South Asia Centre for Medical Physics and Cancer Research

SCMPCR

Newsletter

A Project of Alo-BT

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MOTTO: Quality Education and Health Science for Patient Benefit

Inside This Issue

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Chairman's Message

Covid-19 caused by the SARS-CoV-2 corona virus, affects people all over the world. However, companies and research institutes are developing protective vaccines. One vaccine has now been approved in Russia, another one in the EU and two in the USA. In the mean time on 5th in Russia and 8th December in UK has started the Vaccination. The World Health Organization (WHO) currently counts more than 200 vaccine projects against SARS-CoV-2. Several companies have already invested heavily. The scientist was convinced that there could be two billion vaccine doses by the end of this year. WHO is working with all countries in the world to agree on priorities for distribution. A country should secure a vaccine for itself. But, staffs in health and care facilities, police officers, salespeople, elderly people or those with previous illnesses could be on a priority list. Although vaccines are now being developed at record speed, there must be no compromise on safety.

Although the pandemic situation affected our workflow quiet a lot, we are still continue our activities for achieving our goals in 2020 . As awareness is one of the most important aspects of a country's healthcare, SCMPCR has organized an online awareness program in Khagrachari for the tribal women's on breast cancer and other awareness programs on Covid-19 and medical physics professions in our social media. We already organized two E-learning programs-one in July (ELP-01) and the other one in October (ELP-02). With the help of qualified trainers, we were able to finish these programs without any complication. And I am very happy to inform you that the E-learning program in combination with Hands-on-Workshop will continue even after the pandemic. In 2021, we have planned three e-learning courses in the month of February, July and October. Each course consists a series of lectures by the international well known experts.

I welcome all the interested participants to join our courses. Wish you all a happy, peaceful and COVID free healthy new year 2021.

Prof. Dr. Golam Abu Zakaria
Chairman, SCMPCR

Editor's Notes

It is my great pleasure and privilege to contribute to the SCMPCR newsletter as the editor-in-chief, we share recent reports of SCMPCR e-learning activities and articles from other countries in South Asian region conducted recently in the time of coronavirus crisis. In addition, featured articles, a research abstract, a review article and news & events were included in this issue.

We also encourage you to start a dialogue with us and provide your feedback and suggestions about how our newsletter can be improved. Also please send us your contribution on or before 31st of May 2021 for the next issue which will be published in July 2021.

Thanks
Jeyasingam Jeyasugiththan
Editor-in-Chief

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Implementation of e-learning Program for the Medical Physicists: SCMPCR ELP-01

During the past decade, the advance technologies have been adopted by the healthcare sectors in diagnostic radiology to identify cancer diseases and then treat them using high energy ionizing radiation. According to international rules and regulations, Qualified Medical Physicists (QMP) are required in order to ensure accuracy, precision and quality of treatments. To manage the huge growing demand of use of ionizing radiation in cancer treatments in South Asian Region, SCMPCR is constantly engaging to create skilled manpower with the assistance of international and local experts through national and international collaboration in the field of Radiotherapy, Diagnostic Radiology and Nuclear Medicine. Recently SCMPCR has introduced a series of online e-learning programs which provide quality education and training with low resources by sharing knowledge.

To meet the challenge of digitalizing the health care sectors, e-learning interference for education and training could greatly benefit. It is to mention that, During COVID-19, like other organizations, SCMPCR is still continuing its activities through online for teaching and learning. Hence, SCMPCR has conducted an online course on Medical physics program, called SCMPCR ELP-01, in Bangladesh. This e-learning activity has been accredited by EBAMP and IOMP and will be conduced three times in a year in parallel to the other SCMPCR activities such as hands-on workshop and in-service training program. Each program will consist of a series of lectures with 2-5 internationally well-known qualified experts.

Ms. Jeevanshu Jain, Medical Physicist from Advanced Center for Treatment, Research and Education in Cancer(ACTREC) of Tata Memorial Centre, Navi Mumbai, India was appointed to elaborate the whole procedure. A speech on the mission and vision of SCMPCR was delivered by the Chairman of SCMPCR, Prof. Dr Golam Abu Zakaria. Furthermore, he expressed his view about the importance of e-learning and why such programs are beneficial.

The online platform called Google meet was used and registered participants were only allowed to enter through user name and password provided. The attendance of the participants was taken for certificate distribution. The participants were evaluated electronically through online evaluation form and participants responses were evaluated for the improvement of the program in future. The evaluation report is shown in figure 1. Finally, certificates for the participants were issued. Among 270 registered participants 120 attended and obtained certificates.

Dr. Venkataraman Poopathi
Chief Medical Physicist and
Radiation Safety Officer
Dr. Rela Institute and Medical Centre
CHENNAI, INDIA

I was privileged to be an invited speaker in your SCMPCR ELP-01 first teaching program held in 27 th, June 2020. The program was really a challenging one. As a Medical Physicist I was amazed to know that participants from 51 countries and over 120 participants have attended the program. This shows the thirsty for technical knowledge during the pandemic.

It was great experience that entire audience was listening my talk on "Re-focusing BrachytherapyPhysics in Radiation Oncology". I have done my best even though it was totally new experience for us.We normally conduct the Annual Conferences and Seminars wherein people assemble physically in the conference hall.

Dr. Raju Srivastava
Medical Physicist
Department of Radiotherapy
Ghent University Hospital
Gent, Belgium

Facing the challenges of the Covid-19 pandemic, the E-learning Program definitely was on top of the game on the new learning and teaching landscape. The E-learning Program organized by South Asia Centre for Medical Physics and Cancer Research (SCMPCR) in June-August 2020 was one of the best teaching and learning events. The theme of the program focused on engaging students, dosimetrist, medical physicists, academics etc. with online learning.

The event was attended by a wide range of specialists, from different countries, and coming from with different level of experiences, some of them with an equal split between teaching and research contracts, and others with teaching-only or hospital positions. Most of the participants felt that this period of rapid change is giving us a unique opportunity to innovate and experiment with new practices. The level of expertise and knowledge of the presenters were excellent. In addition, I appreciate their positive attitudes, manifested through their willingness to explain concepts, the clarity of the visual aids and opportunities to ask questions.

Facing the challenges of the Covid-19 pandemic, the E-learning Program definitely was on top of the game on the new learning and teaching landscape. The E-learning Program organized by South Asia Centre for Medical Physics and Cancer Research (SCMPCR) in June-August 2020 was one of the best teaching and learning events. The theme of the program focused on engaging students, dosimetrist, medical physicists, academics etc. with online learning.

Being the moderator for the first ELP by SCMPCR was a matter of honor for me.It was a great learning experience to interact with the international experts of Medical Physics like Poopathi Sir, Naqvi Sir and Srivastava Sir through this platform. Such programs prove to be the cornerstones in the journey of students and young medical physicists like me as we get the opportunity to learn and develop deep understanding of the subject not only from the educators, but from each other also.

The ELP-1, with attendees from over 50 countries, served as a great forum for us all to foster our bond with each other and share knowledge. I learnt a great deal about organizational skills and the importance of coordination from the young SCMPCR TEAM and was really enthused by the guidance of Zakaria Sir and Anupama Azhari Ma'am.

I thank SCMPCR for giving me the opportunity to be a part of their program and I look forward to the future editions of ELP.I wish SCMPCR success in all their future endeavors.

Thank You and Best Wishes.

Ms. Jeevanshu Jain
Medical Physicist
Advanced Center for Treatment, Research and Education in Cancer(ACTREC),
Tata Memorial Centre, Navi Mumbai, India

I attended three webinars of SCMPCR E-learning program (ELP-01) on 27th June, 15th July and 25th July. I want to make my feedback on the program.

Every crisis brings new opportunities. The current pandemic is a golden time to find new ways to interact and learn from each other. Modern communication technologies have removed the distance between us, which is successfully shown by the conducted webinars. The high professional level of the lecturers make the material accessible not only for experienced professionals but also for beginners.

I would like to add a few wishes to SCMPCR. Don't forget about radiology X-ray departments with conventional X-ray, fluoroscopy and CT. I mean that in many places questions about QA and QC stay become actual. I also want to attend practical classes on this topics on the webinar sessions. Many thank to all the organizers, participants and listener.

Bondarevskyi-Kolotii A Viacheslav
Head of Radiation Safety Department,
RSO of Donetsk Clinical Territorial Medical Association, Ukraine

The E learning program scheduled by the South Asia Centre for the Medical Physics and Cancer Research was very successful and as a medical physicist working to a hospital. I gained a good knowledge about the brachytherapy, modern imaging techniques as well as to improve the experiences regarding the operational radiation protection practices. And also the combination and the including's of the lecture series was excellent and the facilities provided by the organizing team was highly appreciable. Very much thanks for SCMPCR team for giving this valuable opportunity to participate us to this program, which was very beneficial for the radiation workers.

Kushani Salindika Hettiarachchi
Medical Physicist
National Hospital of Sri Lanka

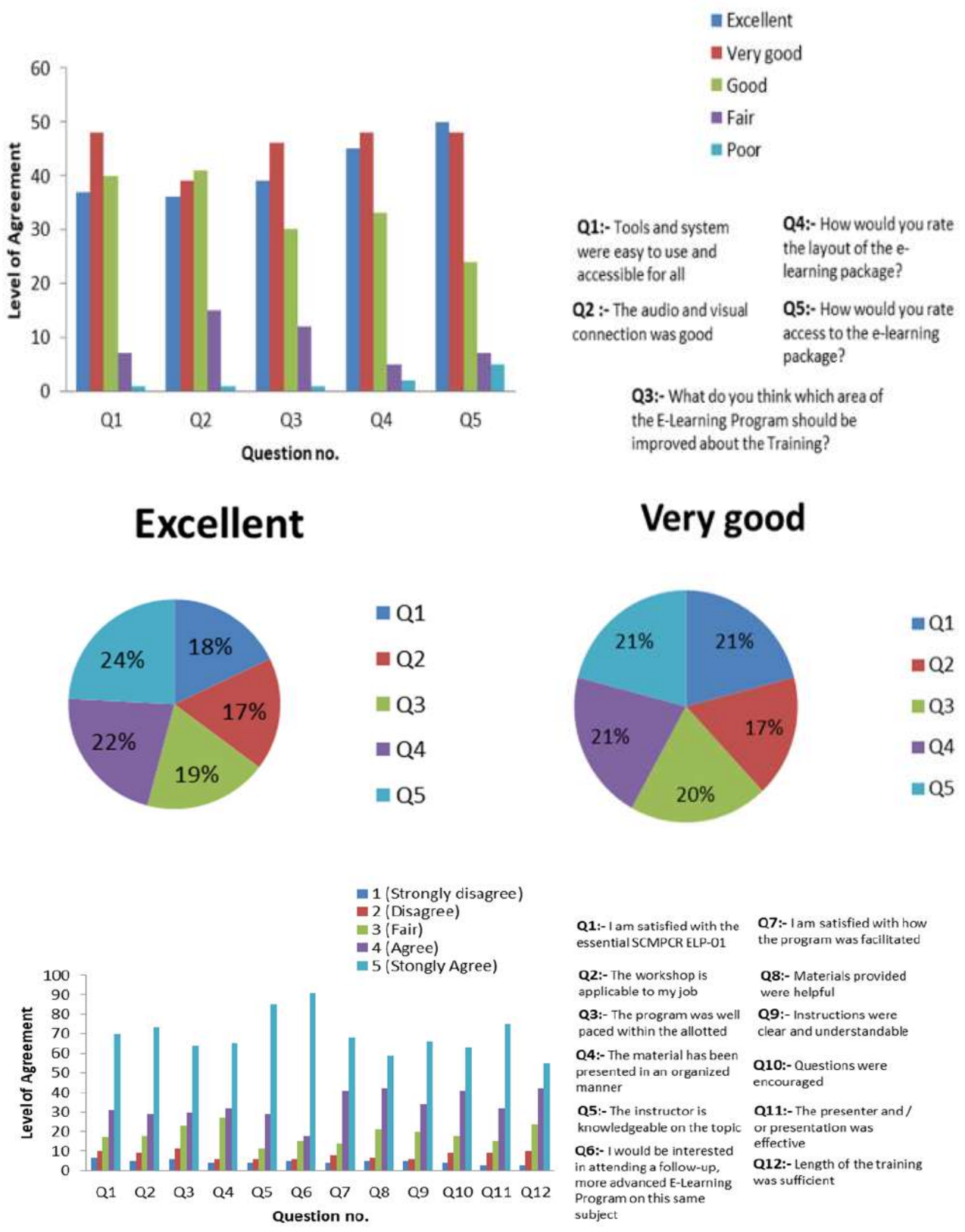


Figure 1: The figure shows responses from the participants of SCMPCR's e-learning program ELP-01 on the topics Brachytherapy Physics, Operational Radiation Protection and Imaging in Modern Radiation Oncology. Evaluation forms were completed by 140 participants from 18 countries attending the three one-day sessions on June 25, July 15 and July 25, 2020.

EBAMP Accredited Online Program for Medical Physicists with CPD point: SCMPCR (ELP-02) October, 2020

After the overwhelming response from the first e-learning program SCMPCR has decided to conduct this 2nd e-learning program on October-2020 which was more organized with some advanced facilities where SCMPCR develop its own e-learning platform using Moodle learning management system. This course was accredited (Accreditation Code APP00133) by European Board for Accreditation in Medical Physics (EBAMP) as CPD event for Medical Physicists at EQF Level 7 and awarded 12 CPD credit points.

The total number of registered participants was 270 from more than 35 countries. Only 78 participants have been selected through selection committee on the basis of their need, experiences, publications and the committee give higher priority to the developing countries participants.

Two lectures followed by examination as well as distribution of online certificate

The online platform was SCMPCR website which was developed by Moodle learning management system. The IT specialist design this platform as per need of ELP with necessary information of the program. The option of polling system, exam method, chat is possible, Only registered participants were allowed to enter through user name and password. In this system SCMPCR took the attendance of the participants and saved it for certificate distribution.

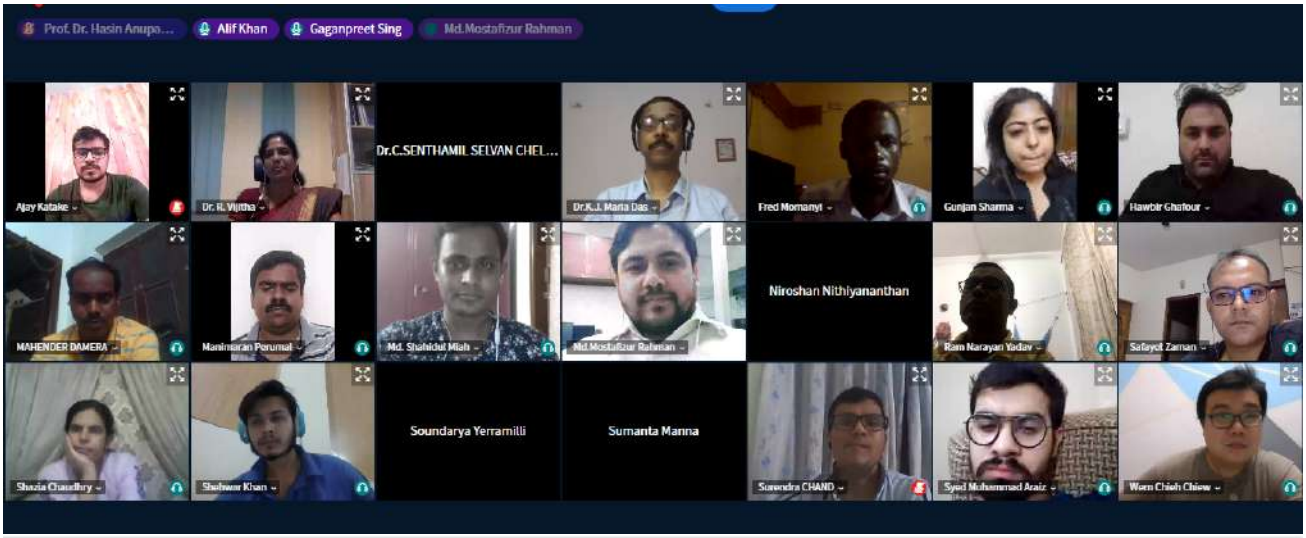
The Moderator for the ELP-02 was Dr. Vijitha Ramanathan (Head of the Department of Radiography and Radiotherapy, Faculty of Allied Health Sciences, General Sir John Kotelawala Defence University, Sri Lanka) who conducted the program very smoothly. The Program was concluded by Prof. Dr. Hasin Anupama Azhari, CEO, SCMPCR as she thanked everyone for joining the program and giving the efforts for learning something new.

Dr. K. Joseph Maria Das
Professor, Department of Radiotherapy
Sanjay Gandhi Postgraduate Institute of Medical Sciences
Lucknow, Uttar Pradesh, India.

It was a wonderful opportunity to be associated in contributing towards the E-Leaning Program conducted by the South Asia Centre for Medical Physics and Cancer Research (SCMPCR) under the guidance of Prof. Golam Abu Zakaria and Prof. Hasin Anupama Azhari.

I admire the passion and motivation by the group in creating this very active and dynamic group for the purpose of teaching and training the young Medical Physicists across the South Asia.

The teaching module was excellent and seamless to conduct my teaching lecture followed by interactive question and answer session well moderated by experts. In addition, the polling function in the software was very useful.



Dipl.-Ing. Holger Wirtz
Head of Medical Physics, CTO
Lake of Constance Radiation Oncology Center
Singen, Germany.

As a teacher for nearly 30 years, Head Teacher of a faculty and a self-taught e-learning developer, I realized that much of what I learned through these webinars and websites achieved the very results.Some progress, some attention, eventual boredom and not as much retention as I would have liked to have seen.

Fundamental knowledge beside practical topics made the course very enjoyable. The professional organization via the videoconferencing made the course accessible by a lot of students.

Wish to have more often such sessions!

Dr. Vijitha Ramanathan
Head of the department,
Senior Lecturer,
Department of Radiography & Radiotherapy,
Faculty of Allied Health Sciences,
General Sir John Kotelawala Defence University, Sri Lanka.

Thank you for giving me the chance to partake in ELP-02 as a moderator. The program was extremely well organized by SCMPCR. Both lectures were very interesting and fascinating. All participants were actively involved in this e-learning program. ELP-02 was very successful. I would like to thank SCMPCR team for their hard work on this event. Good job!

Maaruf Abdullahi
Medical Physicist,
Federal Medical Center Katsina, Nigeria

I am Maaruf Abdullahi, a Medical Physicist from Federal Medical Center Katsina, I'm so much grateful to SCMPCR for such a great, educative and inspiring of E-learning Program, which do much help me a lot in many ways to boost my carrier for a better safe service delivery. I'm lucky to participate in the last two sessions of ELP-01, which is very much well organized and helpful, and I get my certificate of participation. The second E-learning program (ELP-02) is very much interested too and much organized than ELP-01, which show great development. I took part in both the two lectures on 'Image Registration' and 'Radiotherapy in Developing countries'. I really enjoyed both session from such as qualified and experience presenters. It really makes me understanding the way I can be better for the continued success and development of my country in radiotherapy and related disciplines.

Thanks to SCMPCR, it's staff and all that contribute toward the success of such a great programs, especially to developing countries like my own Nigeria. With organizations like SCMPCR, I can say so much would be achieved toward the development in science, research and technology to young researchers across the globe. God bless SCMPCR, it's staffs and activities.

Surendra Chand
Senior Medical Physicist/RSO
B.P. Koirala Memorial Cancer Hospital, Nepal
Treasurer, NAMP

I am pleased to attend the SCMPCR e-learning program (ELP-02) on 10th and 17th October, 2020. I want to express my gratitude and thanks for hosting such an amazing program, well organized with a perfect rhythm. I am overwhelmed the speakers for their contextual information on advance medical physics and on radiotherapy setup management. I have amazing experience from the program. I guess, like me, all participants are looking forward to participate such more e-learning program in future.

Buddhika Srimal Sesath
Medical Physicist
Provincial General Hospital Badulla,
Sri Lanka

Excellent e-learning program on Image Registration in Radiotherapy, which is currently needful in medical physics. It's greatly expanded our knowledge. Specially in this pandemic situation we do not have opportunity to gather knowledge by attending workshops, seminars etc.. Thank you very much for giving me this opportunity to participate this e learning program. Hope to join 3rd e-learning program on coming February. Stay safe.

Addressing October Breast Cancer Awareness Month by Raising Awareness within the Indigenous Ethnic Group of Khagrachari District

The prevalence of breast cancer in Bangladesh is estimated to be 22.5 per 100000 females of all ages. In comparison to all other cancers, breast cancer has the highest prevalence among Bangladeshi women aged between 15-44 years, at 19.3 per 100000 women. As breast cancer remains a leading dreadful cancer of women in Bangladesh, raising awareness of this disease is paramount for the improvement of society as a whole.

In most of the developing countries, like Bangladesh, patients only get diagnosed at the later stages of cancer due to ignorance and lack of awareness. As we know, most forms of cancer are curable when diagnosed early, and awareness is the only way through which we can achieve this and motive people to do so.

In Bangladesh, every year almost 20 to 30 thousand women are diagnosed with breast cancer. A survey showed that, in the USA 1 out of every 8 women is affected by breast cancer. In 1985, USA announced October as the international breast cancer awareness month. Many organisations around the world arranged programs, seminars, and rallies to raise awareness about breast cancer. Awareness plays a key role and is a major strategy of SCMPCR to improve access to health.

This year SCMPCR conducted a remarkable program in an ill heath area where there is limited access to health services. This program was held for the indigenous people living in the southeast part of Chittagong, who are unaware of the facts regarding breast cancer, its diagnosis methods, and available treatment options.

The seminar was sponsored by BEACON Pharmaceuticals Limited. The speakers for the event were Prof. Dr. Golam Abu Zakaria (Founder Chairman, Alo Bhubon Trust and SCMPCR, and Former Chairman and Chief Medical Physicist, Gummersbach Teaching Hospital, University of cologne, Germany), Dr. Aliya Shahnaz (Associate Professor, Oncology Department, Dhaka Medical College and Hospital) and Dr. Shahida Alam (Assistant professor, Department of Radiation Oncology, National Institute of Cancer Research and Hospital). The seminar was moderated by Prof. Dr. Hasin Anupama Azhari (CEO, SCMPCR and Chairman, Department of Medical Physics and Biomedical Engineering, Gono Biswabidyalay). The seminar was focused on Preventive measures and Treatment Approaches.

The seminar was broadcasted at Jalpahar Hall, Matiranga, Khagrachari among the indigenous ethnic group of the South-eastern part of Bangladesh. It was also broadcasted live on the official Facebook page of SCMPCR where many people around the country joined the seminar. Additionally, the seminar was later uploaded to the official YouTube channel of

the SMPCR to allow anyone interested the option of watching the seminar at a later date.

The program started off with the welcome and introductory speech from Prof. Dr. Golam Abu Zakaria mentioning the mission and vision of SCMPCR. Then Assoc. Prof. Dr. Aliya Shahnaz talked about the awareness of breast cancer. Her talk focused on the prevention of Breast carcinoma, including self examination. Next, Assistant Prof. Dr. Shahida Alam talked about the available treatments for breast cancer in Bangladesh. Finally, a question and answer session was held.

A huge amount of appreciation and positive response was received for this seminar. The participants were really pleased with the program and wanted more programs like this in the future. They also agreed to convey the awareness message to their family and friends, so that more people can understand the importance of awareness of breast cancer.

The overwhelming positive response from the participants really inspired the SCMPCR team to arrange more seminars and programs for the people who are deprived of such awareness and health facilities. We, the SCMPCR team, hope we can do more work like this to help more people in need.

An Overview of Recent Development of Radiotherapy Service in Bangladesh

Shahidul Miah[1], Shafayat Habib[1], Prodip Kumar Ray[1], Ashim Kumar Ghosh[1], Rawshan Ara Khatun[1], Julekha Sarker[1], Safayet Zaman[2], Hasin Anupama Azhari[3], Golam Abu Zakaria[3]

[1]Rajshahi Medical College Hospital, Rajshahi, Bangladesh
[2]Dhaka Medical College Hospital, Dhaka, Bangladesh
[3]South Asia Center for Medical Physics and Cancer Research, Dhaka, Bangladesh

Bangladesh is a developing country and is now facing many challenges, especially in the health sector. Cancer management is a priority due to the current trend of rapidly increasing cases of cancer in this region. Although accurate numbers of cancer patients in the region is currently unavailable, according to the WHO it is estimated that there are around 1.3 to 1.5 million cancer patients in the country compared to a total population of around150 million people. An estimated 200,000 new cases are diagnosed each year, while around 100,000 cancer patients die annually.

The country has 10 government-owned radiotherapy centres with 9 Linacs, 6 telecobalt, and 8 HDR Brachytherapy machines, 9 of which include dedicated CT or PET simulators. Additionally, 9 private radiotherapy centres are available with 14 Linacs, 3 telecobalt and 8 HDR Brachytherapy machines, 8 of which are dedicated CT or PET Simulators used to treat cancer patient with well equipped and advance technology. A Dhaka city private hospital (Labaid Hospital) has also installed a Linac that is ready for clinical use. Outside of Dhaka city, in Chittagong (Chattogram Maa-O-Shishu Hospital) and Bogra city (TMSS Medical College & Rofatullah Community Hospital) 2 additional Linacs have been ordered. Bangladeshi Hospitals, both government and private, are increasingly adapting to modern advancements in radiotherapy. A brief overview of the development of radiotherapy services in Bangladesh is described below.

GOVERNMENT HOSPITAL IN BANGLADESH:

National Institute Of Cancer Research and Hospital (NICRH)

The National Institute of Cancer Research and Hospital is the only specialized government institute and tertiary level cancer hospital in Bangladesh. Located in Mohakhali in Dhaka City, it was established in 1982 by the Government of Bangladesh. The first patient radiation treatment was carried out in 1995 using a Cobalt 60 Teletherapy machine at this hospital. At present, this hospital has four Linear accelerators equipped with Eclipse treatment planning system and a simulator. These machines provide multiple treatment options in External Beam Radiotherapy. This includes Three Dimensional Radiotherapy (3DCRT), Intensity modulated Radiotherapy (IMRT) and Electron Therapy. In addition, the NICRH has a Gamma Medplus afterloader for HDR Brachytherapy (Ir-192), which provides curative HDR Brachytherapy service for Gynaecological malignancies using a central vagina and intracavitary applicator. It also has a cobalt unit for cancer palliative treatment. A new 16 slice Toshiba CT Simulator was also installed September 2020. Around 49 Radiation oncologist with residency, 5 medical physicists, 16 radiation technologists and nurses worked here daily.

Dhaka Medical College Hospital (DMCH)

Located in Dhaka City, the Department of Radiotherapy of Dhaka Medical College & Hospital is the first government cancer treatment centre and was established in 1958. This department is equipped with both radiotherapy (external beam radiotherapy and Brachytherapy) facilities. At present, this department has a LINAC, and a 30 MLC based Cobalt 60 Teletherapy machine with PROWESS Treatment Planning software system and record & verifying system. The cobalt 60 machine has multiple treatment option including 3DCRT, IMRT etc. The hospital also has a HDR Brachytherapy machine

with well equipped HDRPlus version 3.0 Treatment Planning software systems and X-Ray C-Arm Machine for simulation. For Brachytherapy treatment, a different type of applicator is used. A new 16 slice Toshiba CT Simulator machine was also installed in September 2020. 19 radiation oncologists, 3 medical physicists, 4 medical technologists and 10 nurses work here daily.

Rajshahi Medical College Hospital (RMCH)

Rajshahi Medical College Hospital established was in 1958. It is located in Rajshahi District and was the second such institution in erstwhile East Pakistan. It is a large hospital that is the central provider for advanced health care in the northern part of Bangladesh. The department of radiotherapy at Rajshahi Medical College is suitably equipped to provide almost all possible therapeutic services for inpatients and outpatients. A Cobalt-60 machine has been available since 1996 for cancer treatment.

This department is equipped with both types of radiotherapy facilities (external beam radiotherapy and Brachytherapy). This department has a 30 MLC based Cobalt 60 Teletherapy Machine which was installed in 2018 with PROWESS treatment planning software system and Record & Verifying system. It has multiple treatment options such as 3DCRT, IMRT etc. For Brachytherapy treatment, a HDR Brachytherapy machine which is well equipped with HDRPlus Treatment Planning software systems and different types of applicators is used. A new CT Simulator machine was also installed in 2020. 3 radiation oncologist, 2 medical physicist, 3 radiation technologist and 3 nurses work on outdoor patients.

Chittagong Medical College Hospital (CMCH)

This hospital is located in Chittagong district. The radiotherapy department has both External Beam radiotherapy and Brachytherapy treatment facilities. For external beam radiotherapy treatment, a new technology cobalt 60 theletherapy machine with treatment planning software system, MLC and Record& Verifying System is used. For Brachytherapy treatment and cervix cancer treatment, a HDR Afterloader Brachytherapy machine (cobalt 60 source) with HDRPlus version 3.0 treatment planning software system which was manufactured and provided by BEBIG Germany in 2016 is used. For Brachytherapy simulation, an X-Ray C-Arm Machine is also used. In this department, 9 radiation oncologists, 2 medical physicists, 3 technologists and nurses worked in outdoor sections.

Sylhet MAG Osmani Medical College Hospital (SOMCH)

Sylhet Medical College Hospital is located in the Sylhet district.This hospital's radiotherapy department only has an External beam radiotherapy treatment facility. For external beam radiotherapy treatment, a 30 MLC cobalt 60 Theletherapy machine which was installed in 2018 with treatment planning system and Record& Verify System is used. Around 100 patients are administered 2D conventional treatment by this cobalt machine every day. A new 16 slice Toshiba CT Simulator machine will also be installed very soon. The new cobalt machine is expected to have multiple treatment option like 3DCRT and IMRT. 3 radiation oncologists, 1 medical physicist and 2 medical technologists, nurses work here regularly.

Sher-E-Bangla Medical College Hospital (SMCH)

Barishal Medical College Hospital is located in the Barishal district. This hospital radiotherapy department only has a Brachytherapy treatment facility. For Brachytherapy treatment and cervix cancer treatment, a HDR Afterloader Brachytherapy machine with cobalt 60 source which was manufactured and provided by BEBIG Germany is used. For Brachytherapy simulation, an X-Ray C-Arm Machine is used. 2 radiation oncologists, 1 medical physicist, 1 technologist and nurses work at this hospital.

Shaheed Ziaur Rahman Medical College Hospital (SZMCH)

Located in Bogura district, this hospitals radiotherapy department only has an External beam radiotherapy treatment facility. At present, this hospital has one Linear accelerator equipped with Eclipse treatment planning software system. It provides multiple treatment options in External Beam Radiotherapy. This includes, Three Dimensional Radiotherapy (3DCRT) Intensity modulated Radiotherapy (IMRT) and Electron Therapy. They have also a new HDR Brachytherapy machine with high activity Ir-192 sources. Clinical operation will soon be starting here. A new dedicated CT Simulator will also be installed in this hospital. 2 radiation oncologist, 1 medical physicist and 3 technologists work here.

Bangabandhu Sheikh Mujib Medical University Hospital (BSMMU)

Bangabandhu Sheikh Mujib Medical University (BSMMU) is the premier Postgraduate Medical Institution of the country. The university is expanding rapidly and at present, the university has many departments equipped with modern technology for service, teaching and research. Since its inception, the university has also been delivering general and specialized clinical services as a tertiary level healthcare center. This hospital has new Advance technology Elekta HD Versa linear accelerator with updated treatment planning software version and a patient position verifying system. They also have a dedicated Simulator for patient simulation. These machines serve multiple treatment options like 3DCRT, IMRT, Rapid Arc, and VMAT and electron beam therapy. In addition they have a Brachytherapy machine that is temporarily not in use, but it is expected to be functional soon. 3 medical physicist and a standard level of staff work here.

Combined Military Hospital (CMH)

The Combined Military Hospital (Dhaka) or CMH is a hospital located in Dhaka Cantonment. It is part of the Combined Military Hospital chain situated in all cantonments of Bangladesh. This hospital has a True beam linear accelerator with four energy settings (6, 10, 15, 18 MV) two of which (6,10 MV) include Flattening Filter Free (FFF). They use updated Eclipse treatment planning software system with well equipped treatment verification tools in this hospital. They also provide Brachytherapy treatment using varian iX Brachytherapy system with Ir 192 source. For patient simulation, this hospital has a PET simulator. They provide multiple treatment options like 3DCRT, IMRT, Rapid Arc, and VMAT, SBRT and electron beam energy. Additionally, they are in the process of purchasing a new Linear accelerator with updated version and modality. 12 radiation oncologists, 4

medical physicists, 12 radiation technologists and 4 nurses work here.

Atomic Energy Research Establishment (AERE)

Atomic Energy Research Establishment is a government nuclear research station in Bangladesh that is located in Savar Upazila, Dhaka. In this centre, they recently installed a new updated linear accelerator to update their radiotherapy facilities. They have multiple treatment options such as 3DCRT, IMRT, Rapid Arc, and VMAT and electron beam therapy. For patient simulation they also have a PET simulator.

PRIVATE HOSPITAL IN BANGLADESH:

United Hospital (UH)

Located in Dhaka city, this hospital provides both EBRT and Brachytherapy Treatment facilities. They have a Truebeam linear accelerator with well equipped treatment modality including updated treatment planning software system, patient positioning verification tools, tumor board etc. They also provide Brachytherapy treatment by HDR Brachytherapy machine (Ir 192) using vaginal cylinder and intracavitary application. They also have CT simulation and PET simulation for treatment planning. Multiple treatment option such as 2D Conventional, 3DCRT, IMRT, Rapid Arc, and VMAT and electron beam therapy is available for patients. They have a standard number of radiotherapy staff as Radiation oncologist, Medical physicist, Medical technologist and nurses.

Square Hospital (SH)

The Square Hospital is a Multidisciplinary hospital located in Dhaka city. It is a well equipped cancer treatment Hospital. They have one Varian DHX Linear accelerator with updated treatment planning software system and Patient setup verification tools including portal vision. They provide multiple treatment options such as 3DCRT, IMRT, Rapid Arc, and VMAT and electron beam therapy. They have also a HDR Brachytherapy machine (Ir 192 source) with TPS system that provides 3D treatment for Brachytherapy patients. 14 radiation oncologists, 3 medical physicists, including 1 internationally qualified medical physicist, 5 technologist and 10 nurses work here daily.

Delta Hospital (DH)

Delta Hospital Limited (DHL) is the pioneer organization for general medical treatment, cancer diagnosis, cancer treatment, and management in the private sector in Bangladesh. It provides the full range of radiation therapy and other services to its patients. Located in Dhaka city, this hospital has three Linear accelerators, all of which are new True Beam Linacs, including one with Treatment planning software systems, patient positioning verification system and two cobalt units. The linac machine has different energy settings and multiple treatment options such as 2D Conventional, 3DCRT, IMRT, Rapid Arc, and VMAT etc. They also have HDR Brachytherapy Machine and CT simulator. 17 radiation oncologists, 7 medical physicists, 35 technologists and nurses worked here.

Evercare Hospital Dhaka (ECH)

The Evercare hospital is a new hospital located in Dhaka city. They have an Elekta

Linear accelerator LINAC HD -VERSA Signature model, which is fitted with a six dimensional rotation couch known as HEXA POD that is programmed to deliver radiation doses to tumours with pinpoint accuracy from any angle. They have multidisciplinary treatment option like 3DCRT, IMRT, Rapid Arc, SRS, VMAT and Electron beam radiotherapy.

The centre is also equipped with an ultramodern HDR Brachytherapy (treatment of cancer by the insertion of radioactive source directly into the body cavity and tissues) unit "FLEXITRON" which houses Cobalt 60 as a radiation source thus ensuring uninterrupted treatment due to the long half-life of the source. In addition to its already existing armamentarium, Evercare Hospital Dhaka has proudly announced that their most advanced PET-CT machine was recently installed, and that it provides cutting-edge technology to stage, plan, manage and monitor the treatment of the tumour or tumours in question. Radiation oncologist, Medical physicist, and a standard number of Medical technologist and nurses work here.

Enam Medical College Hospital (EMCH)

Located Savar in Dhaka district, the Radiotherapy department of this hospital is well equipped with modern updated Linaer accelerator (Elekta) & an HDR Brachytherapy (Nucletron) machine. They are capable of HDR Brachytherapy treatment using a Flexitron machine with cobalt-60 source. They have multiple treatment options for EBRT such as Conventional RT 3DCRT, IMRT, VMAT, IGRT with Eclipse treatment planning system and two verification systems (EPID & CBCT). 4 Radiation oncologists, 2 Medical physicists, standard number of Medical technologists and nurses work here.

Khaja Yunus Ali Medical College Hospital (KYMCH)

Located in Sirajgong distric outside of Dhaka, KYMCH is a multidisciplinary private hospital in North Bengal Bangladesh. This hospital has both EBRT & Brachytherapy treatment services. Three linear accelerator and one Brachytherapy machine with well equipped Monaco & Xio treatment planning software system and other modern updated technologies are available here. They use Philips CT simulator for patient simulation and provide 3DCRT, IMRT, VMAT, IGRT treatment facilities. They also provide 2D conventional treatment and Electron Beam therapy. Medical physicists, Medical Technologist with standard oncology staff worked here.

Ahsania Mission Cancer General Hospital (AMCGH)

AMCGH is a comprehensive 500-bed world-class cancer hospital in Bangladesh run by Ahasania mission cancer society which is located in Dhaka District. They provide multiple treatment options of two linear accelerators with updated treatment modalities like treatment planning software systems, Verification tools etc. They have also treatment options available for Brachytherapy patients. They have multiple treatment options for both EBRT& BT like 2D Conventional, 3DCRT, IMRT, VMAT etc. They also have added a cobalt machine to treat palliative cancer patients. Additionally, the hospital is planning to purchase a Tomotherapy machine soon. 6 radiation oncologists, 6 medical physicists, 16 Radiation technologists and 6 nurses work at this hospital.

North East Medical College & Hospital (NEMCH)

North East Medical College is a private medical school in Bangladesh, established in 1998. It is located in South Surma Upazila,on the southern fringes of Sylhet District. They use a varian linear accelerator with updated Eclipse treatment planning software system and updated verification tools. For Brachytherapy treatment, they also have a HDR Brachytherapy machine with high activity Ir-192 source. By using CT Simulation they provides multiple treatment option like 3DCRT, IMRT, DCRT, Rapid Arc. Additionally, they also provide 2D conventional therapy facilities and Electron beam therapy. 3 medical physicists, along with medical technologists and standard oncology staffs work here.

Labaid Specialized Hospital (LSH)

Located in Dhaka city, LSH has recently installed an updated modern Varian Truebeam linear Accelerator and is in the process of purchasing a Brachytherapy Machine with well equipped treatment modalities in this year. They are expected to start clinical operation soon.

TMSS Medical College & Rofatullah Community Hospital

Located in Bogra District, this hospital is in the process of purchasing Brachytherapy and External Beam Radiiotherapy machines.

Chattogram Maa-O-Shishu Hospital

This is a multidisciplinary health services hospital located in Chittagong District. They are in the process of purchasing EBRT machine for treatment.

Summary

Radiotherapy is a multidisciplinary area which uses complex equipment and radiation sources for treatment. The radiotherapy program is dependent on site planning, construction and staffing the radiotherapy facility with skilled professionals. Medical Physicists play a vital role in radiotherapy such as treatment plan verification, machine calibration, patient positioning etc. There is a lack of qualified medical physicist in Bangladesh. Considering this situation, South Asia Center for medical physics and cancer research has worked to develop skilled manpower in Bangladesh. However, there is no government medical physicist posting in hospitals in Bangladesh except BSMMU. According to International Atomic Energy Agency (IAEA), 2 teletherapy machines and 1brachytherapy machine are needed per 1 million populations. According to this estimate, Dhaka city alone needs 20 machines and the entire country needs around 300 Teletherapy (radiotherapy) machines respectively. Recently, the Bangladeshi government has taken steps to establish 100 beds dedicated specifically to cancer hospitals in eight divisions, with full facilities of cancer treatment. This initiative is hoped to be completed around 2022.

However, Bangladesh is home to a total 19 radiotherapy centres in both the public and private sector. There are only 24 Linear Accelerators installed in the country with 9 teletherapy Cobalt- 60 machines, 16 Brachytherapy machines and 17 dedicated simulators. However, two private centres in Chittagong and Bogra have recently ordered two linacs, which will hopefully be installed very soon. Many medical college hospital in Bangladesh are very much interested in starting Radiotherapy service and they will hopefully be established very soon.

Coping with COVID-19 pandemic while continuing radiological physics services in a tertiary care medical college and hospitals in Jaipur, the capital city of Rajasthan, a north western State of India

Mary Joan, Priya Saini, Meenu Stephen, Arun Chougule

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The department of Radiological Physics, SMS Medical College and Hospitals, Jaipur is providing medical physics services to the departments of radiotherapy, radio diagnosis and other departments utilizing ionizing radiation for diagnosis and treatment. The medical physicists carry-out the radiotherapy treatment planning, dosimetry, radiation safety and protection of patients and personnel and quality assurance of radiation equipment in the hospital along with academic and research activities. The SMS Medical College and Hospitals, Jaipur is one of the largest tertiary care medical colleges of the State of Rajasthan: the largest Indian state by area and seventh largest by population. In addition to the patients from the State, SMS Medical College and Hospitals provides healthcare services to the patients from bordering States of Punjab, Haryana, Uttar Pradesh, Madhya Pradesh and Gujarat. More than 50 lakh outpatients, more than 2.5 lakh surgeries and more than 8000 new cancer patients were treated last year.

In December 2019, the new respiratory tract infecting agent emerged in Wuhan city of China, known as the Corona virus. It was later named COVID-19. Full-genome sequencing and phylogenic analysis indicated that 2019-nCoV is a form of beta coronaviruses associated with human severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS). The virus is mainly transmitted through droplets generated when an infected person coughs, sneezes, or exhales. These droplets are too heavy to hang in the air, and quickly fall on floors or surfaces. You can be infected by breathing in the virus if you are within close proximity of someone who has COVID-19, or by touching a contaminated surface and then your eyes, nose or mouth.

The WHO declared COVID-19 a global pandemic on 11th March 2020. India reported the first confirmed case of the Corona virus infection on 30th January 2020 in the State of Kerala. Currently, this virus is the largest global public health threat leading to a major challenge of medical systems in all countries. India currently has the largest number of confirmed cases in Asia and has the second-highest number of confirmed cases in the world after the United States. India currently holds the single day record for largest increase in cases, set on September 17, with an additional 97,894.

The first case of the COVID-19 pandemic in the Indian State of Rajasthan was reported on 3rd March 2020 in Jaipur. Before 3rd March, India had 3 cases of Corona virus in Kerala all of which were treated and discharged. On 3rd March, India's 4th case was diagnosed in the State of Rajasthan and it was later found that this patient had infected 17 other tourists from Italy who were on a trip to India. These 21 COVID-19 infected patients were admitted in SMS Medical College and Hospitals, Jaipur. The SMS Hospital was the main COVID-19 treatment center in Rajasthan since the first incidence of COVID-19 infection. Early March, all COVID-19 infected

patients in Rajasthan were treated in SMS hospital, Jaipur and a fully equipped OPD facility and isolation wards were established in the hospital. Later, when the COVID-19 positive patients' influx increased, the Prime Minister of India declared lockdown across the country on 21st March 2020. All facilities in the SMS Medical College and Hospitals were also utilized for COVID-19 treatment thereafter as the regular patient inflow was reduced to very minimum.

The situation was same for radiation oncology patients too. The radiation therapy continued on outpatient basis with few inpatients that required hospitalized care. The cancer patient cohort is one of the most vulnerable to serious implications if infected with COVID-19 as they are elderly and immunosuppressed. Hence radiotherapy was one of the most challenging essential services amidst the pandemic.

As radiological examinations such as Chest X-rays and CT scans were one of the primary modalities for diagnosis and treatment evaluation in COVID-19 management, more attention was given to radiology also. A number of new X-ray machines and mobile X-ray units were procured to cater to the urgent needs of the huge no. of COVID-19 positive patients. Commissioning of these units fulfilling the regulatory requirements to ensure optimum radiation safety was also carried out swiftly by us. The faculty and paramedical staff of the department of radiological physics played an important role in the implementation of regulatory guidelines to establish X-ray imaging facility and obtaining regulatory permissions. This unique situation gave rise to many professional and personal challenges to all healthcare professionals including medical physicists in our institute. Carrying out the routine as well as additional radiological physics services was demanding considering the existing hospital

situation and social circumstances. Other than the radiation treatment delivering facility and a small ICU for cancer patients; all other facilities of radiotherapy and radiological physics departments were utilized for COVID-19 patient management.

Medical Physics is a unique workforce characterized by a large variety of relatively complex tasks. Compared to radiation therapists, nurses, radiation oncologists, radiographers and radiologists, a physicists' direct contact to patients is limited. But, the COVID-19 pandemic and associated life style and social modifications and restrictions put forth a variety of challenges in the personal domain rather than the technical ones. Lockdown initiated lack of means of public transport, closing down of public canteens and mess facilities also affected the lives of medical physicists in our department. Many religious festivals and associated holidays came and gone without anyone even realizing.

Establishment of procedure protocols for radiography and radiotherapy treatment delivery, maintaining the quality of the diagnostic and treatment system with optimum machine performance, achieving high through-put in minimum possible time, managing the workload with reduced workforce due to implementation of quarantine, the increased working hours and continuous duty schedules per individuals to accommodate the prescribed quarantine after duties, social stigma towards medical professionals and associated disputes in the personal front, use of PPE and lead aprons in the scorching hot climate of Jaipur going up to 50 degree Celsius in April, May and June are some of the challenges to list a few.

When lockdown was initiated in March end and COVID-19 was declared as a pandemic, there were four medical physicists in our institute, two of them in vulnerable group one being a senior citizen and another being pregnant. We have evolved ourselves to cope with the professional and personal challenges in the most effective and best possible way. Handing over the department space for COVID-19 management, safeguard and maintain the equipment and infrastructure, re-arrangement of radiation physics equipment and facilities to ensure optimum work efficiency, unhindered patient services; cancer as well as COVID-19 were all achieved by co-ordination and tireless efforts of the physicists team. The shock of the pandemic was transient and the department of radiological physics took a leading role in assimilating information on management of cancer patient's treatment, optimal execution of radiological procedures, diagnostic radiological imaging, radiotherapy dose delivery and treatment protocols, personnel and patient protection and communicated among all to equip ourselves better. This helped greatly in optimizing a plan of


Dosimetric QA of tele-cobalt machine


Brachytherapy treatment execution

action and departmental protocol in the midst of confusion. It was highly exciting to coordinate all the activities of the department due to the pandemic externalities. My previous training and experience helped me to handle them effectively.

Two new physicists joined our department in August. Narrated below are the personal experiences and professional challenges of two women medical physicists of our institute one already working and another newly joined in aiding unperturbed radiological physics services to all radiological procedures at this challenging time of COVID-19 pandemic. Ms. Priya Saini is working as medical physicist in Radiological Physics department of SMS Medical College and Hospitals since 2018. Let us listen to her experience.

During lockdown period, I was posted on cobalt teletherapy (Bhabhatron-II) and brachytherapy. My major work was to do treatment planning, treatment time calculation, radiation safety monitoring, QA after repairs, routine radiotherapy treatment equipment calibration and treatment plan reviews, teaching and research. In early March (starting phase of the COVID-19 pandemic), when number of patients were less, COVID isolation wards were made in, one or two departments in our hospital. Our hospital was the main COVID-19 treatment center. With the increasing number of patients, our cancer wards and other department's wards were also converted into isolation wards. And our departments' facilities (physics and dosimetry) were also vacated and occupied for doctors and nurses treating COVID-19 patients. At that time only one room was left with us for conducting our routine works.

Early phase of the COVID-19 pandemic, I found so many difficulties in managing patients because of lack of awareness and fear of this virus. Then I spent extra time in reading the available instructions and followed the guidelines given by WHO and slowly, I overcame my fear. Under normal conditions, the department used to treat 100-120 patients per day on Bhabhatron-II telecobalt machine. But with lockdown, the number of patients declined rapidly, to 50-60 patients per day on Bhabhatron-II telecobalt machine. This happened initially because it was difficult for patients to travel to the hospital as during lockdown there was no public transport and travel by ambulances was not affordable to everyone. Some patients had already left the hospital for their hometowns or villages, as there was uncertainty about the guidelines to be followed for treatments and difficulties with local accommodation in Jaipur. Those patients who were admitted in the hospital wards and staying in the hospital periphery received the remaining

fractions of their radiation treatments. Also patients those were recommended for surgery were also transferred to radiation therapy. So workload in our department slowly increased. For certain cases', including some patients with early stage cancer, radiation was delivered over a shorter period of time. The main reason for indicating hypo fractionated treatments during the COVID-19 pandemic was to minimize the viral exposure and risk of contamination of patients without reducing the effectiveness of the treatments. Our aim was to establish a better way to treat all patients who can benefit from radiotherapy; not to delay the start of treatment of any patient whose deferral may worsen the prognosis of their disease.

After lockdown, as the necessity of regular medical services to the general public became essential, our hospital resumed normal activity by shifting the COVID -19 patients to the university hospital and radiotherapy treatments continued normally again. Patients who survived the lockdown came back to the hospital for their remaining treatments. For those who had already received some radiation fractions, the gap was calculated and dose was managed accordingly. Every day, healthcare workers were seen screening patients with thermal scanning before registering them for treatment and providing them with hand sanitizers.

I made one separate box in manual treatment planning room. Every patient is advised to keep her/his treatment documents in that box. In this way, we could be able to avoid the cross contamination of the virus. After 4-5 treatment calculations, to protect myself and others from infection, I washed my hands with soap or used an alcohol based hand rub. Also, I instructed the security guard to send only one patient at a time inside the manual treatment planning room and every patient is advised to maintain physical distancing of minimum one meter (three feet) from each other. Before starting the treatment, every patient was verified to be COVID-19 negative.

In brachytherapy treatment console, at the time of treatment execution three persons used to be present; one technologist, one resident doctor and myself. We three maintained physical distancing from each other. We did not allow patient/ patient comforter to come in treatment planning room or console. We interacted with patient and patient comforter while maintaining one meter distance outside the minor OT. PPE kits were used while treating the patients. Personal protective equipment has become an important and emotive subject during the current corona virus (COVID -19) epidemic. Personal protective equipment was an important component, but only one part, of a system protecting staff and other patients from COVID -19 cross -infection. Appropriate use significantly reduced the risk of viral transmission.

During the lockdown period the Jaipur temperature varied up to 46 °C. That time as per guidelines; we were not using centralized air conditioner (AC) for preventing the spread of virus through air circulation. So that it was very difficult for us to wear PPE kit while treating the patients. And it was unfit for us also. In case of intraluminal brachytherapy, there was direct interaction with patient while taking the measurements for planning. During such instances I used to wear PPE kit. After completion of treatment, the PPE kits were discarded properly and wash my hands and face with soap. We pasted some notices on the treatment planning room, calculation room and other room doors with necessary messages in local language (no entry without mask, maintain social distancing, do not enter without permission etc.) to make awareness of COVID-19 to the patients and others. We used to ask all treatment ongoing patients about corona symptoms and other health related issues. If patients are found symptomatic then they were sent for COVID-19 test.

During this period, I created brachytherapy treatment plans for about 70 patients. In addition to the treatment planning, I was involved in quality assurance and quality control of the machines in the department and teaching. We did mechanical QA of both machines weekly and dosimetry QA monthly. Before starting the QA we used to sanitize treatment room and control console. In this way, we could prevent the spread of contamination of COVID-19 virus. During this period we became more conscious about hygiene.

During this period, few resident doctors of my department were also became COVID-19 positive and I interacted with one of them before two days. This got me scared and I started to pay more attention to improve my immunity. I did self-assessment for 3-4 days and consulted with a general physician also. Following that, two technologists posted in Bhabhatron tele-cobalt machine tested positive for COVID-19. As per the institutional COVID-19 protocol, they were home quarantined for 14 days. After quarantine they were tested negative for COVID-19 and rejoined the hospital. Frequent issues with the machines were raised during treatment delivery. I was also engaged in troubleshooting of machines. To resolve machine related problems we had to do more hard work as the engineers were unable to reach hospital. We did solve out the problems by online contact with engineers and troubleshooting via team-viewer.

As per local government instructions, from lockdown until now, the paramedical undergraduate students were taught on online classes via Zoom. The class attendances are recorded regularly. There are 5 postgraduate paramedical students and they joined back for regular classes after lockdown. I took many classes for them maintaining proper distance in department seminar room. I also instructed them regarding hospital protocols, necessity to follow proper hygiene and not to sit together without mask or not maintaining social distancing. Recently one of the post-graduate student got severe symptoms similar to Covid -19. He was asked to do COVID-19 test and not to come for classes until negative report. The other four students were asked to self-quarantine. After 24 hours he got negative report and was allowed to take rest for 3-4 days to recover from weakness.

In August beginning, a new physicist from Kerala, Ms Meenu Stephen joined our department. Her experience with the pandemic is as below. I just completed my master degree in Medical Physics and internship from KMIO, Bangalore, Karnataka in February and was searching for a job from my home in Kannur, Kerala. While staying at home I realized several things. With an increasing number of corona virus cases, the government locked down transport services, closed all public and private offices, factories and restricted mobilization. The use of face mask was promoted and schools and colleges were closed. All the religious groups were told to cancel gatherings to encourage social distancing and undue spread of COVID-19 virus. The people were only allowed out of their houses to provide essential services or buy essential goods. The police officers were regularly patrolling public places and markets to make sure people stayed apart and to inform people about the importance of social distancing, wearing masks and gloves etc. For students who are at the juncture of their academic career or professional courses and their parents, the lockdown heightened their anxiety, as it has affected their education and job opportunities. Educational institutes have been forced to depend on online learning. I was using social media to get connected, caring and communicating through mobile phones. These

electronic gadgets have become the need of the hour in the pandemic.

This lethal corona virus pandemic has not just created a medical emergency but also an employment crisis across the country. Since the outbreak of COVID-19 so many hospitals cancelled job interviews. They were not ready to call for new vacancy and were trying to manage with existing workforce. The absence of flights, trains and other modes of public transport during the lockdown made it impossible otherwise also. After 6 month of my course completion, two vacancies were advertised for Medical Physicist in SMS Medical College, Jaipur. The interview was scheduled on 7th July 2020. The main problem that I faced was attending the interview on that day as there was no proper transportation during that time. Travelling from one state to another state was a big deal. Also different states were having different traveling rules according to their current COVID-19 situation.

At that time the only way to reach Jaipur was through flight. The airline services were very few and there were so many procedures to do to get cleared for interstate travelling. The first mandatory step for flying is to install arogyasetu, a central government app that uses location trackers and Bluetooth technology to assess the risk of the user catching COVID-19. Airlines won't allow passengers on flights if the app shows their status as red. The temperature check was carried out all entry points where as self-check in and remote bag drops was the new mandate now to ensure avoiding clustering of people. On the day of the interview, all candidates were aware of the current pandemic situation and the hospital administration conducted the interview according to the COVID-19 protocol. All candidates attended the interview with face mask and maintaining the social distancing. After interview I was not able to go back home due to lack of airline services.

According to the Kerala government guidelines for air travelers coming to the state at that time, all should be home quarantined for 14 days from the date of arrival. As per the guidelines, all the passengers have to register their details with the COVID-19 JAGRATHA web portal. After undergoing medical screening for any symptoms of COVID-19, asymptomatic persons shall undergo home quarantine. Pick up vehicles for arriving passengers will be permitted to enter airport with one person (excluding driver of the vehicle) at a designated place subject to social distancing norms. If the people who pick up the passenger come in physical contact with the traveler, they shall also remain home quarantined for 14 days. After reaching back home I was in quarantine for 14 days. The other family members were not supposed to visit me. The health workers used to come to my home every day and inspect everything. The police officers also used to come home daily to inspect and I was asked to call them for any need including food, grocery etc. After quarantine days, I joined SMS Medical College and Hospitals as a senior demonstrator (Medical Physicist) on 4th August 2020. The distance from my home in Kannur to Jaipur was nearly 3000 kms. During the initial days, one of my major problems was speaking in Hindi, the local language in Jaipur. My mother tongue is Malayalam and understanding spoken Hindi by people wearing face mask was a challenge. With time, I got adjusted and interaction with colleagues and patients improved a lot. Accommodation and food and daily travel to department were other concerns, but I got an accommodation nearby hospital within a week and that solved the commutation problem also. Since, restaurants and canteens are closed; I had to make arrangements to cook also immediately.

COVID-19 situation made me more conscious of personal and public hygiene. People started taking personal hygiene more seriously. The ritual of washing hands, sanitizing things before use, that started as a compulsion slowly became a habit. At this time, there are no specific vaccines or treatments for COVID-19. However, there are many ongoing clinical trials evaluating potential treatments. WHO is continuously providing updates and necessary information. The personal narrations above of Ms Priya Saini and Ms Meenu Stephen give us a glimpse of how each and every one individually contributed to the collective efforts of the department of radiological physics for the flawless pandemic management.

The COVID-19 pandemic affected everyone globally and the department of Radiological Physics, SMS Medical College and Hospitals is not an exception. We are striving for keeping ourselves, our dear and near safe while continuing the medical physics services to all radiological facilities of the institute, without compromising the international standards. The academic arena has taken a new face with frequent webinars, virtual meetings and online examinations. Research has gained due recognition in the clinical medical physics also. Many e-books and documents were made free online during this pandemic, which gave a boost to the academic learning too. The department of Radiological Physics was planning to celebrate the International Medical Physics Week (IMPW) in Jaipur during 11-15 May 2020 which could not materialize due to the COVID-19 pandemic. The Senior Professor and Head of the department of Radiological Physics, Professor Arun Chougule has taken initiatives as President, Asia-Oceania Federation of Organizations for Medical Physics (AFOMP) and Chair Education and Training Committee–International Organization for Medical Physics (ETC-IOMP) in organizing regular webinar series in medical physics and popularizing them. Prof Chougule spearheaded drafting and publishing of comprehensive AFOMP guidelines on radiation oncology operation during COVID-19 and diagnostic radiology services during COVID-19 pandemic-medical physicists' perspective. In this challenging time we had a very proud moment as the department of Radiological Physics when Prof Arun Chougule was recognized as one of the AFOMP outstanding Medical Physicist on the occasion of the 20th anniversary of AFOMP. Many international medical physics conferences which were scheduled during this time are either postponed or are being conducted virtually. These subtle changes in academics, research and professional relations and development will hopefully lead us to a better tomorrow.

(L-R) Arun Chougule, Mary Joan, Rajni Verma, Priya Saini, Meenu Stephen and Gourav Jain

IAEA Safety Standards and PNRA Regulations on Medical Physics: A Review

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The profession of medical physics is advancing rapidly throughout the word as well as in Pakistan. During past ten years or so, the development of radiation related medical sector has been phenomenon in Pakistan, in terms of acquiring hi-tech modalities. These hi-tech modalities include, but not limited to, IORT, Gammaknife, Cyberknife, IGRT, VMAT, Cyclotron, PET/CT, etc.

The International Atomic Energy Agency (IAEA) has recently published two different safety standards: (i) Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, GSR Part 3, 2014 and (ii) Radiation Protection and Safety in Medical Use of Ionizing Radiation, SSG 46, 2018. Both of these documents address the need of radiation protection in medical facilities having radiology, radiotherapy and nuclear medicine practices in detail. These documents (also called standards) include the topics of design, operation, administrative and technical aspects and workforce requirements in medical radiation facilities. These documents have addressed the need of medical physicists in radiology, nuclear medicine and radiotherapy in greater detail and with more emphasis. Based upon the IAEA GSR Part 3, the Pakistan Nuclear Regulatory Authority (PNRA) has initiated the process of revision on the Regulations on Radiation Protection (PAK/904). These Regulations have been recently approved in the authority meeting of PNRA and have largely adopted the requirements of IAEA GSR Part 3 like the dose limits, exposure situations, etc. Another PNRA Regulations on Licensing of Radiation Facilities (PAK/908) Rev. 1, which was approved in 2019, states that the IAEA standards would be applicable in case if any requirement is not mentioned in PNRA Regulations. Therefore, all IAEA standards would eventually be applicable to all medical facilities in Pakistan and their proper understanding is very important.

Since, Pakistan has already acquired specialized modalities for radiotherapy and nuclear medicine practices and IAEA safety standards also require to have medical physics in sub-specialties, the PNRA have adopted the approach to classify medical physicists in three sub-specialties namely radiology, nuclear

Table 1: Past and Existing Qualification Criteria of Medical Physicists

Past criteria		Existing criteria	
Medical Physicist (all purpose)	• MS in medical physics OR • MSc in Physics with 6 months on the job training	Radiotherapy	• MS Medical Physics from a H.E.C. recognized university with one (01) year practical experience in radiotherapy; OR • M.Sc. or BS (4 year) (Physical sciences) from a H.E.C. recognized university with two (02) years practical experience in radiotherapy.
		Nuclear Medicine	• MS Medical Physics from a H.E.C. recognized university with six (06) months practical experience in nuclear medicine; OR • M.Sc. or BS (4 year) (Physical sciences) from a H.E.C. recognized university with one (01) year practical experience in nuclear medicine.
		Radiology	• MS Medical Physics from a H.E.C. recognized university with six (06) months practical experience in radiology; OR • M.Sc. or BS (4 year) (Physical sciences) from a H.E.C. recognized university with one (01) year practical experience in radiology.

medicine and radiotherapy. Before the promulgation of PNRA Regulations PAK/904 Rev. 01, the previous practice did not classify medical physicists in sub-specialties. A comparison between the previous and recent qualification criteria in Pakistan is given in table 1.

A cursory review of table 1 reveals that major transformation has been made to improve the qualification criteria of medical physicists in Pakistan. In order to increase the awareness about this transformation, PNRA has addressed this step in training courses, meetings with the licensees and annual symposiums of medical physicists to celebrate the International Day of Medical Physics, held in Karachi in 2019 and 2020.

This is not only a major regulatory step in accordance with the IAEA safety standards and but also very important to ensure the protection of workers, patients and the public in case of medical application of radiation. Furthermore, as it has now become a mandatory regulatory requirement to appoint modality specific Medical Physicists, this will not only motivate the professionals to choose and excel in their particular field of interest and getting specializations but will also create more job opportunities locally.

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Afghanistan

Current status of Radiotherapy in Afghanistan

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Around the world, cancers are one of the leading causes of death. According to WHO, globally the annual number of people dying because of cancer is around 8.2 million. In addition, nearly three in four cancer patients live in countries with low and middle incomes. Cancer survival rates in developing countries are lower than one-third of that in developed countries. According to WHO in 2012, about 15 thousand (8100 men and 7400 women) died because of cancers in Afghanistan.

Currently, some methods have been developed for cancer treatment globally, which include: Chemotherapy, Radiotherapy, hormonal therapy and immunotherapy etc. The type of treatment depends on the type of cancer and how advance it is. In some cases, doctors may prescribe more than one method. Amongst them, radiation therapy is one of the most prevalent methods used worldwide.

At high doses, radiation therapy kills cancer cells or slows their growth by damaging their DNA. Cancer cells whose DNA is damaged beyond repair stop dividing or die. When the damaged cells die, they are broken down and removed by the body. Radiation therapy does not kill cancer cells right away. It takes days or weeks of treatment before DNA is damaged enough for cancer cells to die. Then, cancer cells keep dying for weeks or months after radiation therapy ends.

Unfortunately, Afghanistan does not have any active radiotherapy facility at the moment. Jamhuriat Hospital of Kabul is the only available cancer centre that people have access to (Referral Hospital) in the country. The majority of patients are referred from all parts of Afghanistan to this hospital to receive the required services. This hospital serves for cancer diagnosis and treatment options other than radiotherapy. After diagnosis, most of the cancer patients are referred to other hospitals outside the country (mostly neighbouring countries such as Pakistan, India and Iran) to receive their cancer treatment.

The government of Afghanistan has recognised this as a problem and has decided to work on establishing some radiotherapy centres in the country. However, the Ali Abad hospital is the only one where the instalment of radiotherapy equipment has been started. This centre will use two medium energy LINAC machines. The construction phase of this centre has already been started and is expected to be completed at the end of 2021. The human resources for this centre have been determined and sent abroad to receive the required knowledge. It is worth mentioning that this project is supported by the International Atomic Energy Agency (IAEA).

There are some other hospitals, namely Jamhuriat and Police 300 bed hospitals, which plan to install radiotherapy centers, but they are still in the design phase.

Journey from Conventional treatment to VMAT with Image Guidance at B. P. Koirala Memorial Cancer Hospital, Nepal: Medical Physics Experience

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Department of Radiation Oncology has been providing its services since the beginning of hospital in 1999. It started radiotherapy services with Mednif Tele Cobalt 60 machine and Mednif Simulator while a set of Ionization chamber, electrometer, water phantom were used for dosimetry. At that time, it was not easy for physicists to use TRS 277 protocol for beam calibration, but they made it possible with their hard work and dedication. After the machines were prepared for clinical use, all patients were simulated and it was very exciting moment as the simulator was being used first time in Nepal for planning. In the beginning, we faced many problems in running Mednif Tele Cobalt machine, for example, source used to struck in beam on position frequently. At times, manual pushing back the strucked source to safe position which resulted the accidental exposure to patients and staffs. So after use of two years, Elite 100 tele Cobalt machine was commissioned and started service in 2001 September.

In July 2002, the department received two Linacs (Varian 2300 C/D and 600 C/D), a 2D Brachytherapy and conventional simulator. Conventional radiotherapy using conventional simulator was the main treatment techniques at that time. In initial months, due to the limitation of technology and to some extent the limited human resources and skills, Anterior posterior/Posterior Anterior or bilateral fields or single field shaped with MLC and manual dose calculation were mostly done during the period. At that time, Organ at risk shielding used to be done using X-ray and MLC shaper

Treatment plan verification with compass system

Working with CIRS phantom

tool. The necessary data requires for conventional planning e.g PDD, OF, wedge factor, tray factors, TMR etc were collected using Blue phantom system. Later on CADPLAN, a two and a half dimensional radiotherapy planning

Treatment planning on Eclipse

system used to be in practice for sophisticated case. MLC shielding shapes were designed in simulator images instead of MLC shaper tools. This situation continued until 2004. Even then the department had Blue Phantom and accessories for measuring beam data and CADPLAN which used to be used in special cases RT planning. The TRS 398 protocol is adopted in BPKMCH stated in 2004.

In 2007, CADPALN is replaced by Eclipse 7.0 and CT scanner in radio diagnosis department of the hospital is shared for CT simulation and treatment in 600 CD and 2300CD linear accelerators, which was the departure from the conventional treatment to embrace three dimensional conformal radiotherapy (3DCRT) at BPKMCH, while conventional treatment also continued for simple cases. Conventional plannings were mostly done for Cobalt-60 teletherapy and cervical cases.

In mid 2012, the 600CD linac was further upgraded to enable it to perform IMRT and Eclipse v7.0 is upgraded to Eclipse v10.0. Due to the technical issues of machines IMRT RT techniques could not continue late 2013. Before 2008, Brachytherapy with Varian varisource machine, was mostly done in planner x-ray of simulator using film scanner. In 2008, simulator electronic images were brought into use for brachytherapy planning.

In July 2018, dedicated CT simulator, 3D Brachytherapy and Clinac Ix machine were installed and commissioned. Eckert and Zeigler 3D Ir-192 radiation source HDR brachytherapy afterloader with SagiPlan standalone system was brought in use for all brachytherapy treatment in the department since August onward.

Clinac iX linear accelerator with Millennium120MLC, cone beam CT and on-board imaging, portal dosimetry, Eclipse v15.6 and ARIA R and V system has been in use since 31 July 2018 which has raised the hope of the hospitals for adapting conformal techniques including IMRT and VMAT. Machine commissioning as well as TPS beam modeling and commissioning was done following installation preparing the machine for 3DCRT planning and delivery. Furthermore, department has to wait for additional quality assurance devices for IMRT/VMAT commissioning like detector matrix, compass, film dosimetry in place and finally been able to start VMAT on 2nd February 2020. From technical specification, acceptance, commissioning to clinical implementation of advanced technology has been made a success by in-house medical physics team.

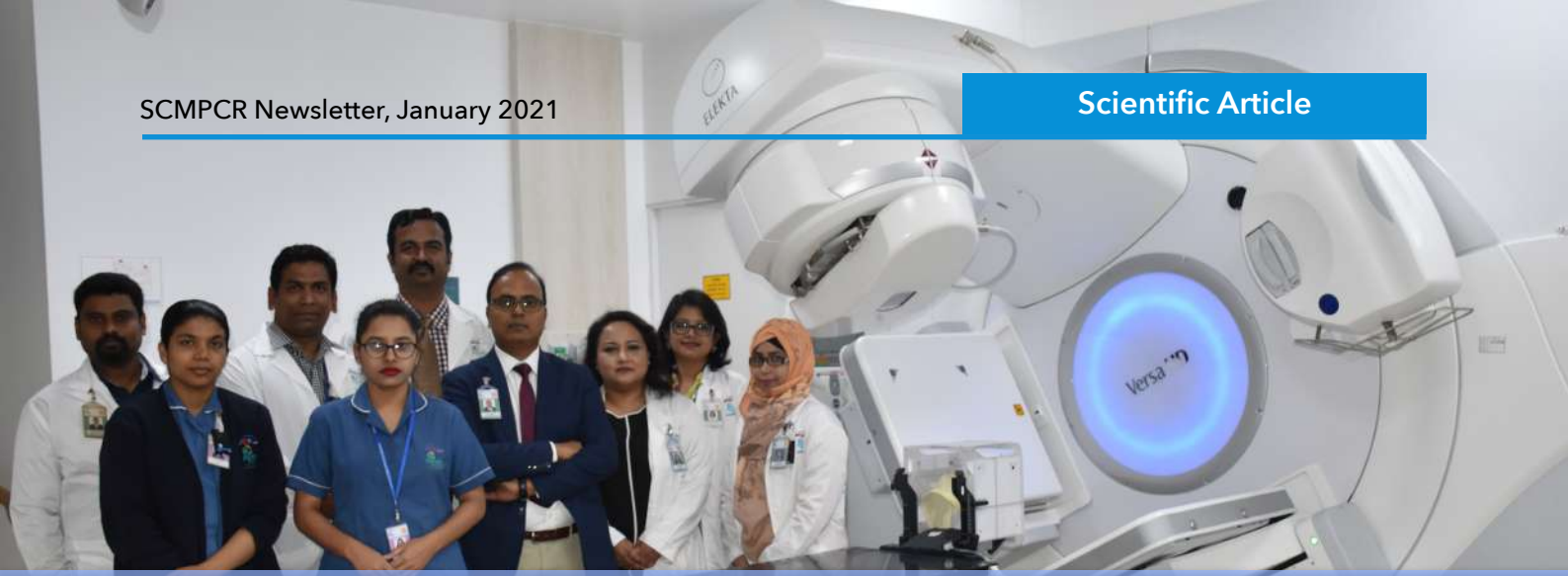
Few patients were already treated successfully using VMAT with Image guidance and returned home. In 2018, altogether 1113 external beam radiotherapy (both conventional and 3DCRT) and 193 brachytherapy patients were treated. This includes wide range of diseases which require radiotherapy.

In spite of having limited number medical physicists in department, they have been associated with Tribhuban University master's in physics students scientific supervision in field of medical dosimetry, treatment planning, QA, radiation safety and protection and individual research.

In nutshell, the department has come a long way from difficult time with conventional facilities to the state of enormous skills, knowledge and resources with modern facilities and treatment techniques through hardwork of medical physicists and other colleagues in the department.

Working with CIRS phantom

Scientific Article



A state-of-art Radiation facility to provide Stereotactic Radiosurgery (SRS) at Evercare Hospitals Dhaka, Bangladesh

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Introduction

X-ray was discovered in the year 1895. Its use in cancer treatment witnessed a sea change from just burning the skin lesion to now acting as equivalent to a surgery called Stereotactic Radiosurgery (SRS) with better navigation to deep-seated lesions. More than 60% of cancer patients require radiation as part of their comprehensive cancer management. There are 13 to 15 lakh cancer patients in Bangladesh, with about 2 lakh patients newly diagnosed with cancer each year [1]. Increasing population and longevity are resulting in an increasing number of cancer patients in Bangladesh. When combined with population aging, the increase in cancer prevalence is inevitable [2]. The availability of the state-of-art radiation facility is still limited in Bangladesh. There are 22 linear accelerators, 12 telecobalt units, 10 HDR brachytherapy units in entire Bangladesh. There are only very few centers that are providing state-of-art radiation treatment. Evercare Hospital is among one of them, which is fully equipped to deliver Stereotactic Radiosurgery (SRS) to all indications. Evercare Hospital has fully loaded state of the art Elekta Versa HD linear accelerator with Apex Dynamic MMLC, making it competent to deliver SRS for all possible indications (malignant, Nonmalignant, and Functional). Stereotactic Radiosurgery technique is a procedure that delivers high doses of radiation precisely to the targeted lesion in only a single or few session when compared with conventional radiation therapy. The goal of SRS/SRT is to deliver very high Radiation doses that will destroy the lesion/tumor and achieve permanent local control equivalent to open surgery.

Figure 1: Preparation of SRS mask for patient

Evercare Hospitals Dhaka (Formerly Apollo Hospitals Dhaka) foresee establishing a state of art radiotherapy facility at par with world standard in Dhaka and started a comprehensive cancer care facility combined with PET-CT imaging in September 2017. We began with Radiation techniques like Intensity Modulated Radiotherapy (IMRT) and Volumetric Modulated Arch Therapy (VMAT) in combination with High Dose Rate (HDR) Brachytherapy. After fully establishing IMRT, IGRT, VMAT, and HDR, in February 2019, we started the stereotactic radiosurgery program at Evercare Hospital, Dhaka, Bangladesh (Fig-1). In April 2019, the first case we treated with SRS was Arteriovenous malformation (AVM) April 2019.

This article aims to share our experience in setting up a Stereotactic facility in a multi-super specialty hospital. To make people aware of this facility and encourage more and more centers to start this facility to provide such treatment to patients at their doorstep and not go abroad. This includes joining hands with different disciples, educating them about their needs, explaining their role, acquiring required accessories, educating the Radiotherapy team about the importance of accuracy of the procedure, patient selection criteria, patient assessment, patient preparation, simulation, and planning, quality checks and treatment delivery.

Figure 2: Patient positioned in the CT scanner along with Localizer Box.

Initial assessment and Patient Preparation

After the registration process with demographic information and nursing assessment, a detailed evaluation of the patient with reviewing previous treatment records, and a general physical examination, including thorough neurological assessment, was done and documented. Complete investigations, including imaging, are done as required for proper diagnosis and staging to decide a patient's eligibility to undergo SRS. In detail, we discuss the role of SRS in his case, possible outcomes, side effects, and possible Alternate options, if any. Now, based on lesion size/type/location/stage, patient's performance status, and compliance, we decide the appropriate SRS dose, multidisciplinary Tumor board constituted beforehand if needed. Then we take informed written consent.

Patient Preparation

We do the patient preparation on the actual Linear accelerator couch to achieve a higher degree of accuracy in preparing the SRS/SRT patient mask. First, the SRS/SRT head frame holder is attached to the linear accelerator with the headrest holder to hold the patient's head during treatment rigidly. It has provisions to attach the stereotactic localization box with adjustment screws on its bottom to adjust the sag of the headrest holder (Fig-1).

The patient is asked to lie down on the couch comfortably, and the patient's head will be adjusted to be in-line with the sagittal laser of the linear accelerator. A customizable small vacuum cushion will be kept as a headrest to position the patient on the frame. If needed, the frame-level is adjusted with the help of reference lines in the localization box using the screws. Once the position is finalized, the thermoplastic mask is prepared with the same position. All accessories used are recorded in detail on a set-up sheet, and photos are also acquired if need to reproduce the position.

Image acquisition and target delineation

The patient has now positioned the same way on a CT scanner connected to a Treatment Planning System (TPS). Stereotactic localizer box placed as shown in the figure. CT images acquired with thin slice thickness, which is 1.25 mm in our case. The Field of View (FOV) of the scout scan is kept sufficiently large to cover the localizer box. It helps to locate the stereotactic coordinate of the target. The CT images were acquired with contrast. A contrast Magnetic Resonance Image (MRI) of the patient is acquired with a thin slice thickness (preferably 1 mm). During the MRI scan, only vacuum cushion headrest is used rest not compatible with MRI (Fig-2).

All the acquired images were transferred to the Monaco Treatment Planning system, and the CT and MRI image was fused using the TPS. The fusion accuracy was checked by comparing the anatomical landmarks in the brain, like the skull, eyeballs, pituitary cavity [3]. The contouring was comprehensively carried out by following the standard guidelines [4] for all Organ at Risk (OAR) and Target volumes, including Gross Tumor Volume (GTV), Planning Target Volume (PTV), by Radiation Oncologist. The GTV delineation finalizes after a consensus among Radiation oncologists, Neurosurgeons, and Neuro-radiologist [5]. Appropriate target dose and dose constraints prescribed, then hand over to medical physicist for generating plan (Fig-3,4).

Treatment Planning and Evaluation

A medical physicist generates a radiation treatment plan. Depending upon the size of the target and location, the delivery method will be selected either dynamic conformal arc by micro multi-leaf Collimator (micro MLC) or Volumetric Arc delivery (VMAT)with AGILITY collimator. In the case of micro MLC, we use the 4.3 mm thick APEX collimator for delivering radiation. In the case of VMAT, the regular AGILITY collimator having 5 mm thick MLC will be used.

Mostly, non-co-planner partial arcs are used as per the standard guideline for the treatment planning purpose. These partial arcs help in contain the low dose spread as well as to increase the

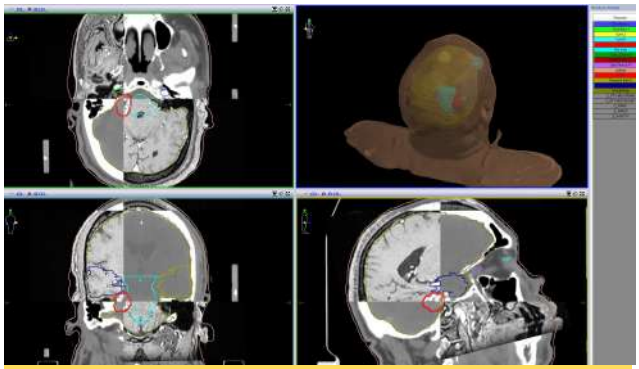

Figure 3: CT-MRI fusion

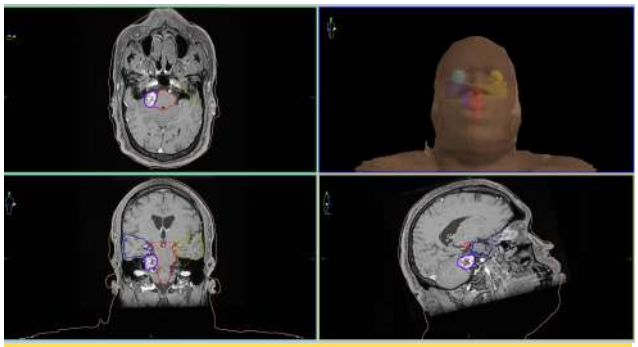

Figure 4: Target Volume and OAR delineation

coverage of the target. The Monte Carlo based algorithm will be used for the dose calculation to achieve higher dose calculation accuracy, and 6MV Flattening Filter Free(FFF) mode is the preferred choice to achieve minimal treatment time as it has the ability to deliver 1800 MU/minute (1800 cGy/min) [6,7]. All possible efforts were made to reduce the integral dose and increase the dose escalation to achieve the adequate coverage to target volume as per the prescription and control the hot areas inside the target volume. The optimization and planning process repeated until we achieve the prescribed goal. Physicist and radiation oncologist jointly evaluate the chosen plan by following standard guidelines for its suitability to deliver to the patient. The target coverage and hot spots are evaluated in Dose Volume Histogram (DVH) as well as in cross-sectional views (Axial, Sagittal, and Coronal), preferably with a color wash. Hot spot up to 120-130% is acceptable in some instances, depending upon clinical requirements but not acceptle if these hot spots going outside the target volume. Once the plan is accepted, the plan will be sent to the MOSAQ record and verification system to prepare the plan to delivery. All the documents were signed after rigorously checked by both medical physicists, radiation oncologists, and a second check by another medical physicist is mandatory as per our department FMEA (Failure Mode and Effect Analysis) protocol to avoid any potential error. The treatment plan also will be checked by a radiotherapy technologist for its deliverability (Fig-5).

Obtaining stereotactic shift using the localizer

The finalized plan was then transferred to a particular software called "Locate," in which the "Z" shaped frame in the localizer box, as mentioned earlier, will be digitized with the help of markers visible in each axial slice. After digitization, the stereotactic shift of the plan isocenter can be obtained using the software. The shift can be printed out in the form of "Target sheets," in which the isocenter coordinated will be marked, the target sheet inserted in the localizer box to ease the set-up process (Fig-6).

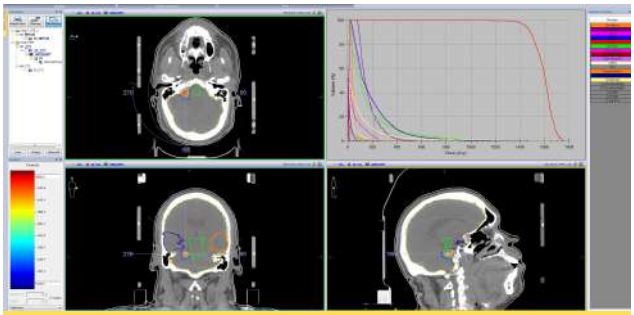

Figure 5: The treatment plan, showing radiation dose distribution in color- wash and DVH

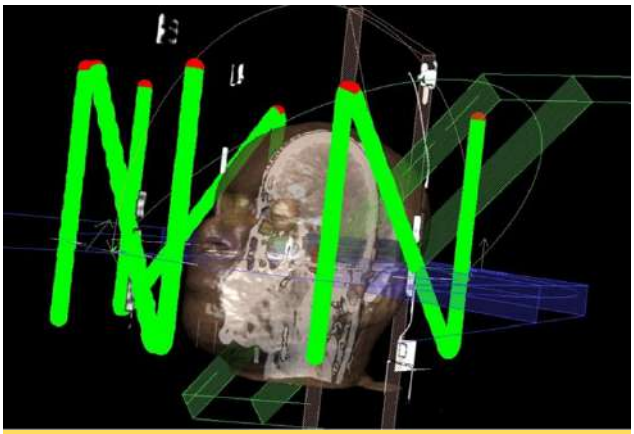

Figure 6: Digitized "Z" shaped marker on the localizer Box

Patient-Specific Quality Assurance Check

A patient-specific quality assurance (QA)test is mandatory. It needs to meet the pass criteria for all the high precision radiotherapy treatments as per the ICRU recommendation before it is being delivered8. The approved plan will be transferred to a QA phantom specific for patient QA. We in our center utilizes the IBA, Imattrix FFF phantom for this purpose. This Imattrix FFF array is designed specially to yield accurate results even at very high dose rates in FFF mode. The delivered dose is recorded with the help of My QA Imattrix FFF software, and a sample of coronal dose plan is obtained in the same position and will be used as a measured dose. The calculated dose obtained from TPS and the measured dose obtained from QA phantom were compared for using the MY QA patient IBA software, and the Gamma Index values were calculated. It should pass a minimum of 90% for 3% and 2 mm distance to agreement value in order for the plan to be eligible to deliver to the patient. In our case, all our patient was reported with 98% pass results.

Pre-treatment checks

Before the patient scheduled for first-day treatment, all parameters related to patient identity, positioning devices, and a treatment plan including, availability of required accessories, number of beam or arc, collimator angle, couch angle, number of monitor units(MU), the sequence of beams or arc's and its suitability for collision-free delivery and radiation dose prescription with authorized person's signatures will be checked by radiotherapy technologist. All related documents, including set-up sheets, treatment planning sheets, complete filled radiotherapy treatment charts, patient assessment notes by nurses, will also be checked before the patient is called for his treatment. A senior technologist and medical physicist will carry out a dummy run to enable interruption-free treatment delivery for the patient once everything is ready. The appropriate correction would be applied immediately if any errors/collisions were found. As part of the JCI standard guideline, all our radiotherapy patients will undergo a detailed nursing assessment before radiotherapy treatment. A doctor will also do a pre & post-treatment check. If needed patient will be admitted for 24 hrs observation.

Treatment Execution:

Staff nurse measures the patient's Vitals. His identity is verified as per International Patient Safety Guidelines (IPSG), e.g., photo ID card and Universal Patient Identity Number (UHID), before taking on the treatment couch. Radiation oncologists and technologists will verify the patient's position. With the help of a Stereotactic localizer, the required stereotactic shift will be applied as per the target sheet print out values. The on-board kVCBCT scan of the patient will be acquired to verify the treatment set-up using the kVCT attached to the linear accelerator. In this process, the patient CT scan will be acquired just before the treatment, and the CT scan images co-registered with the originally obtained planning CT images and the patient positioning shift will be calculated by

Figure 6: Patient positioned on the treatment couch and applied stereotactic shift just before acquiring the CBCT image.

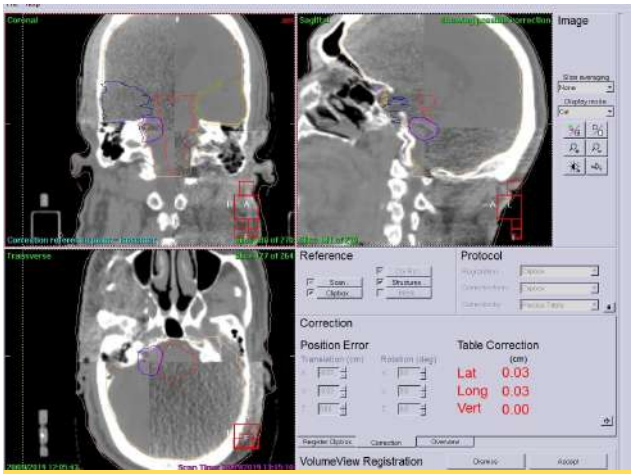

Figure 7: CBCT fused with Planning CT to assure sub-millimeter accuracy just before treatment.

matching the gray values (similar to HU value of CT images) of each pixel of the both CT image series. And the shift can be calculated to the millimeter level and can be corrected accordingly before the start of treatment9. If needed, a repeated CBCT image acquired, and correction will be applied till we get almost zero shift in all the directions. The rotational correction can also be addressed because of the 6D robotic couch attached to the linear accelerator.

After verifying the patient's position, a dedicated time out will be carried out just before switch ON the radiation beam to verify patient identity, diagnosis, treatment modality, energy used, daily dose, number of fractions, and adaptation of special instructions, and number of Monitor Units. The time out will be led by a senior radiotherapy technologist. The entire treating team of Radiation Oncologist, Medical Physicist, Registrar, Nursing staff will be present during the entire treatment. During the treatment execution, the patient will be monitored with closed-circuit television (CCTV), and any two-way voice communication is also possible (Fig-7,8).

Patient statistics and Initial Challenges Faced

We have treated more than 50 patients with different diagnoses, including malignant, nonmalignant, or functional intracranial lesions. The Radiation dose ranges from 13 Gy - 25 Gy for benign lesions and may go up to as high as 90-120 Gy for functional diagnosis. We have now followed up to 12-18 months. We achieve complete obliteration of our 1st AVM patient after 18 months post-SRS. As per the follow-up duration, we achieved a significant radiological and clinical response in all other diagnoses also.

Though there are many patients who require SRS or SRT, most of these patients go abroad who can afford to go overseas to get this treatment. In this era of the internet, most of these patients search for this facility's availability and the expertise of the treating doctor. During interaction, some patients tell us that they have apprehension. Even if it is being done here in Bangladesh, it might not be at par with the world's standard. Hence, the first challenge was breaking the conventional thought of people and their misconception and underestimating the hospitals in Bangladesh. To achieve that, we initially started participating in many scientific events in our hospital and across Dhaka and educated /convinced our medical community about the versatile technology of our SRS/SRT treatment facility provided by Elekta and the efficiency/knowledge of our team. We started explaining to them about the cutting-edge technology we got at Evercare hospital for SRS/SRT treatment. We also arranged some departmental tours for some targeted senior people.

After 1.5 years, we are pleased to share our success story of establishing our center to provide this state-of-the-art radiation to the patients at their doorstep, and now it is not the time for them to travel abroad only for this high precision radiotherapy. We went across the county, including major cities, major medical colleges, scientific associations, National Institutes, and different targeted groups of medical practitioners to spread the news of the availability of world standard SRS/SRT facility at their doorstep.

Summary

Stereotactic radiosurgery is a well-established modality to treat various Malignant, nonmalignant, and functional brain lesions. The practice of Stereotactic radiotherapy is expanding every day, and attempts are being made to expand it in many more indications to shorten the overall treatment time. With the advancement in early diagnosis and patient awareness, the future of stereotactic radiosurgery is going to play a lead role in the management of different brain lesions.

With the vision to provide high-quality treatment to the people of Bangladesh, Evercare Hospital Dhaka has established a start-of-art stereotactic radiosurgery/therapy facility with a specialized workforce. Why go abroad? Patients can avail of this treatment in his/her own country.

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AFOMP IDMP 2020 CELEBRATIONS-7th November 2020

Prof. Arun Chougule, President AFOMP

This year International Day of Medical Physics (IDMP) celebrations were very special due to the COVID19 pandemic situation worldwide, which has changed the conventional methods of basically anything & everything. This pandemic has had a huge impact on education system as well as the organisation of conferences/ seminars. Today, technology is playing a very crucial role in knowledge dissemination through various virtual meetings and other gathering platforms. Therefore, this year the Asia-Oceania Federation of Organisations for Medical Physics (AFOMP) has used virtual platforms to celebrate IDMP. The program was scheduled on 7th November 2020 at 7:00 am GMT. The theme of this year's IDMP

"Medical physicist as a health Professional"

is very relevant and useful as we are still struggling to get recognised as a health professional in most of the Asia-Oceania region.

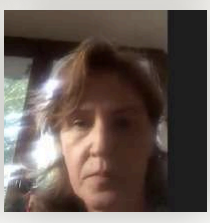
The event provided the public with an option for registering for the event in advance via a link. Around 350 registrations from all around the world were received for the program. The program included various interesting talks from imminent speakers relevant for both the theme and occasion. Program was organised under leadership of Prof. Arun Chougule President of AFOMP. The "program coordinator" for this virtual celebrations was Rajni Verma, AFOMP webmaster. The program started with a recorded IDMP message from Prof. Madan Rehani, President IOMP followed official opening of the program by AFOMP president Prof. Arun Chougule. He talked about the status of medical physics in the AFOMP region and the various challenges and efforts of AFOMP for better recognition of medical physics as both a subject and profession. After his talk, Prof. Eva Bezak, vice president of the AFOMP, explained the importance of leadership in the overall development of the profession. She emphasised the importance of preparing new line leadership. She explained this concept of leadership in a very interesting way, with reference to the Poppy flower. This approach of explanation appeared to have a positive impact on participants and their understanding of the leadership concept.

Prof Bezak's talk was followed by a recorded presentation by Prof Tae Suk Suh, Immediate past president of the AFOMP. Due to an unexpected medical emergency in the family, he was unable to participate in the virtually program live, but made sure to send along the recorded presentation to the organizers. His talk focused on the increasing technological challenges in a medical physicists life with rapidly developing high tech technology in radiotherapy, radio-diagnosis and Nuclear Medicine. He presented his view of a systemic approach to combat these challenges and give us an insight of futuristic technological developments in medical physics.

Next on the agenda was a talk from Prof. Hasin Anupama Azhari, secretary general AFOMP. She chose the theme of this year's IDMP as the title of her talk. She beautifully explained and justified the role of medical physics as a health professional in health care industry. She

also emphasised the importance of professional development and the role of medical physics during this pandemic. Various aspects of administrational changes needed to establish medical physics as a profession was presented. After talks from the speakers, the IOMP IDMP awardee of this year was announced. The title was awarded to none other than Prof. Tae Suk Suh. AFOMP sends the heartiest congratulations to Prof. Tae Suk Suh for his outstanding achievement. This award signifies his life long commitment to the medical physics profession and his contribution towards the development of medical physics as subject. Prof. Tae Suk Suh sent along a written message for all AFOMP members and colleagues, which was read by Prof. Arun Chougule for benefit of all the participants. Next, the program included a live discussion that was very interactive including tonnes of active participation. The event was concluded with remarks form all the eminent speakers for the day, and on a happy note to work hard in the wake of better visibility and recognition of medical physics as a profession. The organisers are thankful to AFOMP EXCOM, all AFOMP NMO's, all the speakers, participants and volunteers.

7.00-7.05 AM GMT	IOMP Presidential Message Dr. Madan Rehani (IOMP President)
7.05-7.25 AM GMT	Opening remarks and talk on Medical Physics in AFOMP Dr. Arun Chougule (AFOMP President)
7.25-7.40 AM GMT	Growing Tall Poppies: Empowering young medical physicists Dr. Eva Bezak (AFOMP Vice– President)
7.40-8.00 AM GMT	Role of Medical Physicists in the era of High tech Technology Dr. Tae Suk Suh (AFOMP Immediate Past President)
8.00-8.20 AM GMT	Medical Physicist as Health Professional Dr. Hasin Anupama Azhari (AFOMP Secretary General)
8.20-8.30 AM GMT	IOMP IDMP Awardee 2020: Dr. Tae Suk Suh
8.30-9.00 AM GMT	Q & A- feed back, conclusion



Experience on Advanced Training in Clinical Radiotherapy in Germany

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The Department of Nuclear Science, University of Colombo, Sri Lanka arranged a five months advance training in radiotherapy with the assistance of University of Heidelberg, Germany, SCMPCR and the Gono Bishwabidyalay University, Bangladesh. We have been selected for that training based on our current experiences on LINAC treatment equipment and academic merit.

Our training program was arranged at the Department of Radiation Oncology of the Medical Faculty, Universitätsklinikum, Mannheim (UMM) under the supervision of Chief Medical Physicist Mr. Volker Steil.

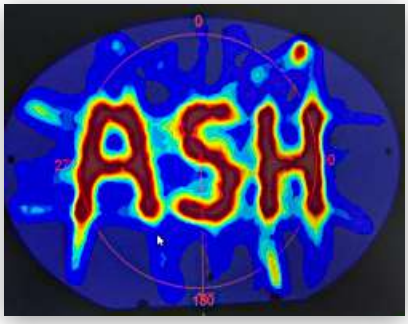
First, I have learnt mechanical QA and dosimetry QA using StarTrack, iViewGT Image Quality Checking using EPID and EPID QC Phantom and accuracy checking of the image quality using Quasar Phantom.

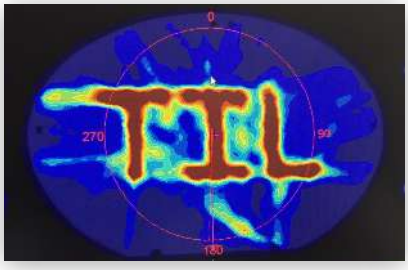
We also gained a vast knowledge on 3D imaging system checking of XVI system using CAT Phantom, Ballbearing (BB) Test for adjusting the radiation isocenter tightness of the LINAC, light field and radiation field measurements using StarTrack, output measurement for both Photon and Electron using 20 cm x 20 cm x 20 cm water phantom with 0.3 cm Gold Chamber, accuracy checking of the ODI with laser and Gantry and Collimator angles using Digital Protractor and finally the functions of the MLCs and Jaws. Although we have already had some experiences on patient specific QAs in our center, we could update our knowledge and experience.

Moreover, we gained more experience on how to create a QA plan, how to evaluate data on OmniPro I'mRT, how to perform a lung SBRT CT using Active Breathing Coordinator (ABC) and some important facts on contouring. We have learnt IMRT and VMAT treatment planning under the guidance of an expert teacher, Dr. Martin Polednik, who taught us to handle IMRT Constraints to have the desired tumor coverage. Although we used to plan IMRT in my center, I did not have proper understanding on IMRT dose Constraints.

At UMM, we were trained on breast, bladder, liver, spine and head and neck

planning in both IMRT and VMAT. Now we are very much confident on handling IMRT Constraints in order to have the desired tumor coverage. Apart from our training we enjoyed during our stay in Germany a lot. That was the first time we came to Mannheim, Germany and we describe that Mannheim is a clean and decent place to live. People where living were so helpful and decent. They don't speak English much but it was OK, we could managed it because of their kindness.





We got some sweet memories to take home too. First, Spaghetti Ice, had with Mr. Volker Steil. Mannheim is the place where that Spaghetti Ice was invented. We were lucky to have such a special dessert, which only a few Sri Lankan can experience.

It unwrapped another nice experience to visit to Heidelberg University and ancient castle with Dr. Frank W. Hensley. It was our first experience traveling in a Tram which we enjoyed a lot. The visit to Heidelberg was extremely nice experience and allowed us to know informative ideas about the history and culture of Germany.

This training was very organized and the trainers are very kind to teach all the things very clearly, making the information extremely valuable. We were able contact the trainers to ask our doubts without any hesitation with all the trainers who provided tips and useful information for our particular dilemmas and hand-on practice.

Further, It was a precious opportunity to us to improve our knowledge on modern treatment technology. We take this opportunity to thank Prof. Golam Abu Zakaria, SCMPCR, DAAD and University of Colombo to arrange this training and give us this chance to participate. Specially, we want to thank Mr. Volker Steil and his team members for all arrangements with excellent facilities. And specially I thank our postgraduate degree program coordinator Dr. J. Jeyasigiththan who put his full effort to arrange this training through the SCMPCR.

In summary, We gained valuable experience and knowledge about radiotherapy quality assurance that can be implemented in our organization. In addition, We learned IMRT and VMAT treatment planning that will help when we start this treatment techniques in our center. Some experience on SBRT planning CT, Contouring and Creating QA plans were very beneficial. And also first ever in our life, we had an opportunity to participate an Intra-beam radiotherapy surgery.

SCMPCR
E-Learning Program (ELP-03)

February 5, 2021 – February 26, 2021

Brachytherapy Basic Principles and Advanced Clinical Applications

Panel of Speakers

Dr. Frank W. Hensley
Former Medical Physicist
Department of Radiation Oncology
University Hospital Heidelberg, Germany

Dipl. Eng. Renate Walter
Medical Physicist and Radiation Protection Commissioner
University Hospital Augsburg, Germany

Dr. Jamema Swamidas
Associate Professor and Medical Physicist
Department of Radiation Oncology
Advanced Centre Training Research and Eductaion in Cancer (ACTREC) Tata Memorial Centre, Mumbai, India.

Dr. Al Mamun Imtiazul Haque
Nuclear Physicist and Medical Radiation Physicist
Department of Radiation Oncology
Royal Prince Alfred Hospital, Australia

Dr. Georg Schwickert
Manager Applications Specialist
Varian Medical Systems, Haan GmbH, Germany

Acknowledgement
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SCMPCR
ELP-03 Program Schedule

Date: February 5, 2021 – February 26, 2021

Topics	Date and Time	Name of the Speakers
Introduction of Brachytherapy	5 February (Friday) 2:30 PM - 3:30 PM (GMT)	Dr. Frank W. Hensley
Source Calibration, Verification and Dose Measurement	6 February (Saturday) 2:30 PM - 3:30 PM (GMT)	
Brachytherapy Dose Calculation	7 February (Sunday) 2:30 PM - 3:30 PM (GMT)	Dipl. Eng. Renate Walter
Treatment Procedure (Image Acquisition, Patient Positioning and Immobilization)	12 February (Friday) 2:30 PM - 3:30 PM (GMT)	
Brachytherapy Treatment Planning (Strategy, Plan Evaluation, Inverse Planning, Algorithms)	13 February (Saturday) 2:30 PM - 3:30 PM (GMT)	Dr. Jamema Swamidas
Brachytherapy Clinical and Special Application	14 February (Sunday) 2:30 PM - 3:30 PM (GMT)	
Practical Session on Transition from Traditional (point A–based) Treatment of Cervical Cancer to Conformal Adaption Using Modern Target Definitions.	19 February (Friday) 2:30 PM -4:30 PM (GMT)	Dr. Georg Schwickert
Brachytherapy QA and Safety	20 February (Saturday) 2:30 PM - 3:30 PM (GMT)	Dr. Al Mamun Imtiazul Haque
Group Discussion	21 February (Sunday) 2:30 PM - 3:30 PM (GMT)	Dr. F. Hensley, Dipl. Eng. R. Walter, Dr. S.V. Jamema and Dr. M.I. Haque
Examination	26 February (Friday) 2:30 PM - 3:30 PM (GMT)	Examination Committee

8 Lectures | 5 Speakers & 4 Moderators | 1 Examination | 12 Hours | SCMPCR Platform

Acknowledgement
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SOUTH ASIA CENTRE FOR MEDICAL PHYSICS AND CANCER RESEARCH

SCMPCR

(A Project of Alo Bhubon Trust)

The main objectives of SCMPCR

To organize awareness, prevention, and screening program for cancer disease;

To provide adequate training to all personnel associated with cancer treatment;

To establish the clinical residency training program for medical physicists;

To develop the infrastructure of e-learning and library;

To establishment Welfare home for poor cancer patients;

To build a self-help group for cancer patients;

To establish a team who will assist in the management and quality control (QC) procedure for the diagnostic radiology equipment in the districts levels;

"SCMPCR was established in 3rd July 2018 is comprised of a group of philanthropic personnel with representatives from different regions of South Asia to work on different projects. SCMPCR is an autonomous body, under Alo Bhubon Trust (Alo -BT) and accountable to its board of trustees/governors. It is a non-profit public partnership which will seek support from other sources. It shall work conjointly with various nationals and international organizations. Major activities of SCMPCR are: to produce skilled manpower, enhance health education and establish a welfare home for cancer patients"

MISSION

TO Achieve UNDP SDG-goal 3 & 4

OUR VISION

TO

PROVIDE QUALITY SERVICES IN CANCER TREATMENT THROUGH TRAINING, EDUCATION INCLUDING E- LEARNING IN RADIOTHERAPY AND IMAGING DISCIPLINES.

GOALS OF SCMPCR

Major activities of SCMPCR are to produce skilled manpower, enhance health education and establish a welfare home for cancer patients.

UNDP SDG-goal 3 (Good Health & Well-being)

Awareness program for the mass people for different communicable and non-communicable diseases, especially for cancer patients.

UNDP SDG-goal 4 (Quality Education)

Arranging and conducting training programs to develop skilled manpower. It realizes the need to educate specially; women regarding the screening and prevention of cancer treatment under UNDP SDG-goal 4.

SCMPCR

PROJECT of ALO BHUBON TRUST (Alo-BT)

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OUR MOTTO

QUALITY EDUCATION AND HEALTH SCIENCE FOR PATIENT BENEFIT