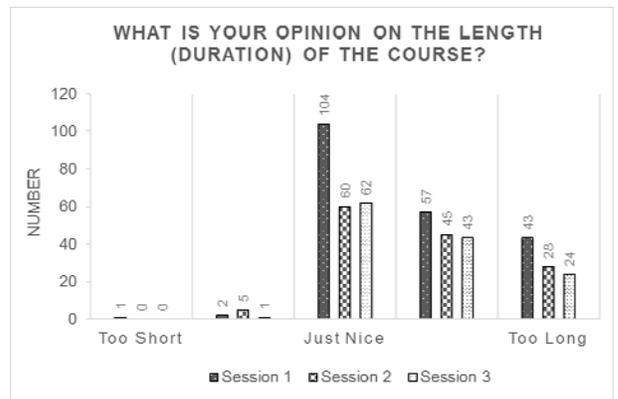


Fig. 5 Rating on the duration (length) of the course

Table 2 shows the ten most recommended topics for future courses from the participant's feedback.

Table 2 Top ten topics recommended by the participants for future courses

No.	Recommended Topics
1	Radiotherapy
2	Radiobiology
3	Stereotactic Body Radiation Therapy
4	Dosimetry
5	Quality Assurance and Quality Control
6	Brachytherapy
7	Stereotactic Radiosurgery
8	Radiation Treatments other than for Cancer
9	Gap Correction during radiotherapy treatment
10	Radiotherapy for COVID-19 Cancer Patients

We also received more than 450 comments gathered from the all three sessions of the course. The five top comments include “good presentation”, “great webinar”, “good work”, “good lecture” and “interesting topic”. In terms of recommendations for future improvements, the comments are categorized as follows:

1. Organize more such courses in the future.
2. Increase duration/length of the workshop.
3. Allocate more time for discussion.
4. Prolong the questions and answers (Q&A) session.
5. Include more animation or video to aid explanation.

VI. CONCLUSIONS

The 13th ACOMP Course has paved a new online learning platform to disseminate the knowledge and experiences in radiobiology. It has received overwhelming response from the participants. The number of attendees (averagely 250 participants per session) has far exceeded the original target of 100 from the ASEAN region. The positive response and feedback from the participants have shown that radiobiology is an important and very much sought-after topic in medical physics and radiation oncology. This information is beneficial in their routine clinical works while bridges the gap for the application of radiobiology principles in the current development of

various imaging and therapeutic procedures. The free online meeting platforms have made teaching and learning more accessible and affordable for everyone.

ACKNOWLEDGMENT

We thank the support of the Taylors' University and the postgraduate students – Miss Asseel Hisham and Miss Hun Yee Tan for hosting the webinar. Special thanks to all the lecturers.

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