South Asia Centre for Medical Physics and Cancer Research

SCMPCR

Newsletter

A Project of Alo-BT

July 2021 | Volume 3 | Issue 2

MOTTO: Quality Education and Health Science for Patient Benefit

Inside This Issue

Chairman's Message

The COVID-19 pandemic in South Asia is now really a catastrophic situation. Developing and rapidly delivering vaccines against the Coronavirus disease is a fundamental step to handle the pandemic, protecting health systems, and rebuilding economies around the world. Equal access to vaccination is the key to kick the pandemic out as no country is safe from the disease until everyone is safe. To accelerate fight against COVID-19, WHO and its partners have worked with vaccine manufacturers to create the COVAX facility. Its aim is to give equal access to the participating countries for the production of vaccines against COVID-19.

In the meantime, the G7 countries have decided on several measures against the current Corona pandemic to avoid future health disasters of this kind. In their "Declaration from Carbis Bay" they announced that they would provide poorer countries with additional support within a year with a total of one billion vaccine doses. All previous G7 announcements add up to 2.3 billion vaccine doses by the end of 2022. The aid organizations criticize that this is too late and not enough for worldwide support. The other global players Russia and China have already showed different activities against the pandemic worldwide. Hopefully, we will get a world without or with Corona within the tolerance limit soon.

In 2021, we already conducted two EBAMP-accredited e-learning courses in February (Advanced Brachytherapy) and July (QC in Radiology). Each course consists of a series of lectures by internationally renowned experts. The third course "Advanced Techniques in Radiotherapy" will take place in October. I am very pleased to announce that the e-learning program combined with the hands-on workshop will continue after the pandemic.Thank you everyone, especially the editorial staff, board members, and the SCMPCR team for their support in making this mirror of medical physics and cancer in South Asia an interesting one. Last but not least, we would like to extend our sincere thanks to the authors and readers of this Newsletter.

Prof. Dr. Golam Abu Zakaria
Chairman, SCMPCR

Editor's Notes

It is my great pleasure and privilege to contribute to this second issue of the Volume 3. In this issue, we share recent SCMPCR highlights including SCMPCR E-Learning activities during COVID-19, General articles, scientific articles and news & events.

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 November 2021 for the next issue which will be published in January 2022.

Thanks
Jeyasingam Jeyasugiththan
Editor-in-Chief

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Addressing Cervical Cancer Awareness Month by Cervical Cancer Screening Program in Keranigonj, Dhaka

Cervical cancer is one of the most common malignancies among women worldwide. In 2018, there were approximately 570000 new cases and 311000 female deaths. Bangladesh has a high burden of cervical cancer due to the lack of screening, high prevalence of risk factors like early marriage, early initiation of sexual activity, multiparity, sexually transmitted diseases (STDs) and low socio-economic conditions.

On January 31st, Cervical Cancer Awareness Month celebrates globally to raise awareness about the disease. Awareness is the essential step of cancer management as prevention is better than cure to reduce this risk. It has found that most people in Bangladesh are on lack public awareness and early detection. Considering these, SCMPCR has arranged several awareness and screening programs since 2018 at the different professional levels and for students and other urban and rural communities.

In this regard, SCMPCR organized a Cervical Cancer Screening Program (Day long VIA and CBE Camp) at the Ati Panchdona community clinic, Keranigonj, t with the support of Electronic Data Tracking with Population-based Cervical and Breast Cancer Screening Program, BSMMU. Beacon Pharmaceuticals Ltd sponsored the program.

A screening test usually performs as a preventive measure to detect potential health problems without signs or symptoms. The primary purpose of screening is to see early risk factors in large numbers. An acidic acid or vinegar is used to detect cervical cancer via screening and take a cell scrap from the uterus. Then the cell scrap is observed if there is any change. If there is any change, then it might turn into cancer later. Screening is essential to detect the potential of cancer development.

The program is organized to help the local underprivileged women understand the benefits of early detection of cancer. The cause, symptoms, and how to counteract to prevent cancer was also explained to these women.

Dr Abu Hossen Md supervised the program. Moinul Ahsan (Civil Surgeon, Dhaka), Dr Farah Diba (UHC, Keranigonj), and Dr Rashed-e-Afroza Parvin (UHC, Keranigonj). The program was included the electronic data registration of the screened woman. The program was implemented by Harun-or-Roshid (Divisional coordinator, BSMMU), Asma Akter (Nurse, BSMMU), Sumi Gharami (Nurse UHC, Keranigonj), Fatema Begum (Health Assistance, UHC, Keranigonj), Anwara Bhuiyan, (Health Assistance, UHC, Keranigonj), Md. Mokhlesur Rahman (Health Assistance, UHC, Keranigonj). On behalf of SCMPCR, Mohammad Ullah Shemanto, Kazimuddin Olin, and Jannat Ara Tahamina has organized the program and coordinates its activities.

The program also organized a free screening session where these women had the facilities of the free screening test. The report of the screening test was given to the patients immediately. Further, the screening program had an option where if any of the attending women got positive from the test, she would be referred to the doctor for treatment. But there were no positive cases detected from the screening.

The participants were pleased with the program and wanted more programs like this in the future. They also agreed on sending the awareness message to their family and friends to understand more people about the importance of screening and do regular tests.

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

SCMPCR E-Learning Program-03: A Full-fledged Accredited Course on Brachytherapy

South Asia Centre for Medical Physics and Cancer Research (SCMPCR) established in 2018 and constantly tries to create skilled manpower for cancer treatment through different programs with the collaboration of national and international institutes and communities. SCMPCR is continually arranged meetings, seminars, workshops, hands-on training programs, in-service training programs, e-learning and awareness programs with the help of national and international experts, and professionals with different experience in the fields of various communicable and non-communicable diseases, especially for cancer patients.

The COVID-19 opened new avenues for online-based teaching and learning. To meet the challenge of the next industrial revolution and digitalization of health care technologies, SCMPCR has introduced a series of e-learning programs (ELPs) during this corona pandemic in June 2020, for the first time in Bangladesh for medical physicists. These ELPs usually covered all the branches of Medical Physics. SCMPCR arranged an accredited ELP-3 titled "**Brachytherapy Basic Principles and Advanced Clinical Applications**" from 5th to 26th of February 2021.

Brachytherapy is an essential tool in the treatment of cancer. The equipment and procedures have evolved since the first brachytherapy procedure was performed soon after discovering radium by Pierre and Marie Curie in 1898. Brachytherapy became a part of the curative management of cervical and prostate cancer patients for more than 100 years.

The program included theories and topics related to the clinical practice of medical physicists in brachytherapy (Dosimetry, QA, TPS, and Protection). The course was designed with series of lectures, group discussions, practical demonstrations of TPS and online examination where the participants had the opportunity for a step-by-step demonstration of various aspects in clinical brachytherapy.

Selection Process

The SCMPCR advertised the accredited ELP-3program through different media. The organizing committee had received an overwhelming response of around 200 applications. Among them, 70 participants were suitable to enrol on the course. The selection committee gave priority to medical physicists from developing countries, women and young physicists, and post-graduate students. Out of 70 selected participants, 48 participants regularly attended all the lectures and examinations in this e-learning program.

Management

For the effective management of the course module, SCMPCR IT experts developed a Moodle-based website to provide a well-equipped learning platform for the participants. User ID and password were provided to all the participants to join the course through the website. The participant's attendance were noted by the organizing committee every day.

Accredited by:

The e-learning program had been accredited by International Organization for Medical Physics (IOMP) with twenty-two CPD points.

Conclusion:

Since 2018, SCMPCR has started its journey with a great motto "Quality Education And Health Science For Patient Benefit," especially developing cancer treatment. To implement its goals, SCMPCR organizes different categories of programs like workshops, hands-on trainings, in-service trainings, e-learning and awareness programs with the national and international well-known experts and through national and international collaboration. All these programs have received lots of positive responses nationally and internationally in a short time. If international organizations like AFOMP, IOMP, EBAMP and many collaborate with us, we move forward to success indomitable.

Trainers/Speakers:

This course consisted of eight lectures by well-known international experts. There were five qualified Speakers and three Moderators from different countries whose remarkable support and contribution made this program very effective and successful. Speakers and moderators feedbacks are below.

Many thanks to SCMPCR for arranging these excellent seminars on important topics in Medical Physics. The new format of electronic workshops that we have been forced to learn by the pandemic opens many possibilities to communicate and share knowledge in an efficient and sustainable manner. Virtual meetings can focus on the needs of physicists in different settings and different parts of the world and, in the same effort, save travelling time and expenses. Let us continue developing this powerful tool to provide focused primary and continuing education and expand medical professionals' networks.

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

I was surprised to see that participants from Australia to Mexico enrolled for the course. It was organized well and I enjoyed lecturing with a kind and smart

moderator at my side. The interested questions from the audience showed how active and keenly the participants listened. Of course I missed to see the participants face to face but as a virtual event it received far more international attention and eventually participation. So for post pandemic times hybrid courses can be an interesting option. It was a great pleasure to contribute to this course and I thank the organizers for inviting me.

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

It has been a pleasure for me to be part of this course. It is so important and valuable to present the techniques and benefits of Brachytherapy to an international group of engaged physicists and to increase their knowledge in this area. Ultimately, these teaching courses will improve the quality of treatments and help patients in their fight against cancer. This way we will come closer to our goal of a world without the fear of cancer.

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

It was a pleasure for me to be invited as a speaker and involved in the E-learning program (ELP-03) of SCMPCR. During my last 23+ years activity as Medical Physicist, Radiation Safety Advisor and Educator, it was always my utmost effort to create passion and enthusiasm among students and trainees, for Radiation Physics applied to interdisciplinary disciplines, specially in Medicine. I went beyond the usual lecture topics in order to create a fascination for Medical Physics & technology and followed the career paths of the students as a "Mentor" too. It will also be my intention to do the same in future.

My overall impression about ELP-03 is quite positive. It was well organized, the other panel colleagues are well selected and have dedicated their time and expertise, for the maximum benefits of the participants. The organizing committee members and moderators have shown their dedication to the noble cause, and everyone deserves heartfelt thanks for this. The overall enthusiasm among the participants was great, and their positive feedback and final exam results reflect this. I am happy to be of further assistance to the participants, if contacted personally by email, also beyond the scope of the course. I will also be happy and am available for any future noble E-learning Program of the SCMPCR, both as a speaker as well as a Mentor.

Dr. Mamun Haque
Nuclear and Medical Radiation Physicist Sydney, Australia

Moderators:

Besides studying BSc in medical physics, I am working as a part time officer at SCMPCR. Since the beginning of my career, I have been working one of the members of the team for organizing committee of various Hands-on training, programs organized by SCMPCR. This is the first time I had the opportunity to moderate in an E-learning program (ELP-03) organized by SCMPCR. For all this I will be grateful to our Chairman Prof. Dr. Golam Abu Zakaria forever who has always given newcomers the opportunity to do something. And I am more grateful to the CEO Prof. Dr. Hasin Anupama Azhari and Program Management Officer Mr. Mohammad Ullah Shemanto whose tireless effort prepared me for the moderation.

The whole program was a new experience for me, through which I enjoyed a lot and learned a lot about the brachytherapy treatment procedure. Through the program, I have captured a learning experience to interact with the international and national experts of Medical Physics like Dr. Frank Hensley, Diplo Eng. Renate Walter, Dr. Jamema Swamidas, Dr. Georg Schwickert and Dr. Mamun Haque. Their every speech was very knowledgeable for all the participant. I wish SCMPCR to succeed in their mission very soon.

Ms. Jannat Ara Tahamina
Trainee Documentation Officer South Asia Centre for Medical Physics and Cancer Research (SCMPCR) Dhaka, Bangladesh

It was an insightful experience as a Moderator to interact with participants on the e-learning program (ELP-03) and be a part of the South Asia Centre for Medical Physics and Cancer Research (SCMPCR) in February 2021 under the guidance of Prof. Golam Abu Zakaria and Prof. Hasin Anupama Azhari. It was a good exposure to interact with International Professionals like Dr. Jamema Swamidas, Dr. Frank Hensley, Diplo Eng. Renate Walter, Dr. Georg Schwickert and Dr. Mamun Haque. They covered all basics and advanced aspects related to treatment procedures of Brachytherapy. I thank SCMPCR for giving me this opportunity to be part of their program and would be keen to participate in such endeavor in near future. I take this opportunity to give my best regards and wish SCMPCR organizing team greater success in their e-learning program series.

Ms. Mandvi Dixit
Radiation Safety Officer, Shree Jagannath Charitable Cancer Hospital Ghaziabad, India

As the world is progressing with technological advancement, the traditional teaching method has also changed simultaneously. Facing the challenges of the Covid-19 pandemic, the E-learning Program definitely is on top of the game on the new learning and teaching landscape. The E-learning Program organized by SCMPCR team from 5th to 26th February, 2021 is one of the best teaching and learning event.

Being the moderator for the 3rd E-learning Program (ELP-03) organized by SCMPCR is a matter of honor for me. It is a great learning experience to interact with the international experts and national experts of Medical Physics like Dr. Frank Hensley Sir, Diplo Eng. Renate Walter Ma'am, Dr. Jamema Swamidas Ma'am, Dr. Georg Schwickert Sir and Dr. Mamun Haque Sir through this platform. I gained a good knowledge about the Brachytherapy basic principles and advanced clinical applications. The program was extremely well organized by the team and was very successful. All eight lectures and group discussion were very interesting and informative.

All participants were actively involved in this e-Learning program. 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 Prof. G. A. Zakaria sir and Prof. Hasin Anupama Ma'am. I am very thankful to SCMPCR for giving this opportunity to me and I would like to thank whole SCMPCR team for their hard work on this event. I look forward to the future editions of ELP. I wish SCMPCR success in all their future endeavors.

Ms. Priya Saini
Medical Physicist , SMS Medical College and Hospital, Jaipur, Rajasthan, India

Participants Feedback:

I would like express my sincere gratitude towards the chairman of SCMPCR Prof. Dr.

Golam Abu Zakaria and Dr. Anupama Azhari for organizing the E-Learning Program (ELP-03). The topic of ELP-03 was on Brachytherapy Basic Principles and Advanced Clinical Applications. I appreciate the efforts of the organizer for choosing interesting topic for the E-learning program. Brachytherapy plays a vital role in managing locally advanced cervical cancer, but its use has been in decline since the widespread adoption of advanced EBRT techniques. I hope the several such events, training and lecture series on Brachytherapy will encourage the radiation workers to practice the same.

I attended all the topics of the lecture series which includes introduction to Brachytherapy, source calibration, dose calculation in brachytherapy, treatment planning and QA programs. Personally, I have acquired good knowledge about brachytherapy techniques, treatment planning and its execution as well as radiation protection and safety aspects. Over all, it was a great E- learning experience for the medical physicist students and beginners. Also, this E-learning program of SCMPCR provides immense confidence to the medical physicists who are planning to start the brachytherapy setup in the department.

On my behalf, I extend a very hearty vote of thanks to all renowned speakers across the academics and industries for their excellent teaching, gracing of important work, sharing your valuable findings and opinions.I am very much thankful to SCMPCR organizing committee for giving me this wonderful opportunity to be a part of this E learning program. Wishing all the success and best wishes to the SCMPCR members and volunteers.

Mr. Subhas Haldar
Medical Physicist and RSO, Saroj Gupta Cancer Centre and Research Institute Kolkata, West Bengal (India)

It was so much pleasure to participate with this beneficial course. I benefited

much concerning the new knowledge I acquired beside understanding new technology and techniques practiced in Brachytherapy, 3D Brachytherapy technology introduces amazing results compared to conventional techniques. Information introduced presented much benefit and value. Thanks to SCMPCR for their efforts.

Maha Hassan Mokhtar
Medical physicist, National Cancer Institute, Cairo University Egypt

I am pleased having opportunity to attend the SCMPCR E-learning program (all of them), I want to express my gratitude and thanks to the organizers and speakers. The program was extremely well organized by SCMPCR and covering the topics comprehensively specially (ELP-3) was amazing and informative about brachytherapy. Totally I enjoyed and learned a lot in a comfortable environment. I would like to thank you very much for giving me this opportunity to participate this E-learning program and hope to join the rest of E-learning program in this year.

Lorena Lopez Beltran
Medical Physicist, National Institute of Pediatrics, Mexico

Importance of Cancer Screening and Early Detection

Julekha Sarker[1], Shahidul Miah[1], Hasin Anupama Azhari[2], Golam Abu Zakaria[2]

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

Cancer is a group of diseases involving abnormal cell growth with the potential to invade or spread to other parts of the body. These contrast with benign tumors, which do not spread. Possible signs and symptoms include a lump, abnormal bleeding, prolonged cough, unexplained weight loss, and a change in bowel movements. While these symptoms may indicate cancer, they can also have other causes. Over 100 types of cancers affect humans.

Tobacco use is the cause of about 22% of cancer deaths. Another 10% are due to obesity, poor diet, lack of physical activity or excessive drinking of alcohol. Other factors include certain infections, exposure to ionizing radiation, and environmental pollutants. In the developing world, 15% of cancers are due to infections such as Helicobacter pylori, hepatitis B, hepatitis C, human papilloma virus infection, Epstein–Barr virus and human immunodeficiency virus (HIV). These factors act, at least partly, by changing the genes of a cell. Typically, many genetic changes are required before cancer develops. Approximately 5–10% of cancers are due to inherited genetic defects. Cancer can be detected by certain signs and symptoms or screening tests. It is then typically further investigated by medical imaging and confirmed by biopsy.

A cancer patient can be cured if the disease is detected at an early stage. The most important component in the fight against cancer is detecting it as early as possible. Many people, however, either delay or avoid getting screened for cancer. Screening is the best option to prevent cancer disease [1].

Bangladesh Cancer statistics in 2020:

Cancer is the second leading cause of death globally, accounting for an estimated 9.6 million deaths, or one in six deaths, in 2018. Lung, prostate, colorectal, stomach and liver cancer are the most common types of cancer in men, while breast, colorectal, lung, cervical and thyroid cancer are the most common among women.

Cancer patients are increasing day by day all over the world. According to Globocan report 2020 the total current population of Bangladesh is 164,689,383 and the new number of cancer cases is 156,775, and the number of death patients 108,990 from January to December 2020 (see fig 1-3 & Table 1). According to this report the Oesophagus cancer 21,745 (14%) is more than other type of cancer but in according to the field survey the oral cavity, Lung, Cervix, Breast cancer is more than other type of cancer [2].

Rajshahi Division is one of the first-level administrative divisions of Bangladesh. It has an area of 18,174.4 square kilometres (7,017.2 sq mi) and third populated division in Bangladesh.

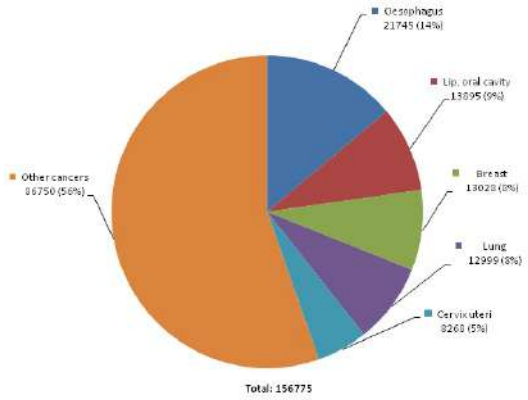

Figure 1: Number of new cases in 2020, both sexes, all ages

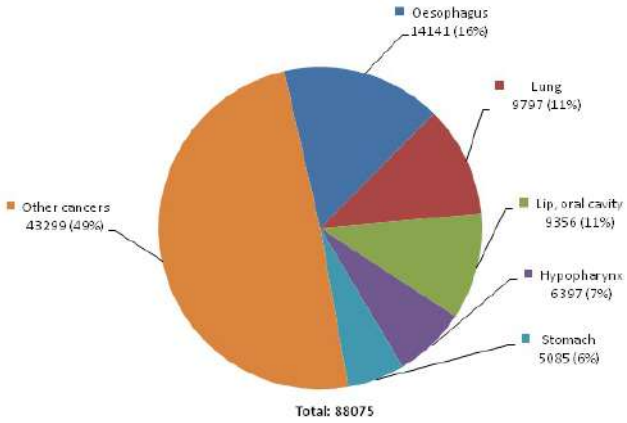

Figure 2: Number of new cases in 2020, males, all ages

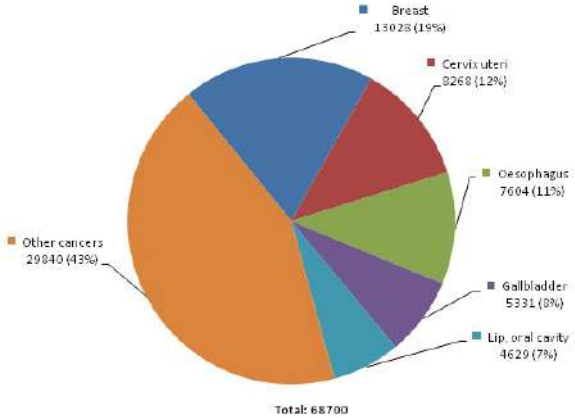

Figure 3: Number of new cases in 2020, females, all ages

Rajshahi Division consists of 8 districts, 70 Upazilas (the next lower administrative tier) and 1,092 Unions (the lowest administrative tier). In Rajshahi division has many health facilities with Medical College Hospital and many diagnostics

Bangladesh

Table 1: Cancer statistic summary 2020 in Bangladesh

	Male	Female	Both sexes
Population	83 259 108	81 430 275	164 689 383
Number of new cancer cases	88 075	68 700	156 775
Age-standardized incidence rate (World)	119.3	92.4	106.2
Risk of developing cancer before the age of 75 years (%)	12.9	9.8	11.5
Number of cancer deaths	63 541	45 449	108 990
Age-standardized mortality rate (World)	87.1	62.9	75.3
Risk of dying from cancer before the age of 75 years (%)	9.7	7.0	8.4
5-year prevalent cases	139 147	131 719	270 866
Top 5 most frequent cancers excluding non-melanoma skin Cancer (ranked by cases)	Oesophagus Lung Lip, oral cavity Hypopharynx Stomach	Breast Cervix uteri Oesophagus Gallbladder Lip, oral cavity	Oesophagus Lip, oral cavity Breast Lung Cervix uteri

and consulting centre for patients but there is no specific cancer screening centre. Many diagnostic centres have cancer diagnostic facilities but no screening facilities. As a result most of cancer patients come to the hospital when the disease is advance stage so that time they have nothing to do. If they patient come early stage then cancer can be cured.

What Is Cancer Screening?

- Cancer screening is looking for cancer before a person has any symptoms.
- There are different kinds of screening tests.
- Screening tests have risks.
  - ✦ Some screening tests can cause serious problems.
  - ✦ False-positive test results are possible.
  - ✦ False-negative test results are possible.
  - ✦ Finding the cancer may not improve the person's health or help the person live longer.

What Are the Goals of Screening Tests?

- Screening tests have many goals.
  - ✦ Finds cancer before symptoms appear.
  - ✦ Screens for a cancer that is easier to treat and cure when found early.
  - ✦ Has few false-negative test results and false-positive test results.
  - ✦ Decreases the chance of dying from cancer
- Screening tests are not meant to diagnose cancer.

There are different kinds of screening tests.

Screening tests include the following:

- Physical exam and history: An exam of the body to check general signs of health, including checking for signs of disease, such as lumps or anything else that seems unusual. A history of the patient's health habits and past illnesses and treatments will also be taken.
- Laboratory tests: Medical procedures that test samples of tissue, blood, urine, or other substances in the body.
- Imaging procedures: Procedures that make pictures of areas inside the body.
- Genetic tests: A laboratory test in which cells or tissue are analyzed to look for changes in genes or chromosomes. These changes may be a sign that a person has or is at risk of having a specific disease or condition [3].

Who Needs to Be Screened?

- Certain screening tests may be suggested only for people who have a high risk for certain cancers.
  - ✦ A personal history of cancer.
  - ✦ A family history of cancer.
  - ✦ Certain gene mutations (changes) that have been linked to cancer.
  - ✦ Exposure to cancer-causing agents such as tobacco smoke or workplace chemicals.
  - ✦ A blood clot that develops for no known reason.
  - ✦ Older age.
- Cancer screening research includes finding out who has an increased risk of cancer.

Some common cancer screening tests:

Colonoscopy, sigmoidoscopy, and high-sensitivity fecal occult blood tests (FOBTs) tests, Ultrasonography.

Table 2: Different type of tumor marker and used

CA 125 (cancer antigen 125)	
Tumor marker for:	ovarian cancer
Used to:	See if cancer treatment is working See if cancer has come back after you've finished treatment

CA 15-3 and CA 27-29 (cancer antigens 15-3 and 27-29)	
Tumor markers for:	breast cancer
Used to:	Monitor treatment in women with advanced breast cancer

PSA (prostate-specific antigen)	
Tumor marker for:	prostate cancer
Used to:	Screen for prostate cancer Help diagnose prostate cancer Monitor treatment Check to see if cancer has come back after you've finished treatment

CEA (carcinoembryonic antigen)	
Tumor marker for:	colorectal cancer, and also for cancers of the lung, stomach, thyroid, pancreas, breast, and ovary
Used to:	See if cancer treatment is working See if cancer has come back after you've finished treatment

AFP (Alpha-fetoprotein)	
Tumor marker for:	liver cancer, and cancers of the ovary or testicles
Used to:	Help diagnose liver cancer Find out if cancer has spread (the stage of cancer) See if cancer treatment is working Predict chances for recovery

B2M (Beta 2-microglobulin)	
Tumor marker for:	multiple myeloma, some lymphomas, and leukemias
Used to:	See if cancer treatment is working

These tests have all been shown to reduce deaths from colorectal cancer. Colonoscopy and sigmoidoscopy also help prevent colorectal cancer because they can detect abnormal colon growths (polyps) that can be removed before they develop into cancer. Expert groups generally recommend that people who are at average risk for colorectal cancer have screening at ages 50 through 75.

Mammography

This methods to screen for breast cancer has been shown to reduce mortality from the disease among woman ages 40 to 74 especially those ages or older.

Pap test and human papilloma virus (HPV):

These tests reduce the incidence of cervical cancer because they allow abnormal cells to be identified and treated before they become cancer. They also reduce deaths from cervical cancer. Testing is generally recommended to begin at age 21 and to end at age 65, as long as recent results have been normal.

Tumor markers:

Tumour markers are substances that are made by cancer cells or by normal cells in response to cancer. Most people have these substances at a low level in their blood, but the amount of each marker can increase, sometimes a lot, when there is cancer in the body. There is different type of tumour marker are used for cancer detection (see table-2). Some tumour markers are specific to one type of cancer, while others may be present in many different types of cancer. Tumour markers are sometimes called biomarkers.

There are many different types of tumors markers, including:

- alpha-fetoprotein (AFP)
- cancer antigen 125 (CA125)
- cancer antigen 15-3 (CA15-3)
- carbohydrate antigen 19-9 (CA19-9)
- carcinoembryonic antigen (CEA)
- human chorionic gonadotropin (hCG or beta-hCG)
- prostate-specific antigen (PSA)

The type of test you get will depend on your health, health history, and symptoms you may have. Below are some of the most common types of tumor markers and what they are used for.

Discussion:

Cancer screening is looking for cancer before a person has any symptoms. Screening tests can help find cancer at an early stage, before symptoms appear. When abnormal tissue or cancer is found early, it may be easier to treat or cure. By the time symptoms appear, the cancer may have grown and spread. This can make the cancer harder to treat or cure.

It is important to remember that when your doctor suggests a screening test, it does not always mean he or she thinks you have cancer. Screening tests are done when you have no cancer symptoms. People who have a high risk of cancer may need to be screened more often or at an earlier age than other people.

The cancer increasing has many reasons the socio-economic problem is one them. In the rural area the people are not aware about cancer disease. And a primary stage cancer has no visible symptom as a result the rural patient doesn't care about it. When they come to hospital then the cancer is advance stage. If they aware about screening and got the screening facilities then they will come at early stage and can be cured that's why the screening program is very important.

The GLOBOCAN 2020 estimates presented in this study indicate that there were 19.3 million new cases of cancer and almost 10 million deaths from cancer in 2020. The disease is an important cause of morbidity and mortality worldwide, in every world region, and irrespective of the level of human development.

References:

- Cancer Screening Overview, https://www.cancer.gov/aboutcancer/screening.
- International Agency for Research on Cancer (WHO), Golobocan 2020. https://gco.iarc.fr/today/data/factsheets/cancers/39-All-cancers-fact-sheet.pdf
- Cancer Country profile, Bangladesh 2020. https://www.who.int/cancer/country-profiles/BGD_2020.pdf

Bhutan Cancer Control Strategy (2021-2025)

Ramu Magendran

Chief Medical Physicist, Jigme Dorji Wangchuck National Referral Hospital, Thimphu, Bhutan.

Introduction:

Cancer is a leading cause of death worldwide. An estimated 10.6 million deaths occurred from cancers in 2020 and are projected to rise to over 15.1 million by 2030 (GLOBOCAN estimates, 2020). Global patterns of 2020 showed that nearly half of the new cases and more than half of the cancer deaths worldwide are estimated to occur in Asia as the region has nearly 60% of the global population (GLOBOCAN estimates, 2020).

About one-third of cancer related deaths have been attributed to the behavioral and dietary risks: high body mass index, low fruit and vegetable intake, lack of physical activity, tobacco use, and alcohol use (GLOBOCAN estimates, 2020). It has been shown that between 30–50% of cancers can be prevented by avoiding risk factors and implementing existing evidence-based prevention strategies.

Unlike the developed countries, the cancers in the least developing countries are attributed to infections (25%) followed by industrial/ lifestyle changes (20.3%) and others (54.7%) (GLOBOCAN estimates, 2020).

Cancer prevention and control is weak in Bhutan. People are often diagnosed at late stages and five-year survival rates for adults and childhood cancers are low. There is delay in care seeking, diagnosis and treatment.

Cancer Burden in Bhutan:

Cancer is a growing public health problem in Bhutan. The population-based cancer registry, Jigme Dorji Wangchuck National Referral Hospital (JDWNRH) recorded 540 cancer cases during the period 2018-2020. Of these 244 were in males and 296 were in females. The top five cancers for the period 2018-2020 were cervical, stomach, head and neck, lung and oesophagus cancers.

Most common cancers in women were cervix, stomach, thyroid, breast and leukemia (Figure 2), whereas in men were stomach, head and neck, lungs, oesophagus and liver. The top five cancers causing highest mortality were stomach, liver, esophagus, cervix, lungs. The mortality in males and females are as shown in tables 1 and 2.

Why National Cancer Control Strategy:

- Build a Top-Tier cancer centre/hospital with necessary facilities along with human resources
- Strengthen the Cancer Society and establish linkage with similar societies across the globe and society can create awareness and give support to the affected people
- Establish a cancer control program and cancer foundation.

Goals, objectives and action areas:

1. Goal:

- The overall goal of the Strategy is to reduce the incidence and mortality of cancer, as well as to improve overall survival and the quality of life of cancer patients and their families.

2. Objectives:

The Strategy will contribute to the above goal through the below six objectives:

- Enhance leadership, governance, resources and accountability for cancer prevention and control
- Implement cost-effective cancer prevention and control interventions
- Implement evidence-based screening and early detection program
- Strengthen people-centred health care delivery for treatment of cancer at all levels of care
- Establish integrated palliative care services across all health services
- Set up cancer surveillance and information systems and strengthen research

Table 1: Leading Cancer Deaths in Males

ICD-10	Sites	Age Standardized mortality rate
C16	Stomach	8.7
C15	Esophagus	3.8
C22	Liver	3.0
C18-20	CRC (colorectal cancers)	1.9
C34	Lung	1.7

Table 2:Leading Cancer Deaths in Females

ICD-10	Sites	Age Standardized mortality rate
C53	Cervix	4.7
C16	Stomach	4.2
C22	liver	2.1
C56	Ovary	2.0
C15	Esophagus	1.8

3. Targets for 2025:

The Strategy will aim to achieve the following measurable targets by 2025

Early diagnosis and management

- >80% of people are aware of common warning symptoms for cancer
- >70% of the patients with oral, breast and cervical cancers are diagnosed at stages I and II within one month of the referral date
- >70% of the cancer patients are diagnosed early at stages I and II (oral, breast and cervix)
- >70% patients diagnosed with potentially curable cancers, initiated treatment within 1 month from diagnosis
- 80% of patients commencing radiotherapy within 15 days of being deemed ready to treat
- ≥90% of breast, cervix and oral cancer patients will have completed the prescribed course of treatment within 6 months following the date of diagnosis
- 80% of patients with cancer receive palliative care

Screening for cervix

- 80% women eligible for cervical screening receive cancer screening within three years
- 95% of those screened positive make recall visits for the confirmatory tests

Risk factors

- Relative reduction of current tobacco use to ≤ 20% (in line with the goals of the Multisectoral National Action Plan for the Prevention and Control of NCDs 2021-2025)
- Relative reduction of harmful use of alcohol to 10% (in line with the goals of the Multisectoral National Action Plan for the Prevention and Control of NCDs 2021-2025)
- 100% coverage for childhood Hepatitis B vaccination
- 100% coverage of vaccination against HPV among female children

Guiding principles

The National Cancer control strategy will be guided by the following principles:

- A focus on major modifiable risk factors and its determinants
- focus on early detection and of the health systems to improve quality of care
- Promote point responsibility and ownership by stakeholders through multisectoral approach
- Be guided by the evidence-based prioritization of cost-effective interventions
- Recognize the needs of special groups such as children and adolescents and population groups needing more attention

Elimination of cervical cancer in Bhutan:

WHO declared in 2018 that global elimination of cervical cancer is feasible. Cervical screening has been an important public health approach in Bhutan. Currently, cytology-based cervical screening is conducted in Bhutan. A study on cervical screening in Thimphu city, authors have documented that although one-time screening coverage reached 60%, there was no active call/recall system. Pap smear is recommended every three years to women aged 20-60 years. Transition from an opportunistic screening to an all reaching population-based screening. (Iacopo Baussano, 2014)

Performance of cervical screening including coverage and follow up among women should be improved. Alternative techniques such as self-collection of vaginal samples in combination with HPV testing which is increasingly being implemented in other countries could be explored to increase screening coverage.

For this Strategy, Bhutan should prioritize cervical screening. Other cancers (e.g, breast, oral, stomach and colorectal) should be assigned to early diagnosis program.

At present Bhutan should focus on early diagnosis and not on population-based screening, which is resource intensive and current infrastructure including qualified manpower is inadequate to meet the demands of an organized screening program. Further strategies for screening will need to be critically evaluated and necessary changes will be suggested in future.

Message from Health Minister, Bhutan:

Determinants of cancers are complex and multifactorial. Major determinants of the cancer burden lie outside the health sector. That is why cancer control needs an intersectoral interaction and public health approach, particularly for cancer prevention.

Comprehensive public health action requires a combination of interventions for the entire population and for individuals. This Strategy provides a unifying framework for cancer prevention and control that will ensure that actions at all levels by all sectors are mutually supportive.

The fatalistic view on cancer that it is incurable should be changed. Health systems have a major role to play to improve the longevity and quality of cancer patients.

Cancer prevention and control is weak in our country. People are often diagnosed at late stages and five-year survival rates both for adults and childhood cancers are low. There is delay in care seeking, diagnosis and treatment.

Cancer treatment requires a multi disciplinarian team made up of well-trained specialists as well as effective integrated care at all level of health services. The number of experts is inadequate to provide a comprehensive people-centric care. The primary health care service does not have adequate capacity to provide screening, continuum of care and palliation.

We must work aggressively to improve the cancer control services. The Ministry of Health will take a leading role in ensuring that the performance is measured, and implementation progress is transparently documented.

This is the first Cancer Control Strategy for the country. I am delighted that we now have the opportunity to implement the Strategy to save the untimely loss of hundreds of fellow citizens to cancers.

Reference:

- Bhutan Cancer control strategy (2025).

Radiotherapy Facilities in West Bengal

Suresh Das

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Introduction

The current focus on global health and specifically on non-communicable diseases (NCDs) offers a tremendous opportunity to reduce the burden of cancer in the world. Patients with cancer generally have a poor prognosis in low-income and middle-income countries, including India, because of low cancer awareness, late diagnosis, and the lack of inequitable access to affordable curative services compared with patients in high-income countries. India has a population of 1.4 billion spread across 29 states and seven union territories. Many of the states are as large as other countries varying degrees of development, population genetics, environment and lifestyles, leading to a heterogeneous distribution of disease burden and health loss.

In developed countries, the radiotherapy utilization rate is ≥50%. However, in developing countries such as India, it is widely believed that the optimal rate is higher (i.e., >55%) and may reach 70-80% in some situations. Therefore, the availability of quality and affordable radiotherapy services is a critical requirement for the fight against cancer in countries such as India.

A population-based cancer registry (PBCR) was organized in Kolkata at the Department of Epidemiology and Biostatistics of the Chittaranjan National Cancer Institute (CNCI), one of the premier cancer Centre in India, to collect incidence data on the resident of city and its surrounding area.

Population profile and Cancer statistics in West Bengal

As per census 2011, the total population of West Bengal is nearly 91 million. Of this rural population is 80%, and the urban population is 20%. North 24 Parganas district is the highest number of populations. In West Bengal, the cancer rate is alarmingly high in females as compared to males. The incidence in rural areas was slightly low compared to more polluted urban counterparts. The most frequently affected organs were the lung, breast, cervix, stomach, liver, uterus, ovary, Oesophagus, pancreas, prostate and tongue. Lung, Oesophagus, stomach, prostate and tongue cancers are much higher in men, while in females, breast and cervix are predominant forms, followed by stomach and Oesophagus. The most significant increase among females was seen in breast cancer, and among men is cancer of the prostate. There was also an increasing trend for lymphoma, urinary bladder, gall bladder and brain tumours in both sexes.

Non-Hodgkin's lymphoma was alarmingly high for the children below ten years, followed by acute lymphoblastic leukaemia and acute myelocytic leukaemia.

Radiotherapy History in West Bengal

The first Department of Radiotherapy in India was opened on January 25, 1910, by the Countess of Minto at the Calcutta Medical College Hospital. The earliest cases treated with deep X-ray and radium. The use of X-rays to treat various diseases, including cancer, started in the year 1920s. The exact history of radium in India is not well known. Furthermore, the publication confirms that patients were treated in Kolkata with deep X-ray and radium brachytherapy at Chittaranjan Seva Sadan Hospital for Women by Dr S. Mitra. The present-day Chittaranjan National Cancer Institute (CNCI) of Kolkata is a premier Regional Cancer Centre for eastern India, committed to Cancer Prevention, and Treatment and Research. Chittaranjan Cancer Hospital started as a highly organized comprehensive cancer Centre with the first Millivolt X-Ray therapy Unit of Asia commissioned in 1950. A technique was evolved to approach tumour sites with minimal exposure to surrounding tissues with mathematic precision using Million Volt Radiation. The first Telecobalt Unit of India was acquired in 1961. All sophisticated equipment for Radiotherapy is available at this Centre, including Cobalt and Cesium Therapy Units and Brachytherapy with Treatment Planning Unit.

Present Radiotherapy Infrastructure in West Bengal:

The radiotherapy centres in West Bengal have either teletherapy facilities alone or both teletherapy or brachytherapy facilities. The distribution of teletherapy and brachytherapy machines in West Bengal is shown in Table 1.

Table1: Number of machines available in each district

District	CT Sim	C-60	LINAC	Tomo	RAL
Kolkata	13	9	17	3	11
Howrah	1	0	2	0	1
Burdwan	0	1	0	0	1
Malda	1	0	1	0	0
Coochbehar	0	1	0	0	0
Darjeeling	1	1	2	0	1

Table 2: Number of machines available in each hospital

Hospital Name	Location	Linac	RAL	CTSim	Cobalt Teleth erapy
Calcutta Medical College Hospital (Govt.)	College st, Kol-73	1	1	1	1
CNCI(Govt.)	Hazra,Kol-27	2	1	1	1
RGKAR Medical College(Govt.)	Shyambazar,Kol-04	2	1	1	1
NRS Medical College(Govt.)	Sealdah,Ko14	2	1	1	1
SSKM(Govt.)	Bhowanipore,Kol-20	0	0	1	1
Command Hospita(Govt.)l	Alipore,kol-27	0	1	0	1
Narayana Super Speciality Hospital	Andul Rd,How-03	2	1	1	0
Appolo Hospital	Kol-54	2	1	1	0
TMC Kolkata	Newtown,Kol-160	3 (2Tomo)	1	1	0
HCG	Newtown, KOl-160	1 Tomo	0	1	0
NSCRI	Newgaria,kol-94	1	1	1	0
Ruby HOspital	Kasba, Kol-107	1	1	1	0
Medella Cancer Centre	Kamarhati,Kol-58	1	0	1	0
AMRI	Dhakuria,Kol-29	1	0	1	0
Soroj Gupta Cancer Research Institute	Thakurpukur,Kol-63	2	1	1	2
Medica Cancer Hospital	Rangapani,Darjeeling	2	1	1	0
North Bengal Medical College(Govt.)	Kwakhali,West Bengal-11	0	0	0	1
RCC	Coochbihar	0	0	0	1
Bankura Sammiloni Medical College	Bankura, West Bengal	0	0	0	1
Burdwan Medical College	Burdwan, West Bengal	0	0	0	1

There are more than 150 Radiation Oncologists. Near about 80 Medical Physicists and more than 200 Radiotherapy Technologists are working in West Bengal.

Barrier to the implementation of Radiotherapy:

There are numerous barriers to the effective implementation of radiotherapy services. For example, the shortage of radiation equipment and the shortage of qualified personnel, including radiation oncologists, medical physicists, and radiation therapists, also represent a barrier. It is difficult to ascertain which comes first, the lack of investment in equipment leading to shortages of trained personnel.

Geography presents another barrier to access radiotherapy. A need for a sound geographic distribution of equipment is highlighted as distance to the cancer facility is a barrier. Radiotherapy is available in densely populated areas and urban centres with limited access in rural and densely populated area. A number of perceptions limit the investment in radiotherapy. Among them the view that radiotherapy is too expensive, too complicated, required specially trained and hard to find personnel that other priorities in cancer care are more important, and that in the longer-term newer treatment will replace radiotherapy and therefore investment is not required. There is also long-standing perception that cancer is a systemic illness and the investment in local treatment modalities will not reduce death rates. The hope for a better systemic chemotherapy and now with molecular targeted agents may detract policy makers from investing in radiotherapy. In the meantime, while the improved systemic therapy is awaited, cancer patients are dying from the lack of access to the proven therapy.

Proposed Solution:

The teaching program of radiation oncologists, medical physicists and radiotherapy technologists provided a great momentum for attracting many candidates to come forward and take up radiotherapy as their career. There are many medical colleges providing MD in radiotherapy to balance the demand of radiation oncologists. Jadavpur University is also conducting Post M.Sc. diploma in medical physics to produce qualified medical physicists. There has been a surge of corporate and private sector hospitals in last decade in West Bengal. A financial model in which poorer section of the society can be treated at lower in corporate hospitals can be a mutually beneficial of Public Private Partnership. West Bengal government recently launched "**SwasthaSathi**" scheme is an great example of PPP to provide the treatment in poor section of people.

As per the recommendation of National Health Policy, The Government of India also launched "**Ayushman Bharat Yogona**" which is designed keeping in mind Universal Health Coverage. Health services in India are largely segmented and Ayushman Bharat aims to make them comprehensive. It is about looking at the health sector as a whole and ensure continuous care for the people of India.

Key Messages:

- Treatment is an important element of cancer control (prevention and treatment are complementary)
- Radiotherapy is an indispensable element of a cancer control program.
- The societal benefits of RT is depend on its accessibility.
- The core elements of a radiation facility are well understood.
- Investments in human resources and educations are required for safety and stability.
- Radiotherapy systems are complex and require a high level of programmatic sophistication for safe operation.

The Role of the Qualified Medical Physicist (MPE) in X-ray Diagnostics in Germany

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This law is intended to transpose the European Union directive "Euratom Basic Safety Standards" into national law. Previously, the application of ionizing radiation to humans was regulated by two ordinances in the national Atomic Energy Act. In this constellation, it was increasingly difficult to legally integrate the development in early detection and preventive examinations with ionizing radiation (keyword: new screening program, e.g., for lung cancer or research into Alzheimer's disease with ionizing radiation, e.g., PET-CT). This is now possible in the new Radiation Protection Act by defining procedures for examining asymptomatic patients. Furthermore, regulations for limit values for radiation exposure with radon and radiological emergency protection were integrated into this law.

For the medical physics expert (MPE), the degree of their involvement is defined in legally binding terms according to the radiological risk of the procedures used in diagnostics and therapy (radiotherapy, X-ray diagnostics and nuclear medicine)

- Involve in close cooperation

  Appointment as radiation protection officer for therapies based on an individual radiation plan. This requires constant presence of the MPE during the applications (this is standard in radiotherapy)

- In standardised treatment, examination with "significant exposure" within nuclear medicine, computed tomography and radiological interventions.

- The MPE must be available during the application.

- If necessary, call in for consultation (other examinations).

Here, the authority or the special conditions of the procedure may make consultation necessary.

The Radiation Protection Ordinance regulates in detail the legally relevant tasks of the MPE. An essential area of responsibility of the MPE, where direct responsibility is assumed in the application of radioactive substances or ionising radiation to humans is

- in the dosimetry of persons

  and in particular

- in the optimisation of radiation protection.

To this end, the MPE contributes through the following tasks:

1. quality assurance in the planning and implementation of applications of radioactive substances or ionizing radiation on humans, including physical-technical quality assurance,
2. selection of equipment, devices and appliances to be used,
3. monitoring of the exposure of persons to whom radioactive substances or ionizing radiation are applied,
4. monitoring of compliance with diagnostic reference values,
5. investigation of incidents,
6. carrying out risk analysis for treatments, and
7. Instruction and briefing of persons involved in the application.

The law will come into full force on 1.1.2023. Until then, all existing permits will continue to apply. However, for new approvals for X-ray equipment, these regulations come into force immediately. In addition, points 1-7 must be implemented immediately for existing licences and equipment. The supervisory authorities check the implementation especially with regard to compliance with the diagnostic reference values during examinations (dose management), as well as with regard to the investigation and reporting of incidents.

Examples of incidents

- unjustified exceedance of dose reference values
- Dose-dependent reporting threshold for
  - patient mix-ups
  - Page mix-ups
  - repetition of examinations due to
    - of setting errors,
    - device defects or
    - body part mix-ups

The process is therefore in full swing and must be fully implemented by 1.1.2023. By then, at the latest, an MPE will be mandatory for the field of X-ray diagnostics.

The German Society for Medical Physics (DGMP) proposes the following MPE personnel key to fulfils these tasks for X-ray diagnostics.

- 0.06 MPE positions per CT unit.
- 0.08 MPE positions per Interventional fluoroscopy e.g. Angiography unit

In this definition, the MPE has the position of a supervisor. The total requirement for Germany, using the above key, is approximately 280 additional MPE (120 MPE for CT, 160 MPE for the angiography units). To meet this need, a training model for MPE for X-ray diagnostics was initiated by the DGMP. For small and medium-sized hospitals and medical practices, cooperation models or freelance MPE´s are possible.

For the University Medical Centre Mannheim, as a maximum care hospital, this means an additional 2 MPE positions with 9 CT units (incl. PET-CT), 17 angiography units and 8 interventional fluoroscopy units. In 2020, 104,000 examinations were recorded in the University Medical Centre Mannheim (UMM) by our dose management system (DMS) Teamplay© from Siemens Healthineers, i.e. approx. 8,600 examinations per month, 84% of which were within the specified dose reference values.

This calculation does not include the performance of the prescribed constancy tests on the examination equipment and on the monitors for viewing and reporting. The reporting and viewing of digital images has already been regulated in detail by standards and guidelines, including the corresponding constancy tests for the corresponding monitors.

Various constellations have been established for the performance of constancy tests

- these constancy tests are part of the maintenance contracts of the manufacturing company
- The hospital's medical technology department carries out these tests as part of its technical service.
- The operating personnel of the devices carry out these constancy tests
- MPEs carry out these constancy tests, subject to a corresponding correction of the staffing key.

With the approval and the start of patient operation, a typical track record is built up for a new X-ray unit

- The X-ray unit is notified to the supervisory authority using a standardised application form.
- An MPE must be appointed at this time.
- If the documents (equipment documentation, radiation protection plan, expert opinion, etc.) are complete, the authority has 4 weeks to issue a permit.
- If this period is not adhered to, the licence is deemed to have been granted. This procedure is well established. In the past, for example, this period was only 2 weeks.
- Only with the approval of the supervisory authority can patient operations begin. From then on:
    - the deadlines for quality assurance start (daily, monthly, etc.)
    - procedures for monitoring reference values (dose management) and recording and reporting incidents must be established
    - documents on patient examinations (images, dose reference values, quality assurance ...) are requested every two years for an external audit by the medical authority (state commission)
    - a new audit by an independent expert is carried out every 5 years (as in the case of re-licensing).

The new Radiation Protection Act thus regulates the involvement and responsibilities of MPEs in all procedures for diagnostics and therapy with ionising radiation in patients with binding specified staff recommendations.

Germany

Article Submission for Next Issue

Submit the article and graphics to

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Online Survey and Evaluation of Paramedical Radiation Physics using Internet-Based E-learning Education during the COVID-19 Pandemic

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Introduction:

The pandemic COVID-19 has spread over whole world and compelled the human society to maintain social distancing. The emergence and rapid spread of coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), a potentially fatal disease, is swiftly leading to public health crises worldwide.

On February 11, 2020, the World Health Organization (WHO) proposed an official name of the virus as COVID-19, an acronym for Coronavirus disease 2019. India was one of the countries affected by the pandemic and the Government of India confirmed India's first case of Coronavirus disease on 30 January 2020 in Kerala. The first case of the COVID-19 pandemic in the Indian State of Rajasthan was reported on 3rd March 2020 in Jaipur. The SMS Hospital was the main COVID-19 treatment centre in Rajasthan since the first incidence of COVID-19 infection. The impact of pandemic COVID-19 is observed in every sector around the world. The education sectors of India as well as world are badly affected by this. It has enforced the world wide lock down creating very bad effect on the students' life. The pandemic opened opportunities to come out of the rigorous classroom teaching model to a new era of digital model (online e-learning), which have not been used before. So, the e-learning has given them a ray of hope for teachers and students to continue their educational activities through online mode.

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.

Paramedical being a professional medical science and clinical discipline, is traditionally taught in a classroom didactic style. The students attend face-to-face lectures and other teaching and learning activities within the campus. The course delivery includes lectures, tutorials, machines practical work (hands-on sessions, demonstrations), clinical attachments and research projects. Due to COVID-19 and lockdown, SMS Medical College was compelled to deliver education through e-learning. We assigned work to students via internet, delivered lectures video conferencing using Webex meeting app. We created WhatsApp groups of teachers, students to share scheduling of classes, prerecorded videos, assignments and presentations. In this article, we present a quick overview of the learning tools currently available and utilized in our approach to provide online teaching of Paramedical Program at the SMS Medical College since April 2020, in relation to learning theory and a model of learning. We also presented here the e-learning responses and experiences from students.

Objectives:

The present research study focused on the following-

- To present the implementation of e-learning in the Paramedical Program during a COVID-19 pandemic.
- To get feedback of students by conducting a survey of teaching and learning activities.
- To enlighten various steps taken by paramedical faculty for paramedical education during this pandemic.

Methods and Materials

In this study, a cross-sectional survey based questionnaire was carried out among paramedical students of Radiological Physics Department of SMS medical colleges in Jaipur, Rajasthan. The survey comprised a total of 14 questions. The questionnaire was prepared based on the experience of the lecture of online classes, prerecorded videos, assignments and presentations. The questions also evaluated experiences and understanding level of students in online classes. We used web based Google Forms, to create questionnaire. In lockdown period, we created WhatsApp group for different year batches (Diploma in Radiation Technology-I, II Bachelor of Radiation Technology-I, II, III and Post-graduation in Radiation Technology I, II).The questionnaire link generated on google form was distributed to all the students on already created WhatsApp group. The access to questionnaire was opened to the students. Consent was obtained from all the participants. No personal or demographic information was collected in this study. We formulated an excel spread sheet for analyzing the results. The lockdown has given them a ray of hope for teachers and students to continue their educational activities through online. The teachers assigned work to students via internet, delivered lectures video conferencing using different Apps like Zoom, Google meet, Facebook, YouTube, and Skype etc. There were WhatsApp groups of guardians, teachers, students and parents for affective

Table 1: Evaluation questions for Paramedical Programme students of online classes taken during Covid-19 Pandemic

1. Have you received precise information in advance for online classes?
   (a). Yes (b). No
2. Online classes scheduling time was appropriate for you?
   (a). Yes (b). No
3. Which types of activities are useful in your learning?
   (a)Face to face section
   (b)Online live lectures
   (c)Recorded videos
   (d)Viewing of videos recordings of practicals
4. Online live lectures……..
   (a)Were very clear and helped me to prepare for my lessons
   (b) Were not clear and unable to prepare for my lessons
   (c)Did not attend the lectures due to poor internet connectivity
   (d)Time was not suitable for me
   (e)Other
5. Online recorded videos ……..
   (a)Were very clear and helped me to prepare for my lessons
   (b)Were not clear and unable to prepare for my lessons
   (c)Were not able to download the videos due to daily limited internet package
   (d)Other
6. Online live quiz sessions…….
   (a)Very useful and informative
   (b)A waste of my time
   (c)Helped me to engage me with the lecturers
   (d)It was a new experience for me
   (e)It was an inspiration and motivation for me
   (f)Other
7. Online MCQ test……
   (a)Helped me to understand the basics of topic
   (b) Did not help me
   (c)Was fun and useless
   (d) Was good for examination practice
   (e)Other
8. Poster presentation……..
   (a)Helped me to understand the basics of topic
   (b)Did not help me
   (c)Were fun and useless
   (d)Other
9. Was the time provided to ask question in discussion?
   (a). Yes (b). No
10. Assignments of classes taken ……
    (e) Helped me to understand the basics of topic
    (f) Did not help me
    (g) Were fun and useless
    (h) Other
11. What challenges did you face because of the shift from the face to face classroom to a complete online classes environment?
12. Which medium (Smart phone, Computer System, Tablet, Laptop) was used by you to attend online classes. Which was more convenient?
13. Would you like to suggest any improvements?
14. What do you think is the positive sides and negative sides of the online e-learning experience?

communication through which they are always in touch to share their difficulties through this e-medium. We used Cisco Webex Meeting platform for online classes. It provides schedule meetings that last up to 50 minutes, and invite up to 100 people to a meeting. It also provides recording of meetings and share content feature. The system was intended to deliver lecture and presentations in a systematic and integrated manner. All teaching–learning activities were designed to ensure the constructive alignment of the curriculum. Prerecorded videos were sent through official WhatsApp group and Google drive. So that instructional delivery, a combination of synchronous and asynchronous methods was implemented.

A survey was carried of 25 weeks of e-learning classes. The students' feedback was collected in a questionnaire (Table1). In the survey, comparative questions between face to-face lectures and all e-learning methods were asked to the students. In this way, the two delivery modes of the same course could be compared in the same batch of students.

Results:

There are total 150 students in paramedical course. Out of 150, around 90 to 100 students were participated in the google form based survey. Responses of survey were collected by google form. 85.6% (77/90) students confirmed that precise information was received in advance for online classes and 14.4% (13/90) students said that information was not received in advance (Fig1).

As per the responses for 91.1% (82/90) students, online classes scheduling time was appropriate and for 8.9% (8/90) students,

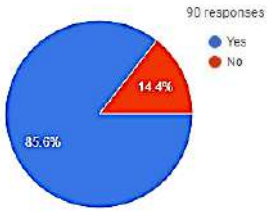

Fig 1: Result regarding responses of received precise information of online classes in the paramedical program.

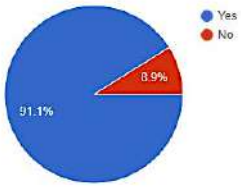

Fig 2: Result regarding responses of online classes scheduling time.

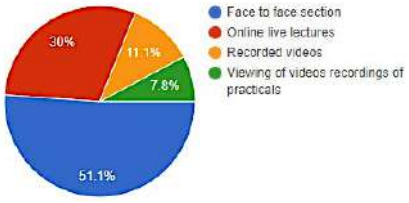

Fig 3: Result regarding responses of useful activities in online learning.

Fig 4: Result regarding responses of online live lecture

India

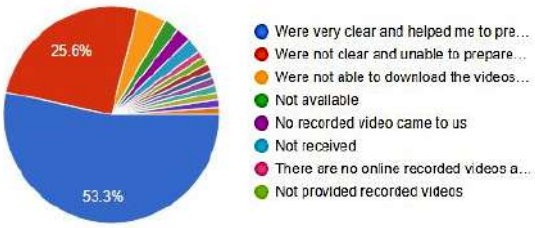

Fig 5: Result regarding responses of online recorded videos.

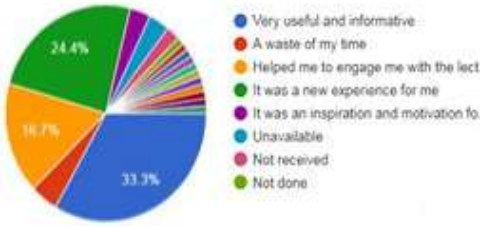

Fig 6: Result regarding responses of online live quiz sessions.

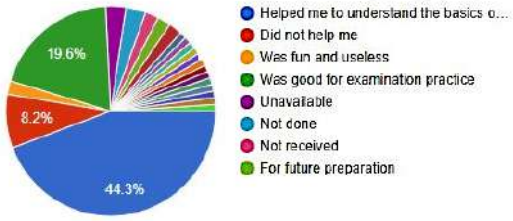

Fig 7: Result regarding responses of online MCQ test.

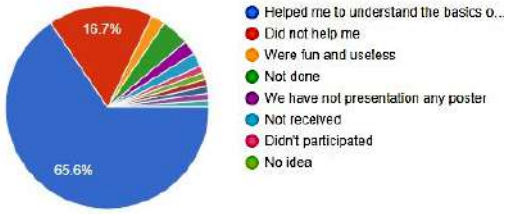

Fig 8: Result regarding responses of poster presentation.

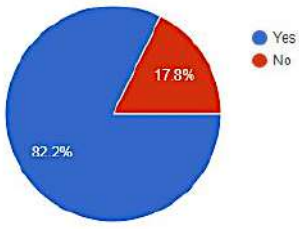

Fig 9: Result regarding responses of time provided to ask question in online class discussion.

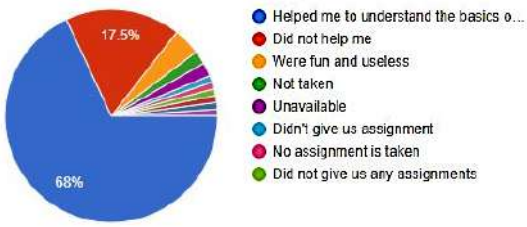

Fig 10: Result regarding responses of assignments of classes taken.

online classes scheduling time was not appropriate (Fig.2). Further 51% (46/90) students preferred face-to-face lectures compared to e-learning and 30% (27/90) students preferred online live lectures. 11.1% (10/90) students preferred recorded videos and 7.8% (7/90) students preferred viewing of videos recording of practical (Fig.3). It was found that 45.6% (41/90) students felt that the online live lecture were very clear and helped them to understand and prepare their lessons and 41% (37/90) students felt that the online live lecture were not clear and did not helped them to prepare their lessons . Some of students could not attend the lecture due to poor internet connectivity (Fig.4).

The online recorded videos/lectures were well-received by students, with 53.3%(48/90) felt that they were very clear and helped them prepare for their lessons however 25.6% (23/90) students reported that they were not clear and did not help them prepare for their lessons. However, they found that some recordings were lengthy and not very engaging but some students were not able to download the videos due to limited internet package (Fig. 5). Online live quiz session was conducted. Although 30 out of the 90 students appreciated that these activities helped them to understand the topics better however only two students said it was fun and useless (Fig. 6).

Online multiple-choice questions (MCQs) were carried out. 44.3% (43/97) responded that it helped them to understand their topics better. 19.6% (19/97) said that it helped them for preparing examination practice. Only 8.2% (8/97) students said they felt that did not help them for anything and 2.1% (2/97) of students responded that it was fun and useless for them (Fig. 7).n In the case of poster presentation 65.6% (59/90) of students replied that it was useful for them to understand the basics of the topic however 16.7% (15/90) said that it did not help for them .Only for 2.2% (2/90) of students, it was fun and useless (Fig. 8). 82.2% (75/90) students appreciated that they were provided sufficient time for asking question in discussion section and only 19.4% (18/90) responded that there was no sufficient time for asking question (Fig. 9). 68% (66/97) students confirmed that the assignments helped them to understand the basics of topic however 17.5% (17/97) said that it did not help them to understand the topic. Only 4.1% (4/97) responded that it was a fun and useless for them (Fig. 10).

Students faced so many challenges because of the shift from the face to face classroom to a complete online classes environment. Around 40% (38.8/97) students replied that everything was correct but internet connection was poor which did not make sound clear. About 45% (43.65/97) students did not face any internet connectivity issue. It was comfortable for their. Technical problems, such as poor internet connectivity, limited data plans and audio clarity problems were some issues faced by students during the online classes. Most of students used smart phone for online classes, which most commercially available and easy to carry too. (Fig. 11).

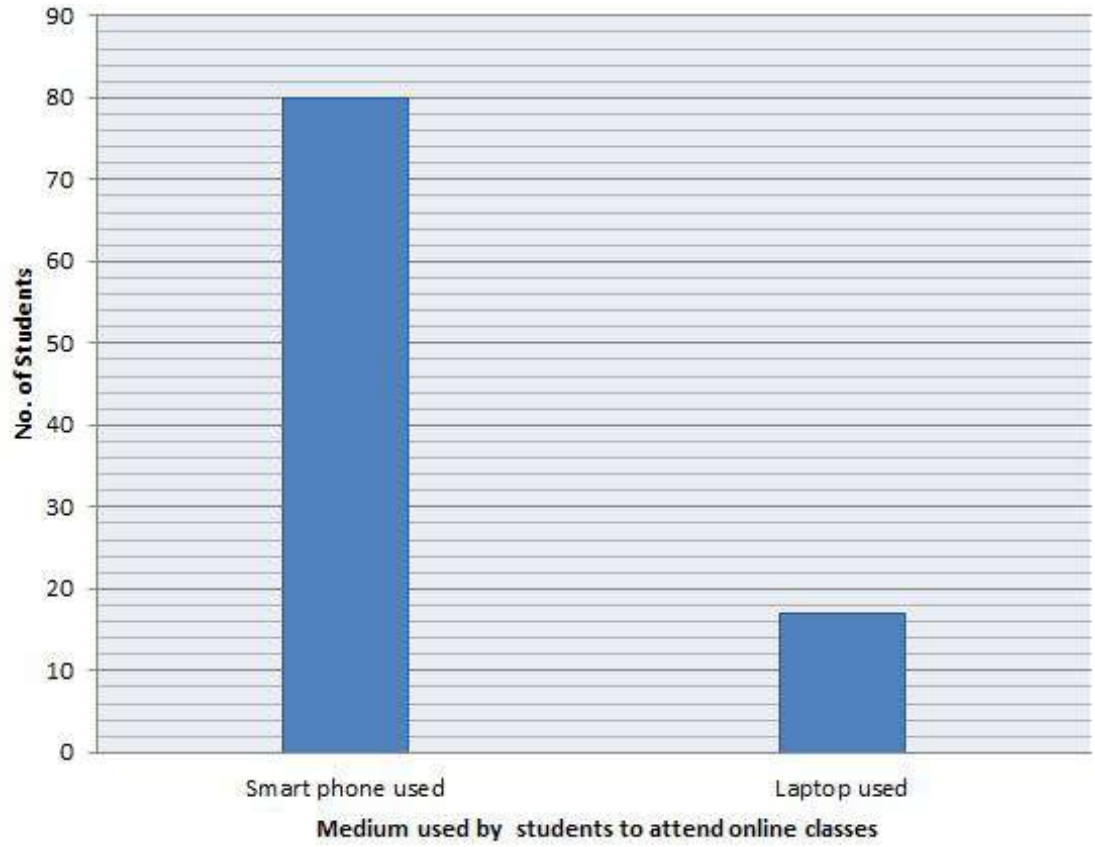

Fig 11. Result regarding responses of medium used by student to attend the online classes

Conclusion :

COVID-19 pandemic and subsequent lockdown has impacted immensely to the education sector of India. Though it has created many challenges, various opportunities are also evolved. Due to the COVID-19 pandemic, SMS Medical College had to be shifted from the traditional campus-based education to Internet-based e-learning. We predict that even after the COVID-19 crisis, the new norm of teaching will continue, perhaps into another form of symbiotic co-existence of hybrid learning, where e-learning activities would complement effectively with face-to-face activities. Indeed, the experience gained during the pandemic has enriched and broadened the approach to teaching in paramedical course at SMS Medical College. The priority should be to utilize digital technology to create an advantageous position for young students in India. It is need of the hour for the educational institutions to strengthen their knowledge and Information Technology infrastructure to be ready for facing COVID-19 like situations. Even if the COVID-19 crisis stretches longer, there is an urgent need to take efforts on maximum utilization of online platforms so that students not only complete their degree in this academic year but also to get ready for the future digital oriented environment. There is also a need to explore other online collaborative learning tools to improve instructional delivery and increase student engagement. It should be remembered that "Learning is the goal and technology is just the environment".

References:

1. Atul Sharma, Swapnil Tiwari, Manas Kanti Deb, Jean Louis Marty. Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2): a global pandemic and treatment strategies. Elsevier Public Health Emergency Collection. 2020; 56 (2): 106054. Available from: doi: 10.1016/j.ijantimicag.2020.106054.
2. Cao W, Fang Z, Hou G, Han M, Xu X , Dong J. The psychological impact of the COVID-19 epidemic on college students in China. Psychiatry Res. 2020; 287: 112934.
3. Che Ahmad Azlan , Jeannie Hsiu Ding Wong , Li Kuo Tan , Muhammad Shahrun Nizam A. D. Huri , Ngie Min Ung , Vinod Pallath , Christina Phoay Lay Tan , Chai Hong Yeong & Kwan Hoong Ng . Teaching and learning of postgraduate medical physics using Internet-based e-learning during the COVID-19 pandemic – A case study from Malaysia. Physica Med.2020; 80:10–16. Available from: doi: 10.1016/j.ejmp.2020.10.002.
4. Joshua Stern. Introduction to Online Teaching and Learning.Retrieved on April 17, 2020 from http://www.wlac.edu/online/documents/otl.pdf.
5. MHRD notice (20 March, 2020). COVID-19 Stay Safe: Digital Initiatives. Retrieved on May 25, 2020 from https://www.mohfw.gov.in/pdf/Covid19.pdf.
6. Pravat Ku Jena. Impact of pandemic covid-19 on education in India. International Journal of current Research.2020; 12(07): 12582-12586.
7. Pravat Ku. Jena (2020). Online learning during lockdown period for covid-19 in India. International Journal of Multidisciplinary Educational Research 9(8), 82-92.

Study on Optimal Scintillation Detectors for Ultrafast-Electron Beam X-ray CT scanners

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This work comprises an advanced study with experiments on scintillation-based detectors in order to design and build detector systems for ultrafast Electron Beam X-ray CT scanners (EBCT) that are designed and operated at the institute of Fluid Dynamics of the Helmholtz-Zentrum Dresden-Rossendorf (HZDR) for multiphase flow imaging [1]. EBCT scanners operate by deflecting an electron beam along a semicircular target of tungsten to generate a high speed X-ray fan beam (Figure 1). For the next generation of EBCT scanners, an X-ray transparent target made of graphite that is coated only with a micro layer of tungsten has been developed to provide 3D imaging capabilities as well as to avoid an axial offset between the focal spot and the detector ring as occurred in the latest EBCT scanners [2]. For X-ray detection, cadmium zinc telluride (CZT) detectors are used as direct converters of the X-rays to a measurable electrical current. The performance of (CZT) detectors is limited by their polarization effect [3] , in addition to the challenges to build multi-plane detectors due to the limited crystal growth of the (CZT) material [4]. As a solution for the previous limitations, an ultrafast scintillation-based detector could be used to replace the current (CZT) detector as it does not suffer from polarization effects, and can be manufactured in flexible sizes for 3D X-ray imaging purposes [5]. Due to the ultimate scanning speed, the bandwidth of the new scintillation-based detector is supposed to be 1 MHz. This would require a corresponding maximum rise and fall time of about 350 ns for each of the detector sub-components (scintillator, photodetector, front-end amplifier). Furthermore, the detector should be efficient, stable, features high signal to noise ratio (SNR), low temperature sensitivity, low power consumption, a spatial resolution of up to 1 mm along

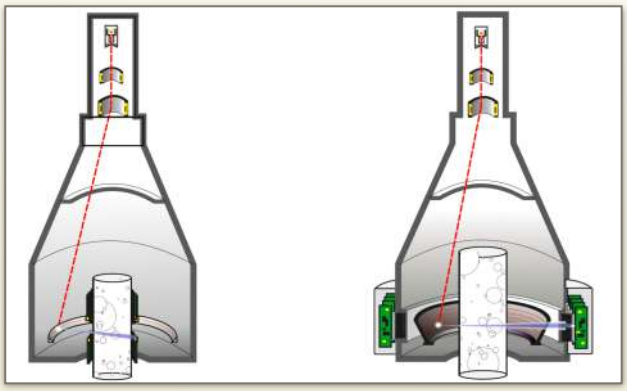

Figure (1).Cross section of currently used EBCT scanners (left). New design for future EBCT scanners using a transparent X-ray target (right).

with a linear response and dynamic range of approximately 4 orders of magnitude to support 3D imaging capabilities.

Pre-selection and testing of photodetectors:

The basic requirements of an optimal photodetector for ultra-fast scanning include linearity, wide dynamic range, low dark current, intrinsic gain, overlapped spectral matching with the applied scintillator, low-temperature sensitivity, and compacted size. To select a suitable device, each of the following detectors: avalanche photodiode (APD, Hamamatsu S8550), PIN photodiode (first sensor X7), and silicon photomultiplier (SiPM, Ketek PM3315) have been tested and compared. An optical setup

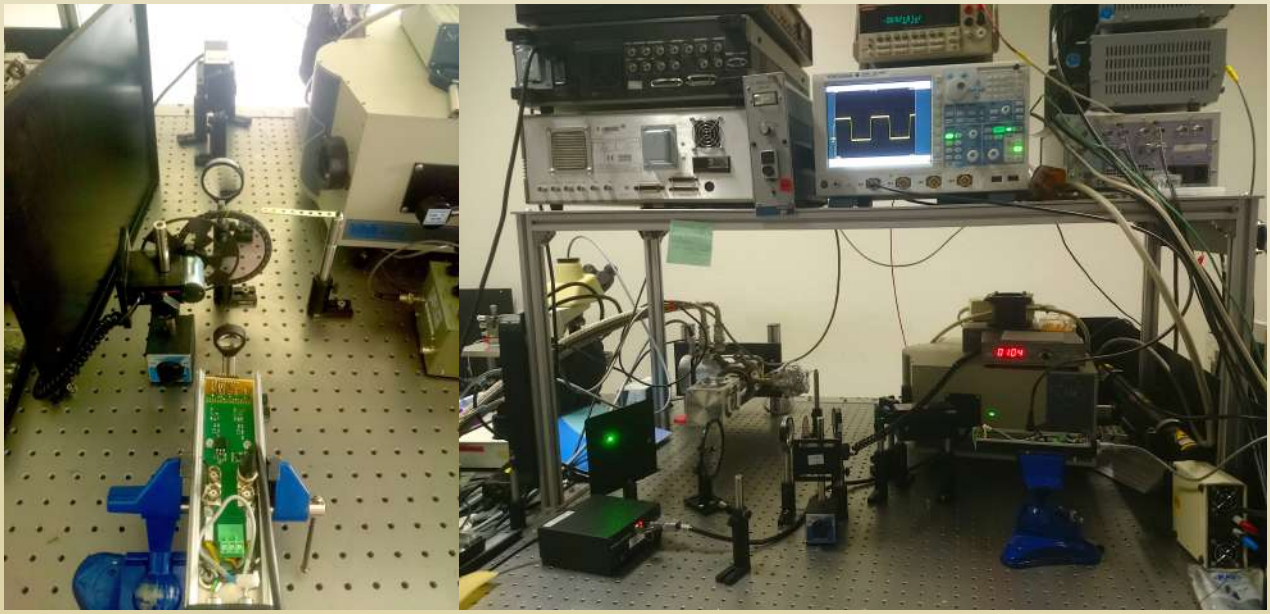

Figure (2). Optical setup for the detector characterization (left). Detected light pulses are monitored on the oscilloscope (right).

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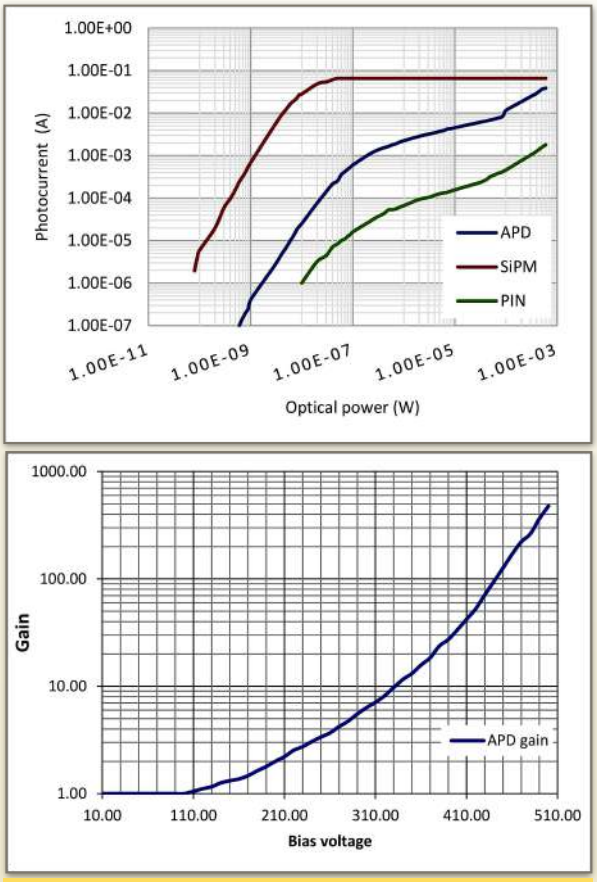

Figure (3). Dynamic range is measured by using increasing intensity light pulses (top panel). Gain vs bias voltage for APD detector at a constant light intensity (bottom panel).

(Fig. 2) has been designed to characterize each of the preselected PIN, APD, and SiPM using a green laser source of 532 nm with a maximum power of 300 mW. Optical power has been adjusted exponentially using fixed and adjustable natural density filters. The setup has been calibrated by two optical power meters. The generated light has been chopped at 1 kHz for zero level calibration.

Due to the Gaussian nature of the laser beam, a lens setup has been used to expand the beam along the sensor surface in a homogeneous way for precise linearity characterization. All experiments have been performed in dark environment. Sensors have been fixed inside a black box with a small light inlet aperture for optical and electromagnetic noise suppression. Furthermore, the bandwidth of photodetectors has been tested using LED light pulses in another setup.

For the detector bandwidth, each of PIN, APD, and SiPM have been found to be fast enough as their bandwidth exceeded 1 MHz. For dynamic range and linearity (Figure 3), SiPM sensor showed poor dynamic range due to the limited number of microcells and dead time of recovery. Moreover, the sensor produced high level of noise due to its discrete nature. For the previous reasons, SiPM sensor has been excluded. PIN photodiode showed a wide dynamic range and linear response, however, poor signal to noise ratio SNR at low light intensities and microphonic effects limited its performance. The avalanche photodiode showed good performance characteristics in both low and high light intensities in addition to wide dynamic range, linear response and intrinsic gain. For a gain value of 33, the maximum light output power of the optimal scintillator (10 μW) did not exceed its linear region of response. For all of the previous figures of merit, APD has been found to be the best photodetector for ultrafast X-ray imaging applications.

Pre-selection and testing of scintillation materials:

Based on the previously stated detector requirements, characteristics of about 500 types of scintillation materials [6] have been compared against the following requirements;

- Decay time shorter than 350 ns,
- Transparency,

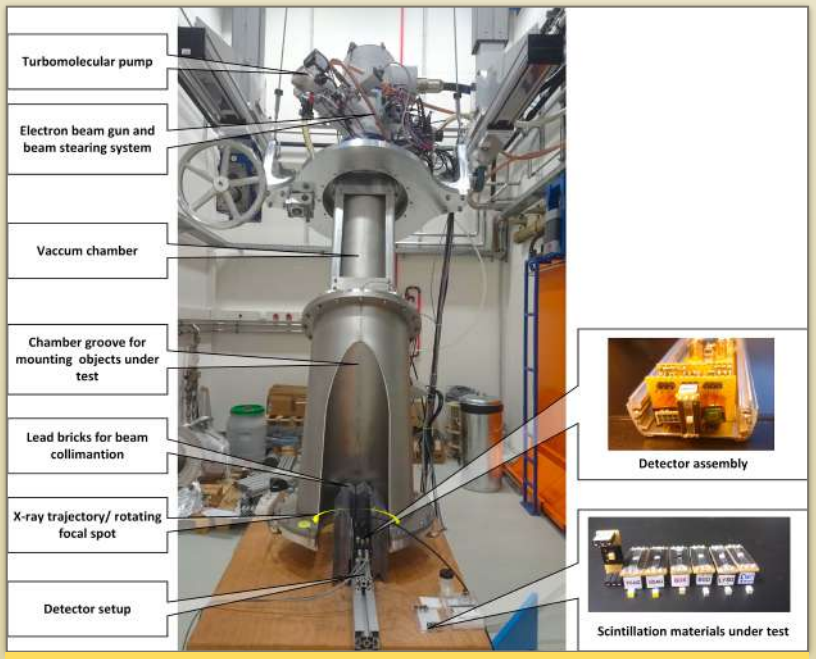

Figure (4) shows a photograph for the ultrafast EBCT scanner with its components. The detector setup is mounted between lead bricks in front of the X-ray beam semi-circular

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- Maximum light yield,
- Minimum afterglow (after 1 min. of irradiation at 150 kV, 50 mA),
- No radiation damage (after 1 min. of irradiation at 150 kV, 50 mA),
- Maximum possible stopping power,
- Non hygroscopic,
- Reliable to be manufactured from commercially available parts and cost efficient.

According to the requirements, each of GGAG [7], YGAG, YAG [8], LYSO [9], BGO [10], and GSO [11] have been selected, purchased and prepared for evaluation. The attenuation thickness has been calculated based on the density and mass attenuation coefficient of each material [12]. All crystals have been polished, coated with TiO_2 and coupled to the avalanche photodiode (gain =33, TIA gain =10 k) for testing. A setup of lead blocks has been arranged inside the scanner head to collimate the X-rays within a slit of 5 mm, and a focal spot-detector distance of 210 mm as shown in figure (4). It was intended to characterize relative light output compared to LYSO crystal, radiation damage and afterglow. Experiments have been performed at X-ray parameters of 150 kV, 5-50 mA, and a scanning frequency of 8 kHz. Measurement of absolute decay time using X-rays from the EBCT scanner was not possible due to the Gaussian nature of the rotating X-ray beam.

Each of the tested samples showed an adequate temporal response except (YGAG) material, which showed an afterglow of 11% of the peak emission (1 µs after the end of the X-ray pulse). No afterglow has been detected for the other samples. For temporal radiation damage, only YAG crystal showed a 10% decrease of light output (after 1 min of irradiation, 50 mA, 150 kV, 8 kHz). Among all tested samples, GGAG scintillator showed the maximum light yield (Figure 5), excellent linearity, optimum spectral matching with the (APD), undetectable radiation damage or afterglow. For those reasons, GGAG was found to be the optimal scintillation material for the design of ultrafast EBCT detectors with a 1MHz bandwidth.

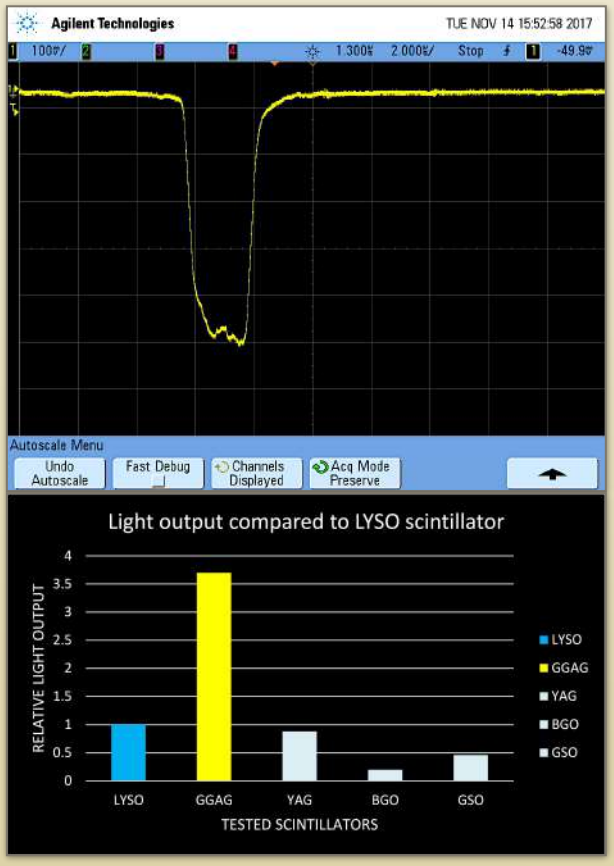

Figure (5) GGAG+APD detector response to a fast X-ray pulse of 2µs (left). Relative light output of the tested scintillators compared to LYSO scintillator (right).

Summary:

Based on theoretical studies and experiments, the optimal scintillation detector components for ultrafast EBCT scanners are:

- Scintillation material: Gd3Ga3Al2O12 (GGAG).
- Photodetector: Avalanche photodiode Hamamatsu S8550.
- Analog front-end: Transimpedance amplifier circuit using OPA657, gain of 10,000.

Based on the selected components and measurements, the detector showed the following features;

- Bandwidth of 3.5 MHz (3 times faster than the minimum required bandwidth),
- High SNR,
- No afterglow for maximum operating parameters of the scanner (1 min. of irradiation, 150 kV, 50 mA, 8 kHz scanning frequency),
- No radiation damage for the previous conditions,
- 3D imaging capabilities for the new generation of scanners,
- High detection efficiency,
- Linear response,
- Wide dynamic range (up to 4 orders of magnitude),
- Optimum spectral matching (up to 85%) between the scintillator and the APD.

References:

1. FFischer et al., Meas. Sci. Technol., vol. 19, no. 9, p. 094002, Sep. 2008.
2. Hampel et al., Nucl. Instrum. Methods Phys. Res. Sect. Accel. Spectrometers Detect. Assoc. Equip., vol. 635, no. 1, pp. 8–12, Apr. 2011.
3. Del Sordo et al., Sensors, vol. 9, no. 5, pp. 3491–3526, May 2009.
4. Shefer et al., Rep., vol. 1, no. 1, pp. 76–91, Mar. 2013.
5. Bieberie et al. Sensors 2020, 20, 5174. https://doi.org/10.3390/s20185174.
6. "Scintillation Properties." [Online]. Available: http://scintillator.lbl.gov/. [Accessed: 27-Oct-2017].
7. David et al., J. Phys. Conf. Ser., vol. 637, p. 012004, Sep. 2015.
8. Matsuo et al., J. Synchrotron Radiat., vol. 18, no. 4, pp. 601–604, Jul. 2011.
9. Pepin et al., in Nuclear Science Symposium Conference Record, 2007. NSS'07. IEEE, 2007, vol. 3, pp. 2292–2295.
10. Brunner et al., Phys. Med. Biol., vol. 62, no. 11, pp. 4421–4439, Jun. 2017.
11. Tanaka et al., Nucl. Instrum. Methods Phys. Res. Sect. Accel. Spectrometers Detect. Assoc. Equip., vol. 404, no. 2–3, pp. 283–294, 1998.
12. "NIST XCOM: Element/Compound/Mixture." [Online]. Available: https://physics.nist.gov/PhysRefData/Xcom/html/xcom1.html. [Accessed: 25-Nov-2017].

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A dosimetric Study of Conformal, Hybrid and VMAT Radiotherapy Techniques for the Treatment of Mid Thoracic Esophageal Cancer

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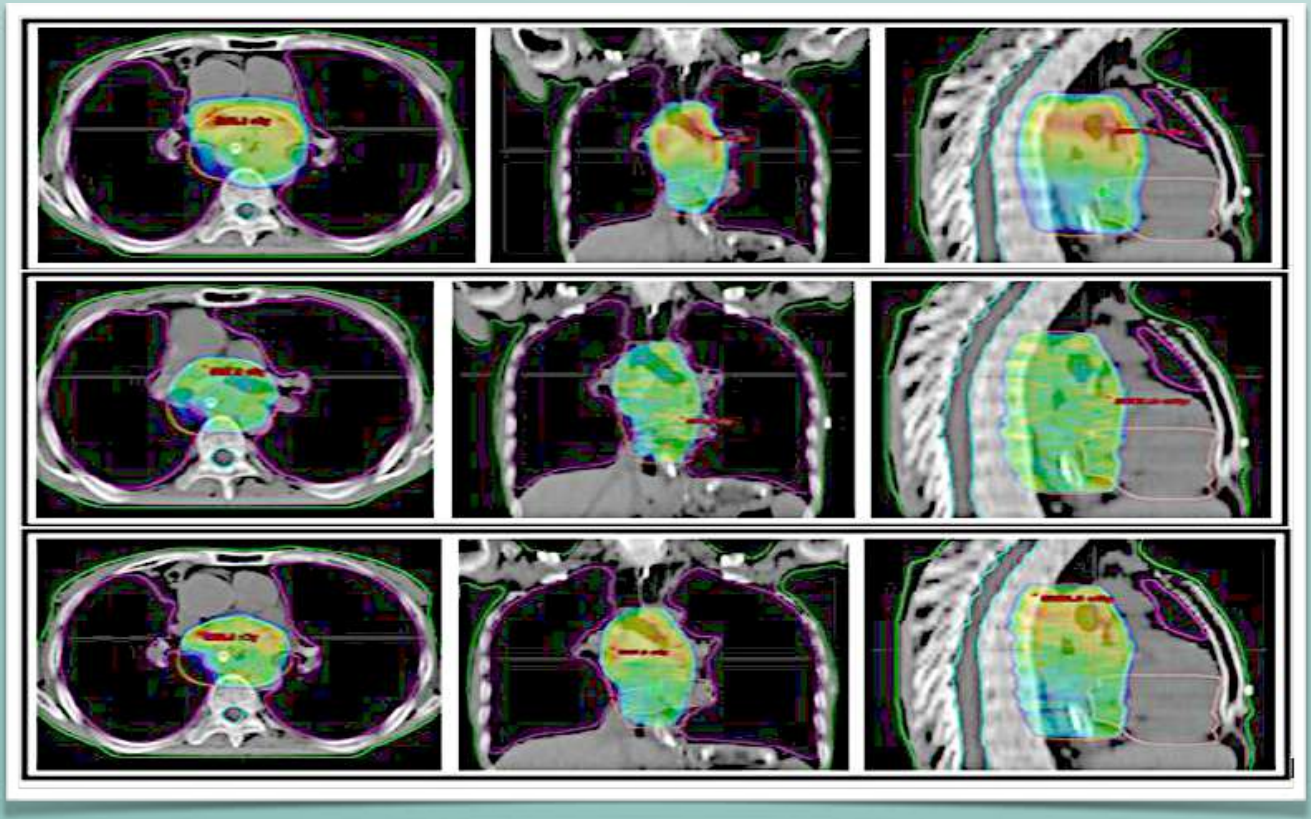
Introduction:

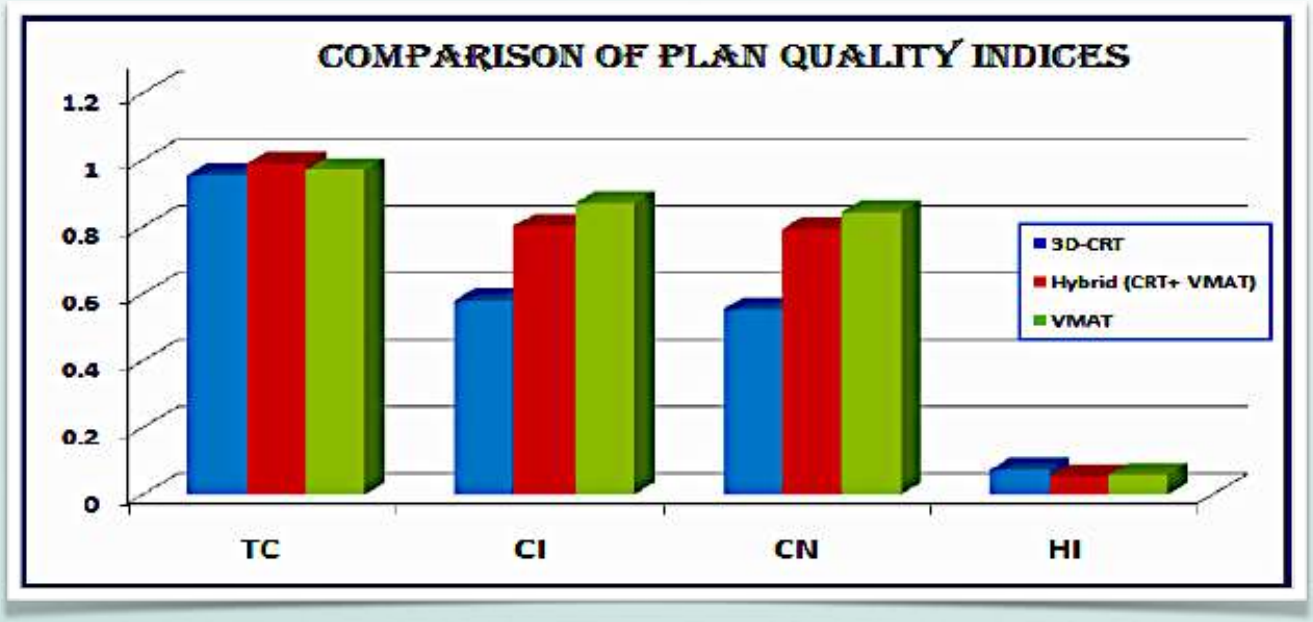
Esophageal cancer (EC) is one of the most common malignancies in the world, so as in the South Asian developing countries. Radiotherapy is a major treatment method for EC because majority of the patients are often diagnosed at locally advanced stages which could not be totally feasible for surgery.

Generally, Three Dimensional Conformal radiotherapy (3D-CRT) is the treatment of choice for esophageal cancer. This technique uses parallel opposed AP/PA fields for the first phase followed by an off cord (boost) plan with two posterior oblique and AP fields. Owing to the location and size of the target volume, 3D conformal plans may compromise target coverage due to the close proximity of OARs to the target volume and makes the dose escalation impossible. Sometimes hot spot outside the target volume is also a major limitation of this technique. Alternatively, modulated treatment planning approach like IMRT/VMAT can be used to provide superior target coverage while reducing dose to the OARs (lung, spinal cord and heart). Studies have generally shown that VMAT is able to produce similar or better dose distributions, while achieving a reduction in treatment time and a reduction in monitor units (MU). Despite the benefits of VMAT based treatment techniques, we need to cognizant of the potential implications of integral dose and the large volume of tissue receiving low dose, which is furthermore crucial in case of esophageal cancer where target volume is surrounded by a large volume of lung. Given the availability of various treatment techniques, our objective is to provide an all-inclusive treatment planning approach for the mid thoracic esophageal cancer. The purpose of this study is to investigate the potential benefit of the Hybrid technique (3D-CRT combined with VMAT) against full course of 3D-CRT & VMAT technique in the treatment of mid-thoracic esophageal cancer patient.

Materials and Methods:

A total of 10 patients were taken up for this study. All patients underwent CT Simulation in a supine position, positioned using wing board, with hands raised above the head. In this planning





study, all the image sets of 10 patients were planned for three techniques (3D CRT, Hybrid & VMAT). Mean target volume was 220cc (range 109–301 cc). Lungs, Heart, and Spinal cord were drawn as OARs. The planning was carried out isocentrically, to a prescribed dose of 5040 cGy in 28 fractions with 5 fractions/week. The total dose is split as 3600 cGy in 20 fractions for initial phase followed by 1440 cGy in 8 fractions delivered as boost. In 3D-CRT plan, the first phase contained AP-PA followed by boost plan containing Anterior and two posterior fields. In Hybrid technique, the dose per fraction of 180cGy is delivered concurrently by splitting 100cGy using AP-PA field arrangement and 80cGy by VMAT. In VMAT plan, full dose is planned using single arc technique having allowed dose constraints. All treatment plans were generated in a computerized treatment planning system (Monaco; Ver:5.11.03; Elekta Medical Systems). The dose calculations were performed using Collapse cone (CC) & Monte Carlo (MC) with heterogeneity correction ON. Quantitative and qualitative analysis were carried out using various dosimetric parameters for both target volume and OARs.

Result & Discussion:

The Conformity Indices (CI) for Hybrid plan (0.81±0.04) is comparable to the plan with VMAT alone (0.88±0.08) and better than 3D-CRT plan (0.59±0.04). The Homogeneity Indices (HI) for Hybrid plan (0.06±0.010) is comparable to VMAT plan (0.06±0.008) and better than 3D-CRT plan (0.07±0.009).

The maximum Dose (Dmax) of spinal cord in Hybrid plan was in the range of 3965±100 cGy as compared to the dose range of 2413±334cGy in VMAT and 4253±181cGy in 3D–CRT. Though all the plans resulted in spinal cord dose within the tolerance level, ALARA principle needs to be applied in selection a particular plan for delivery. The increased risk of radiation pneumonitis correlated with heterogeneous parameters, such as MLD, the percentage of lung volume receiving at least 30 Gy (V20), 20 Gy (V20), 10 Gy (V10) or 5 Gy (V5), in which V20 was a recognized indicator confirmed by several studies. The evaluation of hybrid plan revealed the range of dose levels (Dmean= 1016±212cGy; V5=69±12cc; V10=29±9cc and V20=12±4cc) superior to VMAT alone plan (Dmean=1356±224cGy; V5=82±9cc; V10=66±12cc; V20=19±8cc) and 3D-CRT (Dmean=1214±285cGy; V5=71±11cc; V10=37±12cc; V20=15±6cc). Hybrid plan demonstrated clear advantage in most of the lung dosimetric parameters in this study. For region of heart, the dose evaluation was carried out through mean dose (Dmean) and the volume of heart receiving 40Gy (V40). For the hybrid plan, the dose levels are (Dmean=2899±663cGy; V40=22±10cc), as comparable to VMAT along plan (Dmean=2019±476cGy; V40=10±6cc); but better than 3D CRT (Dmean=3197±756cGy; V40=56±17cc). Predictably, VMAT alone technique results in higher integral dose since this technique has larger beam entry and exit points for the full therapeutic dose as compared to 3D-CRT and Hybrid techniques. The number of MUs per fraction ranges from 377±46 for VMAT alone plan to 276±26 for Hybrid plan and 194±7 for 3D-CRT plan. Though 3D-CRT gives less MU delivery, Hybrid plan has better dosimetric advantage without severe increase in MU/fraction as compared to VMAT alone plan.

Conclusion:

Using Hybrid technique for mid thoracic esophageal radiotherapy can improve the target coverage, while concurrently reducing the volume of the lung and healthy tissue irradiated by the intermediate dose. Lower MU required for Hybrid technique compared to VMAT reduces the head leakage thereby reduces the whole body dose and reduces the probability of secondary malignancy. Also, Hybrid technique offers clear advantage over 3D CRT in terms of heart and spinal cord dose. Hybrid planning offers an integrative approach that can combine the best of both techniques. So hybrid technique is a good compromise between full courses of 3D CRT & VMAT plan. Hybrid technique (3D CRT combined with VMAT concurrently) can be a promising treatment technique for mid-thoracic esophageal cancer patients.

Impact of AKUH Medical Physics Training Program on Human Resource Development of the Country

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The Aga Khan University Hospital (AKUH), Pakistan's first private international university, is committed to providing education, research, and health care of international standards relevant to Pakistan and the region. In line with this vision, the University Hospital established a state-of-the-art Radiation Oncology facility in 2005. AKUH is one of the few teaching hospitals in Pakistan to be awarded Joint Commission International (JCI) accreditation.

In the speciality of Radiation Oncology, Medical Physicists play an imperative role. They are skilled professionals with multidisciplinary responsibilities including, but not limited to, radiation safety, treatment planning, treatment delivery, and quality assurance in radiation therapy. Many new modern radiotherapy units, such as Gamma Knife, CyberKnife, Modern linear accelerator (LINAC) capable of Stereotactic, Volumetric and intensity-modulated radiotherapy with Image-guided and Respiratory gating systems, have recently been installed in Pakistan and especially in Karachi. This makes the deficiency of skilled medical physicists even more critical in the country. The AKUH has taken the initiative of 'capacity building' locally, with the help of international expertise, by establishing a two-year Certificate Program in Medical Physics specializing in radiation therapy to meet the emerging needs of quality radiation therapy.

This article highlights the significance of this certificate program and its outcome for human resources development in the country. The program's objective is to educate and train students to a competency level sufficient to practice radiation oncology physics independently. This prepares the students for clinical practices in radiation therapy (RT) physics through structured clinical training and didactic courses. The program design is profoundly inclined with the Canadian medical physics education system. The program objectives follow the guidelines of the American Association of Physicists in Medicine. The syllabus and the reference text are based on the IAEA recommendations. Since 2011 total of nine batches were passed out, including 2 to 3 trainees per batch. Around 65 % of trainees are giving their services as Medical Physicist in different private hospitals listed in table 2.

In Pakistan, only two institutes providing structured training in this unique field.

- Pakistan Institute of Engineering & Applied Sciences (PIEAS) have a degree program, and their candidates provide these services to the government sector. For clinical experience, they have to do a 6-month attachment to any radiation facility
- AKUH certificate program caters private sector, details shown in Table 2. The downside of Medical Physicist training is that there is no licensing body in Pakistan to certify Medical Physicist. The International Medical Physics Certification Board (IMPCB) is one of the latest venues to certify Medical Physics in a developing country. AKUH is embarking on training its trainees to prepare and cope for that exam. Hopefully, in 2022 we will be able to arrange the IMPCB exam in Pakistan.

Table 1: Summary of didactic portion, clinical rotations and trainee resources

Didactic Portion
❑ Anatomy and Physiology
❑ Medical Imaging & Nuclear Medicine
❑ Advanced Topics in Medical Physics
❑ Dosimetry & Treatment Planning
❑ Clinical Oncology
❑ Radiation Therapy Physics
❑ Radiation Therapy Methodology
❑ Radiobiology
❑ Radiation Protection & Safety

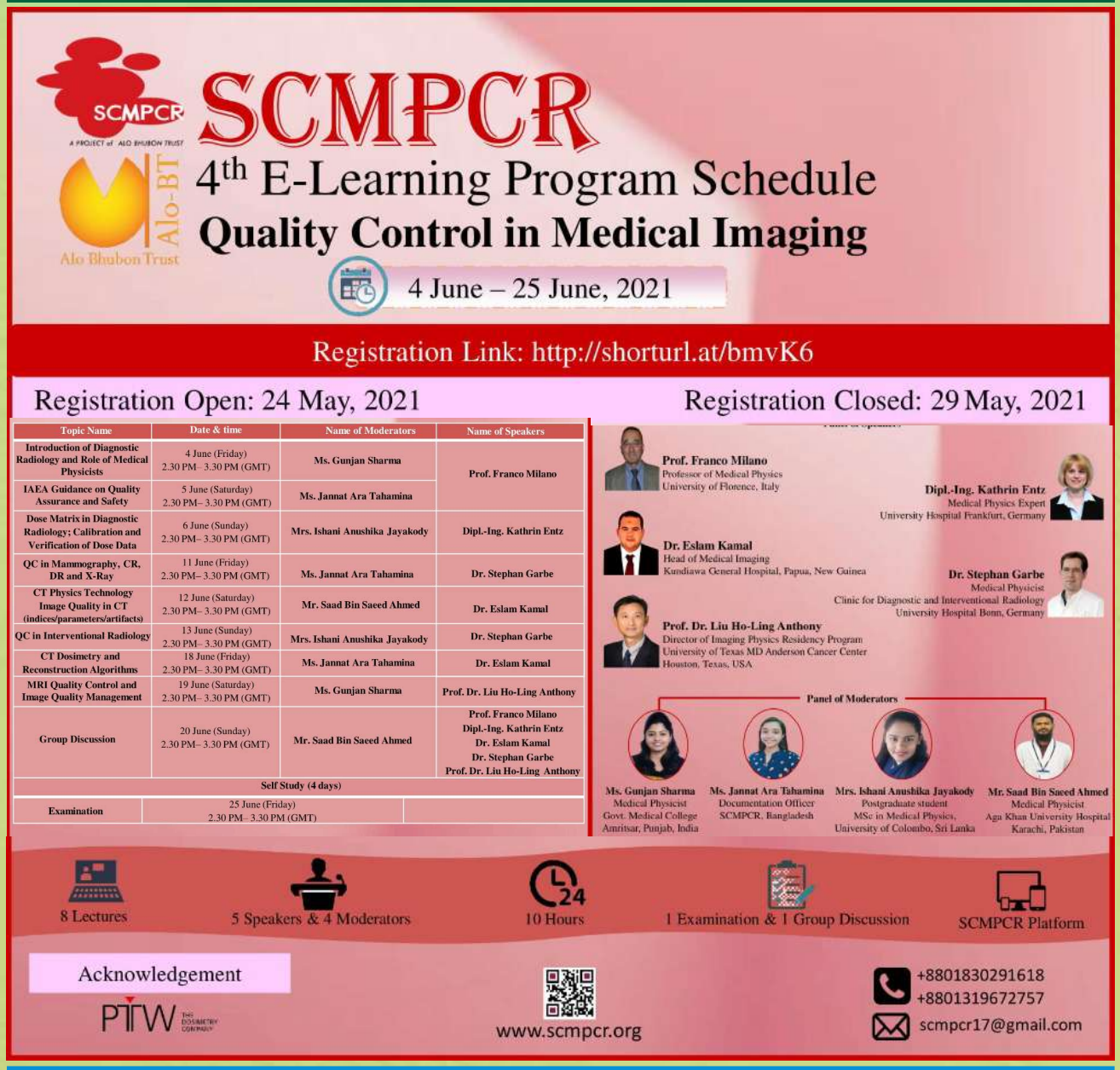
Clinical Rotations
❑ QA Machine (Weekly, Monthly, Annually)
❑ Medical Imaging & Nuclear Medicine
❑ HDR Brachytherapy
❑ Physics Seminar
❑ Patient Treatment under supervision
❑ Simulation Lab
❑ Annual Radiation Safety Review
❑ Thesis and Project
❑ Annual Fire, Chemical Biohazard Review
❑ Radiation Protection Workshop

Trainee Resources
❑ Main Library of AKUH
❑ Departmental Library
❑ E-Library
❑ Course handout
❑ Individual Computers
❑ Stipend
❑ Clinical resources and Educational resources
❑ Mentors and Facilitator

Table 2: Medical Physicist in different private hospitals. Abbreviation: TEST: Total Electron Skin Therapy; IGRT: Image guided Radiotherapy ; VMAT: Volumetric Modulated Arc Therapy; IMPCB: International Medical Physics Certification Board; IMRT: Intensity Modulation Radiotherapy; TBI: Total Body Irradiation

Table 2:

Batch	Tr. Passed	On Job	Track of Affiliations	Years	Designation	Expertise on Machine
2009-2011	2	1	Aga Khan University Hospital, Karachi	2011- present	Senior Medical Physicist	Modern LINAC (VMAT, IMRT, IGRT, TBI, TSET) & Image guided Brachytherapy (IGBT)
		2	Aga Khan University Hospital, Karachi	2011-2017	Medical Physicist	LINAC and Brachytherapy
			Ziauddin University Hospital, Karachi	2017- present	Senior Medical Physicist	Modern LINAC (VMAT, IMRT, IGRT)
2011-2013	2	3	North West General Hospital, Peshawar	2013-2014	Jr. Medical Physicist	LINAC
			Ziauddin University Hospital, Karachi	2014-2017	Medical Physicist	Modern LINAC (IMRT, IGRT) & Cobolt-60 Unit
			Aga Khan University Hospital, Nairobi	2017-present	Senior Medical Physicist	Modern LINAC (IMRT, IGRT) & IGBT
		4	Institute of Nuclear Energy Safety Technology, China	2014 - present	Postdoctoral Researcher	Medical Physics
2012-2013	3	5	Sindh Institute of Urology and Transplantation, Karachi	2015 - 2018	Sr. Medical Physicist	LINAC & brachytherapy
			Hamad Medical Corporation, Qatar	2019- present	Associate Medical Physicist	Modern LINAC & brachytherapy
2014-2015	3	6	Sindh Institute of Urology and Transplantation, Karachi	2015-2018	Medical Physicist, Radiation Protection Officer RPO	Nuclear Medicine and PET CT
			Aga Khan University Hospital, Karachi	2018- present	Medical Physicist	Modern LINAC (VMAT, IMRT, IGRT, TBI, TSET) & IGBT
2015-2016	1	7	Liaquat National Hospital, Karachi	2017- present	Medical Physicist /RPO	Nuclear Medicine and Radiology
2016-2017	2	8	Aga Khan University Hospital, Karachi	2018-present	Medical Physicist	Modern LINAC (VMAT, IMRT, IGRT, TBI, TSET) & IGBT
		9	Aga Khan University Hospital, Karachi	2018-2019	Medical Physicist	Modern LINAC (VMAT, IMRT, IGRT, TBI, TSET) & IGBT
			Neurospinal & Cancer Care Institute, Karachi	2020- present	Medical Physicist	Gamma Knife & Modern LINAC ((VMAT, IMRT, IGRT)
2017-2018	3	10	Sindh Institute of Urology and Transplantation, Karachi	2019- present	Medical Physicist	Nuclear Medicine and PET CT
		11	Jinnah Post Graduate Medical Centre, Karachi	2020- present	Medical Physicist	TomoTherapy
2018-2019	3	12	Jinnah Post Graduate Medical Centre, Karachi	2020- present	Medical Physicist	TomoTherapy
		13	Aga Khan University Hospital, Karachi	2020 - present	Medical Physicist	Modern LINAC (VMAT, IMRT, IGRT, TBI, TSET) & IGBT



Pakistan

Newly Established Cancer Centre in Btticaloa, Sri Lanka

Amalathasan Dinesh

Medical Physicist, Teaching Hospital, Btticaloa, Sri Lanka

Batticaloa Teaching Hospital started radiation cancer treatment 25 June 2020 as the 5th hospital to treat cancer diseases and the third government hospital using Linear Accelerator in Sri Lanka.

In Sri Lanka, Cancer patients obtain free radiotherapy treatments from the public cancer care services, and currently, nine regional centres are covering all provinces. The Teaching Hospital Batticaloa launched its first linear accelerator (LINAC) on 17th June 2020 as the third LINAC regional centre in Sri Lanka. Then the radiotherapy treatment started under the guidance of Medical Physicists of the National Cancer Institute, Apeksha Hospital, Maharagama and the radiotherapy planning training for the hospital physicist provided by the Medical physicists Apeksha hospital Maharagama and the Base Hospital Tellippalai, Jaffna.

A total number of 407 cancer patients have received 3DCRT radiotherapy treatment at this hospital so far. Among them, 112 patients were diagnosed with head and neck cancer, 89 were breast cancer patients, 87 were palliative care patients, and the rest were abdominal, pelvis, and sarcoma patients.

It must be noted that the cancer treatment unit at the Batticaloa Teaching Hospital joined as the second government hospital with IMRT radiation cancer treatment by the Medical physicist of Cancer Institute, Apeksha hospital Maharagama on 10th June 2021. The hospital recently started the IMRT treatment for head and neck patients and planned to extend to other cases. Further, the introduction of IMRT treatment is benefited not only people living in the Eastern province but also cancer patients from neighbouring provinces. The Batticaloa Teaching Hospital is functioning with three radiation oncologists, two Medical Physicists and four radiotherapists.

Batticaloa Teaching Hospital joined as the second government hospital with IMRT radiation cancer treatment by the Medical physicist of Cancer Institute, Apeksha hospital Maharagama on June 2021, 10.

Sri Lanka

The Contribution of The South Asia Centre for Medical Physics and Cancer Research (SCMPCR) in a Win-Win New Book

Ahmed Elzawawy, Golam Abu Zakaria and Wilfred Ngwa
The Global Health Catalyst, Boston, USA

The global health catalyst win-win movement (GHC win-win) will issue a new book by the end of this summer 2021. It is entitled "Approaching global oncology: The win-win model". It is edited by Prof. Ahmed Elzawawy and Prof. Wilfred Ngwa. The foreword is written by Sir Muir Gray and with a Keynote of Her Royal Princess Dina Mird. The Publisher is IOP publishing Ltd, Bristol, UK. Leaders of the GHC win-win and distinguished co-authors contributed in the book. Prof. Golam Abu Zakaria is one of the contributors as he is one of the main leaders of the GHC win-win. Moreover, there is a chapter entitled "The South Asia Centre for Medical Physics and Cancer Research (SCMPCR): Its activities and collaboration with the Global Health Catalyst (GHC)" by Mohammad Ullah Shemanto, Hasin Anupama Azhari, Golam Abu Zakaria .

The South Asian (SA) region with its eight countries (Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka) with its 1.9 billion inhabitants forms approximately one-fourth of the world's population. The Win-Win initiative was proposed by Ahmed Elzawawy in December 2007. The Win-Win became a part and the main notion of Global Health Catalyst at Harvard Medical School in April, 2016. In 2020, it became the Win-Win Global Health Catalyst movement (Win-Win GHC), director: Prof. Wilfred Ngwa www.icedoc.net/winwin.htm

It involves stakeholders at Harvard Medical School, Pennsylvania University, Oxford University UK, University of Heidelberg Germany, Argentina, Tanzania, Egypt as well as Goteborg University, Sweden and in collaboration with all organizations, societies, institutes and individuals experts and all stakeholders who share the same objective; to reduce the gap in access to affordable and value-based cancer care in the world. Examples of organizations are European Societies of Surgical Oncology, African Organization for Research and Training in Cancer (AORTIC), AFrOx, UK and Latin America, Caribbean Society of Medical Oncology (SLACOM) and The South Asia Centre for Medical Physics and Cancer Research (SCMPCR).

Are there two wings of the win-win initiative: The first wing is "to explore scientific approaches to increase affordability of better value cancer care". The second wing of the win-win initiative was proposed in November, 2015 and declared in 29 April, 2016 during the Global Health Catalyst Summit at Harvard Medical School, Boston, MA, USA. This wing regards catalyst action and professional advice to increase enormously the rate of establishment of services of clinical oncology in the world starting with the most difficult challenges in LMICS including Africa.

The GHC Win-Win movement involves professional consultants, and experts volunteer catalysts and young catalysts. The Win-Win movement is not a funding body. We are not competing or replacing any, but, we are complementing and completing with all who have the same objective.

We'll apply in this book, for the first time, what Ahmed Elzawawy proposes as a model for publishing books in 3rd decade of the 21st century. It is what we describe as "A living book!" It is a combination of these points; 1) Hard copy; 2) Electronic copy; and 3) We'll receive the feedback, comments, ideas, new information, new achievements, scientific researches and proposals of readers. There are at least two links available for sending feedback to: http://icedoc.net/feedback.html and http://icedoc.org/feedback.html .

4) In addition to classical references, links to videos and YouTube 5) This is a new era for book publications; in which readers are invited to contribute in realization of the objective of the book in the upcoming years and to report in the next editions. So, the senders may receive replies via e-mails and via websites as well e.g. ecancer4all, http://www.icedoc.org/Books.htm and http://www.icedoc.net/Books.htm

That is about the short term replies and interactions between contributors. 6) For the longer term, the filtered feedback will be synopsized in special chapters or in the main text in a next edition or a next book.

The GHC Win-Win movement and the new book "Approaching global oncology: The win-win model" belong to all stakeholders and to all readers. It is a win-win!

Links: The Global Health Catalyst Win-Win Initiative (https://www.globalhealthcatalyst.com/ and www.icedoc.net/winwin.htm, The Global Oncology University (GO-U) (www.ghcuniversity.org)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IMPORTANT DATES

Abstract Submission Opens	June 1, 2021
Abstract Submission Closes	August 31, 2021
Abstract Acceptance Notification	September 30, 2021
Early Bird Registration Opens	June 1, 2021
Early Bird Registration Closes	October 15, 2021
Congress Dates	December 10-12, 2021

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SOUTH ASIA CENTRE FOR MEDICAL PHYSICS AND CANCER RESEARCH

(A Project of Alo Bhubon Trust)

SUBMISSION DEADLINE FOR NEXT ISSUE: November 30, 2021

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