

# Voice of BMPS

An official E-Newsletter of BMPS, Issue 8, November, 2020



Marie Skłodowska-Curie  
(7 November 1867 – 4 July 1934)



**MEDICAL PHYSICIST**  
AS  
**HEALTH PROFESSIONAL**



**November 7**

INTERNATIONAL DAY OF

**MEDICAL PHYSICS**

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# Contents

## Messages

06-13

Editorial Message

06

Message from President, IOMP

08

Message from President, AFOMP

09

Message from Coordinator, IDMP

10

Message from President, BMPS

11

Message from General Secretary, BMPS

12

## General Articles

14-21

Medical Physics: Bangladesh Perspective  
**Prof. Dr. Kazi Manzur Kader**

14-16

Biomedical Engineering Overview  
**Md. Hozzatul Islam Sayed**

17-21

## Scientific Articles

23-43

Volumetric-Modulated Arc Therapy (VMAT): A Single Window System for State of Art Radiation Techniques  
**Dr. Murugan Appasamy**

23-28

Argument and Contention Over the Use of Low-dose Irradiation to COVID-19 Pneumonia: A Review  
**Nazmul Hasan Mehedi**

29-33

# Contents

Designing New Tools for Curing Cardiovascular Diseases to Avoid Angioplasty, Coronary, Bypass & Open Heart Surgery <b>Md. Hozzatul Islam Sayed</b>	34-43
<b>Continuous Professional Development (CPD)</b>	<b>45-53</b>
Clinical Fellowship in National Cancer Center – Japan: December 2019	45-46
Internship Program: Narayana Superspeciality Hospital, Kolkata, India: November, 2019 – April, 2020	47
Achievement of “Master of Science in Radiological Science” degree from the Graduate School of Human Health Sciences, Tokyo Metropolitan University, Japan, 2018-2019	48
Pioneer QMP in Nepal: Experience of IMPCB Examination	48-49
Internship Program through German Academic Exchange Service (DAAD) Scholarship: University Medical Centre Mannheim (UMM) August -December,2019	50-52
List of Publications of BMPS Members, 2019-2020	53
<b>News and Events</b>	<b>55-68</b>
Celebration of IDMP - 2019	55

# Contents

A Series of Webinar Program: BMPS, June 2020	56
Celebration of BMPS: IMPW 2020	56-59
Meeting in BAEC, February 2020	60
The Sixth International: ICRM, February 2020	60-61
International Conference: ICMP, February 2020	61-62
Courtesy Visit: RMCH, February,2020	62
Courtesy visit: Chairman BAEC, January 2020	62
Celebrating MACROMEDICS DAY, January 2020	63
Courtesy visit : BSMMU, December 2019	63-64
Meeting of BMPS Executive Committee; November 2019	64
Bangladesh Breast Cancer Conference, November 2019	64-65
Participation in AMPICON-2019, Kolkata	65-66
Participation in Perth, Australia: EPSM-AOCMP 2019	66

# Contents

A Meeting of BMPS: Dr. F. Hensley, Germany 2019 67

Charity Organizations in Bangladesh working for  
Cancer Treatment 68-70

SCMPCR Breast Cancer Awareness Program  
for the Indigenous Ethnic Group: Khagrachari District,  
October 2020 71-72

Celebration of World Cancer Day, February 2020 73

**Awards & Honors 75-78**

AFOMP's Outstanding Medical Physicist Award, 2020 75

The First IMPCB Certified QMP: Bangladesh and Nepal 76

Achievement of PhD Degree, 2020 77

JSMP Travel Award 2020 77-78

Elekta Award 2020 78

**COVID Pandemic Activities at a Glance 79**

**Upcoming Events 80**

**BMPS Executive Committee (2019-2020) 81**



## EDITORIAL



On behalf of Bangladesh Medical Physics Society (BMPS), we wish you all a Happy International Medical Physics day. It is a great pleasure of us to present you the "Voice of BMPS" (Electronic Newsletter of Bangladesh Medical Physics Society) Issue-8, 2020 on this joyful day. We feel honored to publish the newsletter each year in the International Day of Medical Physics (IDMP) that celebrates the birthday of Madam Marie Sklodowska–Curie.

The theme of this year 2020 is "Medical Physicist as a Health Professional". COVID-19 pandemic brings new challenges to even well-developed healthcare systems. As Healthcare Professional, Medical Physicist across the world who are working hard in the frontline, treating patients despite of the health risks.

This edition of the newsletter contains the activities of the active participants of BMPS members. Also it contains the previous one (01) year of progress of BMPS. Although COVID-19 has affected the progression quite a bit, it is still noticeable.

It is to be mentioned Medical Physics development in education, profession, training is remarkable. The young generation is driving it utmost to move it forward. In the mean time BMPCB (Bangladesh Medical Physics Certification Board) is going to establish individual certification which one step progress. It is our pleasure to organize AOCMP 2021 in Bangladesh by BMPS in cooperation with our endeavours national, international.

Voice of BMPS editors are improving the newsletter in different ways, and moving it along the pathway to maintain international standard. A huge thanks to all the persons who contributed by writing wonderful and inspiring articles, without which there wouldn't have been this newsletter issue. I hope you will enjoy reading this issue.

Let's celebrate this joyful day with proper social distancing and do our best to improve the quality of treatment incorporated with update technology involving all the medical physics professionals.

I thank all the readers for being with us. We will gladly accept any criticism. Please do inform us if you have any suggestion regarding this sector. I hope you will share this with your family and friends. It will help us to grow and help the world as a whole.

Thank you. Stay safe.

Editor

K. M. Masud Rana

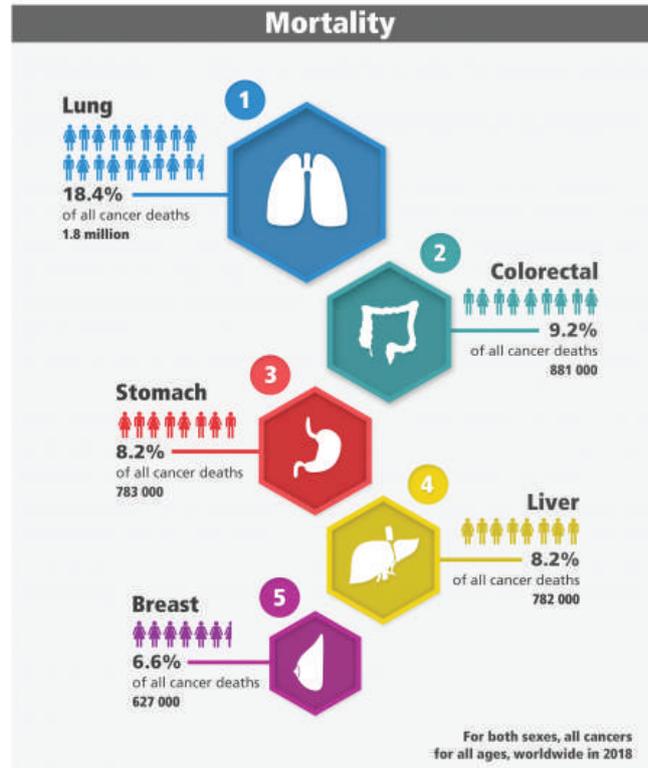
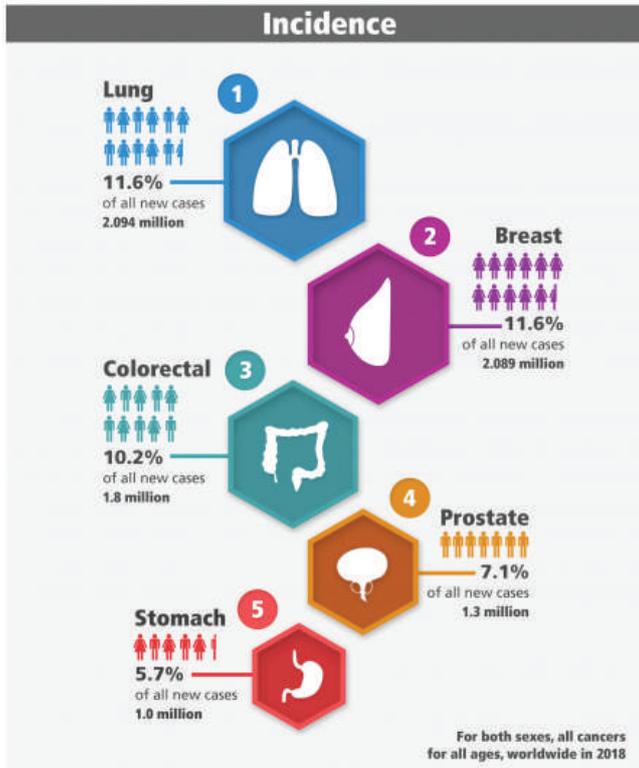
Chief Editor

Prof. Dr. Hasin Anupama Azhari

# CANCER TODAY

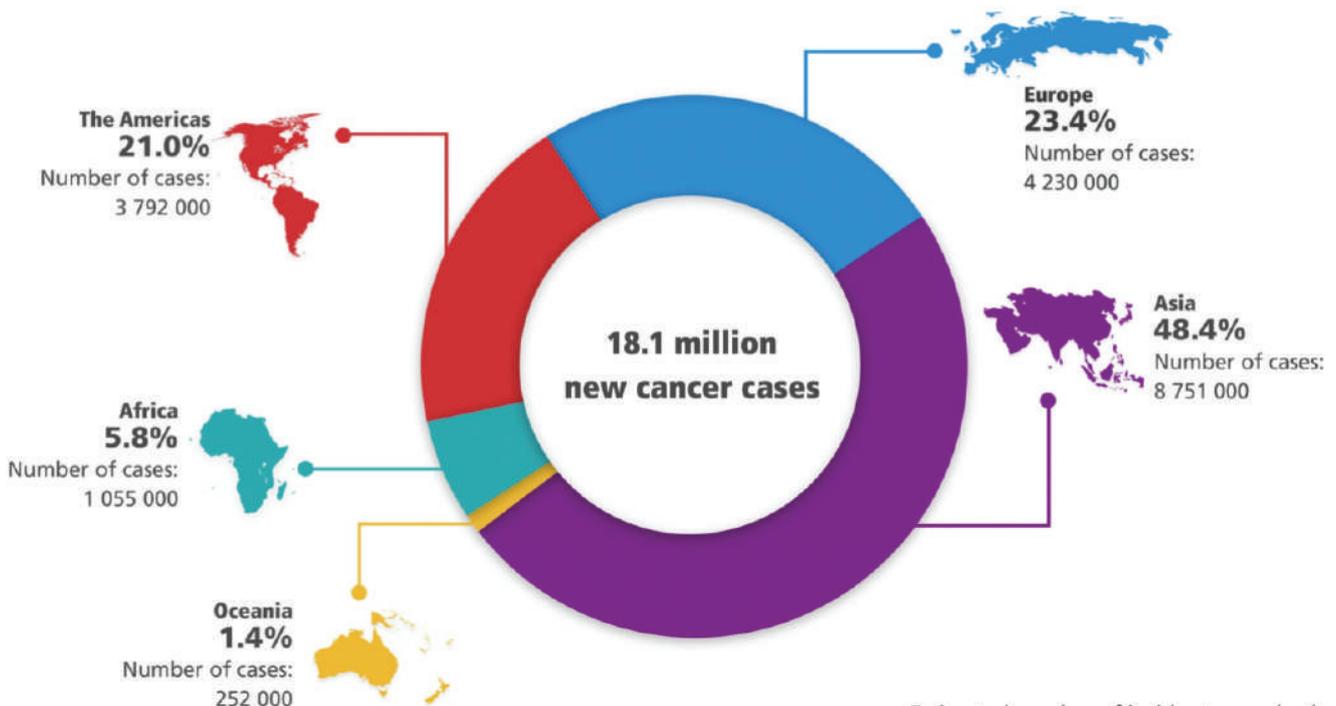
## The five most commonly diagnosed cancer types

### Percentages of new cancer cases and cancer deaths worldwide in 2018



Data source: GLOBOCAN 2018  
Available at Global Cancer Observatory (<http://gco.iarc.fr/>)  
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## Global cancer incidence

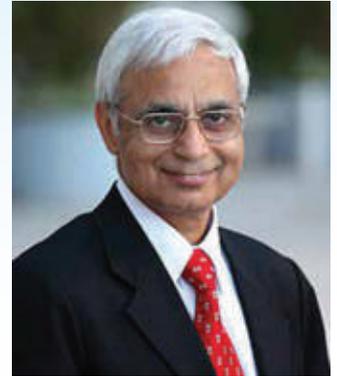




International Organization for Medical Physics



## MESSAGE FROM PRESIDENT, IOMP



I am delighted to note that "Bangladesh Medical Physics Society (BMPS) is observing the International Day of Medical Physics (IDMP) which is celebrated every year on 7th November.

It is nice to note that BMPS e-Newsletter titled "Voice of BMPS" is going to be released on 7th November 2020.

I wish to congratulate BMPS on its active programs for medical physics community and for benefit of other professionals organized on IDMP and otherwise.

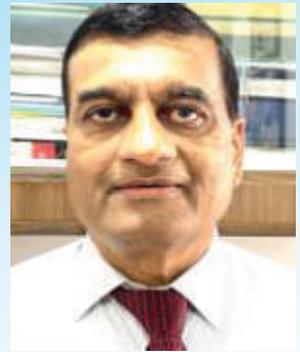
I wish BMPS all success.

Yours sincerely,

Madan M Rehani  
President, IOMP



## MESSAGE FROM PRESIDENT, AFOMP



Presidential message,

As the President of Asia-Oceania Federation of Organizations for Medical Physics (AFOMP), kindly accept my greetings and best wishes on the International Day of Medical Physics (IDMP 2020). I am very happy to note that Bangladesh Medical Physics Society (BMPS) organizing activities as IDMP 2020 celebration. This year, the 20th anniversary year of AFOMP is being celebrated from 28 May 2020 to 27 May 2021 to mark teamwork and cooperation for the sustainable growth of Medical Physics in AFOMP region.

The medical physicists are health professionals and dealing with the wellbeing of mankind. The contribution of Medical Physics in healthcare is multidimensional and it has improved healthcare tremendously. Therefore, considering of competency of medical physicists, WHO, ILO recognized medical physicists as health professionals. ILO recognized medical physicists as a profession in the classification and responses were divided between including medical physics under 'physicists' and under 'health professions'. This year's IDMP theme is "Medical Physicist as a Health Professional" to showcase the importance, multidimensional role of the medical physicist in a healthcare facility and recognizing profession globally. Despite the fact that the significant contribution of medical physicists to healthcare services, medical physicists in some countries are not recognized as a health profession as they deserve to be. To bring it over and recognize the contribution of Medical Physics to healthcare, IOMP celebrates IDMP since 2013 every year on 7th November, the birthday of Prof. Marie Curie, remarking the contribution of the medical physicist in healthcare. AFOMP also celebrates IDMP since its inception. AFOMP and NMOs trying their level best to encourage medical physics education and professional development in AFOMP region, a lot has been achieved but still long way to go.

I am delighted that BMPS is celebrating IDMP and carrying activities. I wish all of you a very happy IDMP 2020

Thanks

Prof. Arun Chougule

President- AFOMP

## MESSAGE FROM COORDINATOR, IDMP



Dear Medical Physics Colleagues across the Globe,

It is my pleasure to announce to you the theme of this year to mark the celebrations of the International Day of Medical Physics (IDMP 2020):

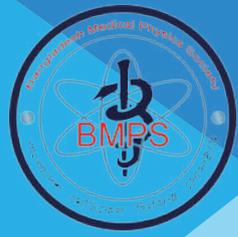
“Medical Physicist as a Health Professional”

As we all may know this year has brought remarkable challenges to healthcare systems around the world. As healthcare workers, Medical Physicists as well as many others were in the frontline in dealing with COVID-19 patients and they also deserve recognition and appreciation for their efforts. Many countries still don't recognize medical physicists as healthcare professionals, hoping that this year's theme is expected to bring awareness and shed light on the importance of our profession in the healthcare field and that the medical physicist is an essential key element not only to help in diagnosis and treatment of many diseases but also to ensure radiation safety for patients, professionals, and staff.

I hope this year's difficulties don't stand in the way of celebrating this day to honor our profession. Taking social distancing measures into consideration, this day can still be celebrated through online meetings, gatherings, contests, and parties.

I wish all my colleagues around the World a Happy Medical Physics Day. Enjoy the celebrations of this day even from your home or behind a screen in your office to show our pride of being a Medical Physicist!

Ibrahim Duhaini  
IOMP Treasurer  
IDMP Coordinator  
Chair ETC, IOMP



## MESSAGE FROM PRESIDENT, BMPS



It is my pleasure to announce that Bangladesh Medical Physics Society (BMPS) will celebrate the International Day of Medical Physics (IDMP) by publishing the 8th issue of its official e-Newsletter to commemorate the birthday of Prof. Mary Curie who contributed immensely for medical physics. The theme of IDMP of this year “Medical Physicist as a Health Professional”. Each year BMPS also organize a seminar to celebrate this day. Due to present COVID-19 situation, we are going to organize an online conference on 13<sup>th</sup> November 2020. Welcome to all our readers for our new newsletter. It contains some interesting articles, information about past medical physics activities conducted by BMPS members. It also consists of future medical physics events to be held in home and abroad, which can be beneficial for the professionals as well as students, who wants to explore their scientific outlook in the international arena. I hope you will enjoy the newsletter and welcome to our online conference. Your suggestions and advice for future development will be highly appreciated.

Thanking You

Md. Anwarul Islam  
President  
Bangladesh Medical Physics Society (BMPS)



## MESSAGE FROM GENERAL SECRETARY, BMPS



I am glad that "Bangladesh Medical Physics Society (BMPS)" is going to observe the International Day of Medical Physics (IDMP), which is celebrated every year on 7th November- the birth day of Mary Skowadowska Curie. It is worth to note that BMPS publishes its electronic newsletter- "Voice of BMPS" on this auspicious day every year. This year the theme of IDMP is "Medical Physicist as a Health Professional". Medical Physicists are health-care professionals recognized by World Health Organization (WHO) and International Labour Organization (ILO). As like as other healthcare workers, Medical Physicists are also in the frontline in dealing with the patients during COVID-19 pandemic situation. Therefore, they deserve recognition and appreciation for their efforts. It is expected that this year's theme may bring awareness and importance of medical physicist in the health-care discipline.

I believe that the COVID-19 pandemic situation cannot stand in the way of celebrating this day to honour our profession. Taking social distancing into consideration, this remarkable day can still be celebrated through online meetings, gatherings, contests, and parties.

I would like to thank all BMPS colleagues for their great initiatives and efforts for the celebration of IDMP 2020 and I also wish all my Medical Physicist colleagues across the globe a "Happy Medical Physics Day".

Dr. M. Akhtaruzzaman  
General Secretary  
Bangladesh Medical Physics Society (BMPS)



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## General Articles

### Medical Physics Bangladesh Perspective\*

Prof. Dr. Kazi Manzur Kader

Senior Consultant & Head, Oncology Department- Delta Hospital Limited



Cancer is a leading cause of death globally. Radiotherapy is an essential in the management of the cancer patients alongside with chemotherapy or surgery for cure or palliation. About 60% patients receive radiotherapy each year as definitive, adjuvant or palliative to surgery or chemotherapy. Radiation Oncology is the clinical and scientific discipline devoted to management of cancer by using ionization radiation. It deals with physical and biological basis of radiation therapy. The aim of radiotherapy is to delivery of a precise dose of radiation for a defined tumor volume without cause damage to the surrounding tissues. On the other hand, medical physics is the application of concepts and methods of physics in medical science for diagnosis and treatment purposes. The newest developments of radiation treatments are 3DCRT(Three-Dimensional Conformal Radiation Therapy), IMRT (Intensity Modulated Therapy), IGRT (Image Guide Radiotherapy), SRT(Stereotactic Radiotherapy), SRS (Stereotactic Radio Surgery), Rapid Arc Therapy and Intravascular Brachytherapy.

To begin with, the journey of Medical Physics in Bangladesh started back in the nineties and the exposure came through several international seminars in Dhaka. From 1996-1999, a series of seminars were held by DGMP “Medical Physics in Developing Countries” at the Physics department of Bangladesh University of Engineering & Technology (BUET). These events lead to the establishment of a full-fledged & functional “Department of Medical Physics & Biomedical Engineering (MPBME)” at Gono University in Dhaka which is rare of its kind. The University offers a two years Master’s program (2000) and four years of Bachelor’s program (2005). The syllabus of these courses was structured in such a way to ensure the development of DGMP, AAMP & IAEA which covers all the important aspects of Medical Physics emphasizing the needs of Bangladesh. The main concern of this department to produce Medical Physicists who are highly qualified and specialized in Radiation Oncology & Imaging fields. In 2004, South East University, a private University, opened a master’s program on Medical Physics which could not be able to make its mark due to the shortage of

academicians specialized in Medical Physics along with some other reasons. Additionally, Dhaka University opened a department of Biomedical Physics and Technology that offers Ph.D. course in Biomedical Engineering. In addition to Dhaka University, National University & Jahangirnagar University also offer a PhD in Medical Physics.

Currently in MPBME at Gono University ninety students are studying. A significant number of students were awarded MSc. degree along with eighty students already being awarded BSc. degree. Nineteen students and five teachers have been sent from the department to Germany under the collaboration with Heidelberg University. WHO states that a minimum of 600 hundred Medical Physicists and 300 Radiotherapy centers are needed for 150 million population of Bangladesh but the current scenario reveals the statistics of 18 Radiotherapy centers which are equipped with 10 linear accelerators, 12 Cobalt60 Teletherapy, 7 CT-Stimulators, 4 Brachytherapy units with only 23 Medical Physicist currently employed. According to International Conference on Medical Physics in Radiation Oncology and Imaging (ICMPROI-2011) these numbers will increase on greater scale and there will be more Medical Physicists to ensure treatment. Furthermore, along with only one post-graduate institute, there are only 17 nuclear medicine centers is in the country equipping 36 gamma cameras, 2 PET machines with 20 Medical Physicists working in those institutions. So, to promote medical physics education and training a society named "Bangladesh Medical Physics Society" has been formed. In the cooperation of "Bangladesh Society of Radiation Oncologists BSRO" recently an International seminar on radiation oncology physics and imaging was organized by MBPME and BMPS. The seminar includes over 200 participants including 36 foreign delegates from over 10 countries. An urgent crash program has been launched for clinical training in Radiotherapy in collaboration with Germany to develop Qualified Medical Physicist QMP.

Medical physicists and biomedical engineers play a vital role in terms of cancer patients treated with radiotherapy. There are some national and international academic collaborations exist for instance with National Institute of Cancer Research & Hospital (NICRH), Mohakhali; Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka; the University of Heidelberg, Germany in cooperation with German Cancer Research Center; Thakupukur Cancer Hospital, Kolkata, India. Medical Physics and Biomedical Engineering at Gono University is a huge success that leads us to recruit more Medical physicists in radiotherapy centers to ensure safe and effective treatment of cancer patients throughout the country. Public universities should come forward to bear the torch of success and produce more qualified medical physicists. To sum up, I would like to mention that, all these chain of events regarding Medical physics and radiation oncology alongside other contributors especially one person is most important who actually pioneered the path of Medical Physics in our country and that person is Prof. Dr. Golam Abu Zakaria.

It is my immense pleasure to introduce Prof. Dr. Golam Abu Zakaria, PhD, Chairman & Chief Medical Physicist of the Independent department of Radiation Physics at Gummers Bach Hospital and Academic teaching at Hospital of the University Cologne, is a Bangladeshi gentleman.

In 1996, I had the first exposure to attend a workshop at Physics department of BUET (Bangladesh University of Engineering & Technology), organized by German and BUET Bangladesh project. Prof. Zakaria and other German medical physicists attended this workshop. Participants were physicists and physicians from different institutions where Radiotherapy faculty is available. Practical classes were held in Delta Oncology Hospital (Dosimetry & others) where radiotherapy is the important treatment aspect for cancer patient management.

The modern and advanced radiation therapy needs qualified medical physicists for treatment as neo adjuvant, adjuvant and palliative purposes. Prof. Zakaria used to come every year in Bangladesh and organize seminars, symposiums, workshops and invigilate the exams of different medical degrees along with supervision of thesis of MS degree under GONO University and Dhaka University. He is a man of excellent personality when it comes to teach or even organizing social events. I should recall the year 2006 when I was in a fellowship program in Klinikum Oncology Hospital of Darmstadt for 3 months (Completed within two months schedule including holiday works) training in Linac and uses of 3DCRT, IMRT, IGRT and SBRT procedures planning at that time Dr. Zakaria visited Darmstadt from Cologne and introduced me with the faculties as an Assistant Professor Radiation Oncology working at National Institute for Cancer Research & Hospital Bangladesh at that time. Additionally, he also mentioned regarding my additional degree on Medical & Radiation Physics (MSc.) to the visiting faculties and authorities. Finally sightseeing followed by the dinner with this great man showed his excellent hospitality.

Prof. Dr. Zakaria is the man of academic interest and research oriented person though he has long standing interest & involvement of Radiotherapy at European level. His position in the EORTC RT group has given him the opportunity to collaborate physicists, clinicians and technologists in many institutions all over Europe and beyond. He always keeps in mind for up gradation of Bangladesh Medical Physicists' chapter. My best regards & wishes with him & his family.

\* This article is written for the book 'Dr. Zakaria and Friends: Medical Physics in Bangladesh and other Essays' which will be published in February 2021.

# Biomedical Engineering Overview

Md. Hozzatul Islam Sayed

Department of Biomedical Engineering, Jashore University of Science & Technology, Jashore-7408, Khulna, Bangladesh

## Evolution of the Modern Healthcare System:

Before 1900, medicine had little to offer average citizens, since its resources consisted mainly of physicians, their education and their “little black bag.” In general, physicians seemed to be in short supply, but the shortage had rather different causes than the current crisis in the availability of healthcare professionals. Although the costs of obtaining medical training were relatively low, the demand for doctors’ services also was very small, since many of the services provided by physicians also could be obtained from experienced amateurs in the community.

The changes that have occurred within medical science originated in the rapid developments that took place in the applied sciences (i.e., chemistry, physics, engineering, microbiology, physiology, pharmacology, etc.) at the turn of the twentieth century. New discoveries in medical sciences followed one another like intermediates in a chain reaction. However, the most significant innovation for clinical medicine was the development of x-rays. These “new kinds of rays,” as W.K. Roentgen described them in 1895, opened the “inner man” to medical inspection. Initially, x-rays were used to diagnose bone fractures and dislocations, and in the process, x-ray machines became commonplace in most urban hospitals. Separate departments of radiology were established, and their influence spread to other departments throughout the hospital.

In the decades following World War II, technological advances were spurred on by efforts to develop superior weapon systems and to establish habitats in space and on the ocean floor. As a by-product of these efforts, the development of medical devices accelerated and the medical profession benefited greatly from this rapid surge of technological finds. Consider the following examples:

1. Advances in solid-state electronics made it possible to map the subtle behavior of the fundamental unit of the central nervous system the neuron as well as to monitor the various physiological parameters, such as the electrocardiogram, of patients in intensive care units.
2. New prosthetic devices became a goal of engineers involved in providing the disabled with tools to improve their quality of life.
3. Nuclear medicine—an outgrowth of the atomic age emerged as a powerful and effective approach in detecting and treating specific physiological abnormalities.
4. Diagnostic ultrasound based on sonar technology became so widely accepted that ultrasonic studies are now part of the routine diagnostic workup in many medical specialties.

5. "Spare parts" surgery also became commonplace. Technologists were encouraged to provide cardiac assist devices, such as artificial heart valves and artificial blood vessels, and the artificial heart program was launched to develop a replacement for a defective or diseased human heart.
  6. Advances in materials have made the development of disposable medical devices, such as needles and thermometers, a reality.
  7. Advancements in molecular engineering have allowed for the discovery of countless pharmacological agents and to the design of their delivery, including implantable delivery systems.
  8. Computers similar to those developed to control the flight plans of the Apollo capsule were used to store, process, and cross-check medical records, to monitor patient status in intensive care units, and to provide sophisticated statistical diagnoses of potential diseases correlated with specific sets of patient symptoms.
  9. Development of the first computer-based medical instrument, the computerized axial tomography scanner, revolutionized clinical approaches to noninvasive diagnostic imaging procedures, which now include magnetic resonance imaging and positron emission tomography as well.
  10. A wide variety of new cardiovascular technologies including implantable defibrillators and chemically treated stents were developed.
  11. Neuronal pacing systems were used to detect and prevent epileptic seizures.
  12. Artificial organs and tissue have been created.
  13. The completion of the genome project has stimulated the search for new biological markers and personalized medicine.
  14. The further understanding of cellular and biomolecular processes have led to the engineering of stem cells into therapeutically valuable lineages and to the regeneration of organs and tissue structures.
  15. Developments in nanotechnology have yielded nanomaterials for use in tissue engineering and facilitated the creation and study of nanoparticles and molecular machine systems that will assist in the detection and treatment of disease and injury.
- The impact of these discoveries and many others has been profound. The healthcare system of today consists of technologically sophisticated clinical staff operating primarily in modern hospitals designed to accommodate the new medical technology. This evolutionary process continues, with advances in the physical sciences such as materials and nanotechnology and in the life sciences such as molecular biology, genomics, stem cell biology, and artificial and regenerated tissue and organs. These advances have altered and will continue to alter the very nature of the healthcare delivery system itself.

So, let to know briefly about Biomedical Engineering:

**Bioengineering** is usually defined as a basic research-oriented activity closely related to biotechnology and genetic engineering, that is, the modification of animal or plant cells or parts of cells to improve plants or animals or to develop new microorganisms for beneficial ends. In the food industry, for example, this has meant the improvement of strains of yeast for fermentation. In agriculture, bioengineers may be concerned with the improvement of crop yields by treatment of plants with organisms to reduce frost damage. It is clear that future bioengineers will have a tremendous impact on the quality of human life. The potential of this specialty is difficult to imagine. Consider the following activities of bioengineers:

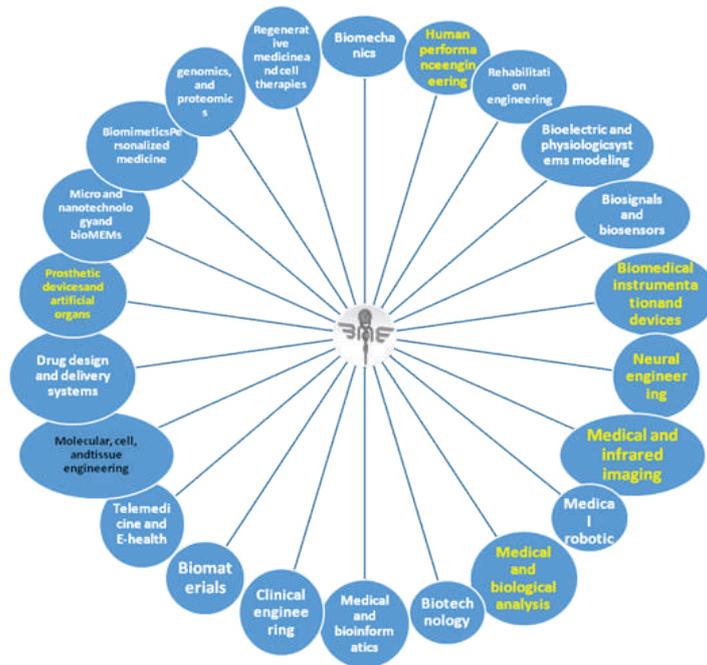
- Development of improved species of plants and animals for food production
- Invention of new medical diagnostic tests for diseases
- Production of synthetic vaccines from clone cells
- Bioenvironmental engineering to protect human, animal, and plant life from toxicants and pollutants
- Study of protein–surface interactions
- Modeling of the growth kinetics of yeast and hybridoma cells.
- Research in immobilized enzyme technology
- Development of therapeutic proteins and monoclonal antibodies

Biomedical engineers, on the other hand, apply electrical, mechanical, chemical, optical, and other engineering principles to understand, modify, or control biological (i.e., human and animal) systems as well as design and manufacture products that can monitor physiological functions and assist in the diagnosis and treatment of patients. When biomedical engineers work in a hospital or clinic, they are more aptly called clinical engineers.

So let know responsibilities of the biomedical engineers. Actually what they do. The breadth of activity of biomedical engineers is now significant. The field has moved from being concerned primarily with the development of medical instruments in the 1950s and 1960s to include a more wide-ranging set of activities. As illustrated below, the field of biomedical engineering now includes many new career areas (see Figure P.1), each of which is presented in this handbook. These areas include:

Application of engineering system analysis (physiological modeling, simulation, and control) to biological problems

- Detection, measurement, and monitoring of physiological signals (i.e., biosensors and biomedical instrumentation)
- Diagnostic interpretation via signal-processing techniques of bioelectric data
- Therapeutic and rehabilitation procedures and devices (rehabilitation engineering)
- Devices for replacement or augmentation of bodily functions (artificial organs)



**Fig: The World of Biomedical Engineering.**

- Computer analysis of patient-related data and clinical decision making (i.e., medical informatics and artificial intelligence)
- Medical imaging, that is, the graphic display of anatomic detail or physiological function
- The creation of new biological products (e.g., biotechnology and tissue engineering)
- The development of new materials to be used within the body (biomaterials)

Typical pursuits of biomedical engineers, therefore, include

- Research in new materials for implanted artificial organs
- Development of new diagnostic instruments for blood analysis
- Computer modeling of the function of the human heart
- Writing software for analysis of medical research data
- Analysis of medical device hazards for safety and efficacy
- Development of new diagnostic imaging systems
- Design of telemetry systems for patient monitoring
- Design of biomedical sensors for measurement of human physiological systems variables
- Development of expert systems for diagnosis of disease
- Design of closed-loop control systems for drug administration
- Modeling of the physiological systems of the human body
- Design of instrumentation for sports medicine

- Development of new dental materials
- Design of communication aids for the handicapped
- Study of pulmonary fluid dynamics
- Study of the biomechanics of the human body
- Development of material to be used as a replacement for human skin

Biomedical engineering, then, is an interdisciplinary branch of engineering that ranges from theoretical, Non-experimental undertakings to state-of-the-art applications. It can encompass research, development, implementation, and operation. Accordingly, like medical practice itself, it is unlikely that any single person can acquire expertise that encompasses the entire field. Yet, because of the interdisciplinary nature of this activity, there is considerable interplay and overlapping of interest and effort between them.

For example, biomedical engineers engaged in the development of biosensors may interact with those interested in prosthetic devices to develop a means to detect and use the same bioelectric signal to power a prosthetic device. Those engaged in automating clinical chemistry laboratories may collaborate with those developing expert systems to assist clinicians in making decisions based on specific laboratory data. The possibilities are endless.

Perhaps, a greater potential benefit occurring from the use of biomedical engineering is identification of the problems and needs of our present healthcare system that can be solved using existing engineering technology and systems methodology. Consequently, the field of biomedical engineering offers hope in the continuing battle to provide high-quality care at a reasonable cost. If properly directed toward solving problems related to preventive medical approaches, ambulatory care services, and the like, biomedical engineers can provide the tools and techniques to make our healthcare system more effective and efficient and, in the process, improve the quality of life for all.

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  - OT Light ((INFIMED – POLAND)
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## Scientific Articles

# Volumetric-Modulated Arc Therapy (VMAT): A Single Window System for State of Art Radiation Techniques

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### Introduction:

There have been significant advances in the delivery of radiotherapy over the past few decades. The introduction of IMRT give us the freedom to escalate dose to target and this is achieved by subdividing each radiation beam into smaller radiation beamlets and varying the individual intensities of these beamlets [1–3]. The advantages of this technique are improved target volume conformity, particularly in volumes with complex concave shapes, and improved sparing of normal tissues and organs at risk (OARs) resulting in reduced acute and late toxicities [4–7]. IMRT also has the ability to produce inhomogeneous dose distributions, which allows the simultaneous delivery of different doses per fraction to separate areas within the target volume. Despite the obvious benefits of IMRT, there are still some disadvantages. A standard IMRT plan often requires multiple fixed angle radiation beams, which can increase treatment delivery time. This can impact on patient comfort on the treatment couch, reproducibility of treatment position and intrafraction motion.

More recently, there has been some interest in arc based or rotational therapies to overcome some of the limitations associated with conventional and fixed field IMRT. The basic concept of arc therapy is the delivery of radiation from a continuous rotation of the radiation source and allows the patient to be treated from a full 360-degree beam angle. Arc therapies have the ability to achieve highly conformal dose distributions and are essentially an alternative form of IMRT with additional advantage of shorter treatment delivery.

The VMAT was first introduced in 2007 and described as a novel radiation technique that allowed the simultaneous variation of three parameters during treatment delivery, i.e. gantry rotation speed, treatment aperture shape via movement of MLC leaves and dose rate [8]. The earlier form of arc therapy, termed intensity modulated arc therapy (IMAT) was first described by Yu in 1995 [9] and required the use of multiple superimposed arcs to achieve a satisfactory dose distribution [10].

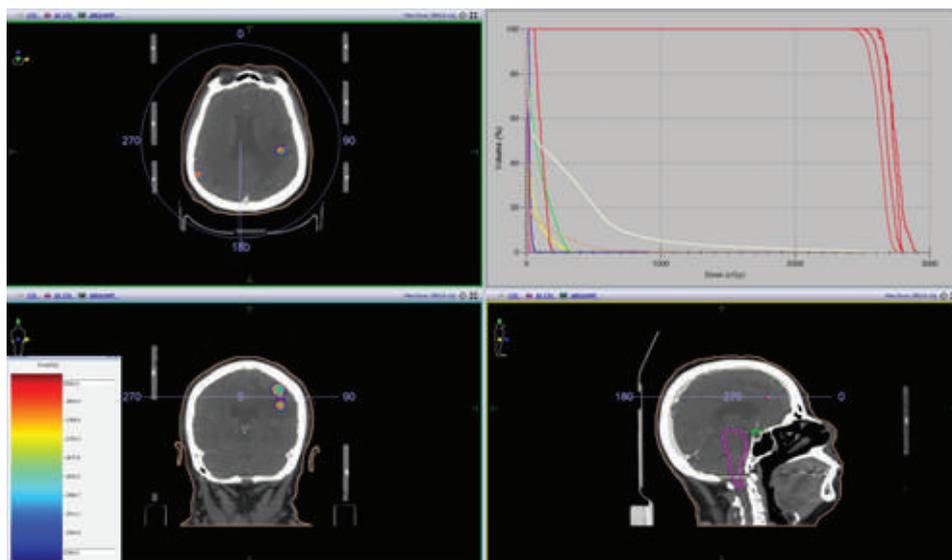
Recent VMAT techniques have allowed the whole target volume to be treated using one or two arcs, although complex cases may require more. In a recent review, VMAT is essentially described as a form of single arc IMAT technique that employs dose rate variation [11]. One benefit of VMAT compared with tomotherapy is the possibility of delivering this treatment on conventional linear accelerators, which are configured to have this capability. Currently there are several VMAT systems available under various names (RapidArc, Varian; SmartArc, Philips; and Elekta VMAT, Elekta). The main aim of this article is to summarize the new avenues of VMAT, where it has been used to overcome the limitation of conventional treatment techniques and its advantages.

### **Treatment for Multiple intra-cranial lesions:**

Conventionally, SRS and SRT have been delivered with the help of dedicated Gamma Knife equipment, where 206 Co-60 sources are used in the form of helmet to deliver a desired dose to the target. But later advancement of linear accelerator technology brought the "X-Knife" in which fixed size cone were used to deliver SRS and SRT using high energy X-rays along with SRS/SRT frames fixed on the patient head. Recently after the introduction of VMAT technology, there is a paradigm shift in the method of treatment, i.e. SRS/SRT can be delivered without frames and accuracy can be achieved nearly equivalent to that of conventional SRS/SRT.

As VMAT has the freedom to modulate speed of MLC's, collimator and Gantry rotation as per the clinical requirement (optimization), it helps to reduce the dose to OAR's as well as to achieve rapid dose escalation or dose fall off outside PTV. Mostly, full arcs and non-co-planer partial arcs are used as per the standard guideline for the treatment planning purpose. These partial arcs help in contain the low dose spread as well as to increase the coverage of the target. The Monte Carlo based algorithm will be used for the dose calculation to achieve higher dose calculation accuracy and 6MV Flattening Filter Free(FFF) mode is the preferred choice to achieve minimal treatment time as it has the ability to deliver 1800 MU/minute (1800 cGy/min). Inverse treatment planning optimization method will be adopted to achieve the required coverage to the target at the same time importance is given to the OAR's and the RTOG SRS/SRT dose constraints are used to restrict dose to OAR's during optimization. All possible efforts were made to reduce the integral dose and to increase the dose escalation to achieve the adequate coverage to target volume as per the prescription and to have control over the hot areas inside the target volume.

Another advantage of VMAT is that multiple lesions can be treated simultaneously with a common isocenter, which is not possible in conventional method. Differential prescription also possible and as it uses single arc, the treatment time will be significantly reduced when compared with older techniques.

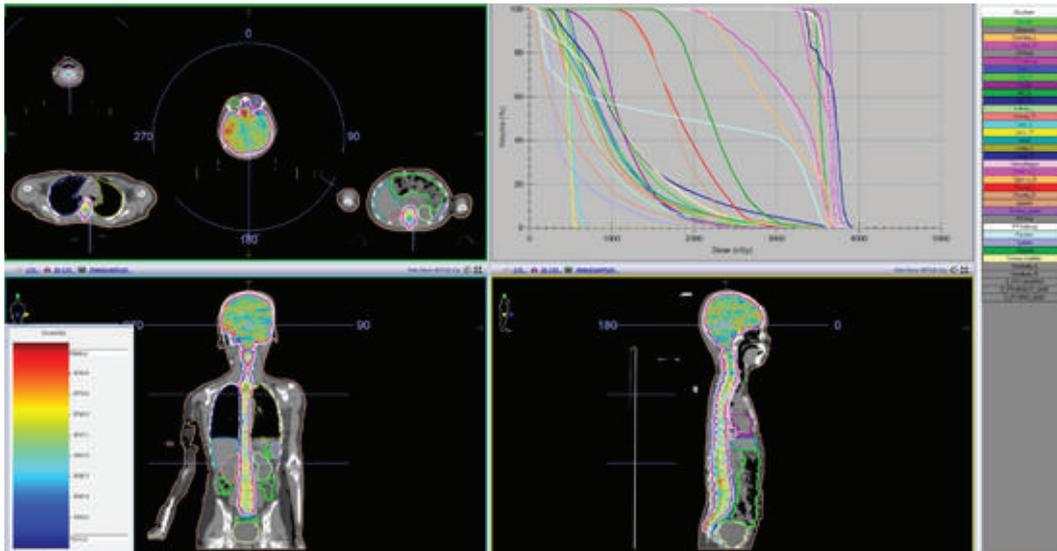


**Figure 1: showing dose distribution and DVH of multiple lesions treated using VMAT technique**

The figure1, shows the 4 lesions treated with SRT in our institution. We used 2 full arcs (360 degree) in Clockwise (CW) and counterclockwise (CCW) directions with 6MV FFF mode. The patient had 2 lesions one in the left parietal lobe of 1.5 and 1.1 cm diameter, one in right parietal lobe of 0.5 cm and the other is in left frontal lobe with 0.3 cm diameter. The total dose delivered was 24Gy in single fraction.

### **Craniospinal irradiation with VMAT:**

Craniospinal irradiation (CSI) is an essential component for the treatment of primary intracranial tumors with a risk of leptomeningeal spread. However, CSI is technically challenging due to the large and irregular target volume and the radiosensitivity of the spinal cord and other critical structures. Conventional three-dimensional conformal radiotherapy (3DCRT) CSI techniques require matching multiple fields, with different isocenters, to cover the intended target volume. Unfortunately, 3DCRT methods often result in dose inhomogeneity and inaccuracy at the field junction areas. A common solution to minimize the dose inhomogeneity is to use weekly inter-fractional manual shifts of the field junctions [12, 13], but there are several disadvantages to this method. First, the high-dose gradients between the matched fields have the potential to create unintentional high and/or low doses in the spinal cord when even a small setup error is introduced [14]. Second, 3DCRT CSI patients are commonly set up in the prone position to provide direct visualization of the multiple field junctions, but this position is often uncomfortable and can lead to increased patient motion during treatment. Furthermore, the oral cavity and airway are restricted while in the prone position, and the flexed head position is not conducive to immobilization for children requiring anesthesia. Third, inter-fractional manual shifts are complicated, which can exacerbate patient setup errors and lengthen the overall treatment time.

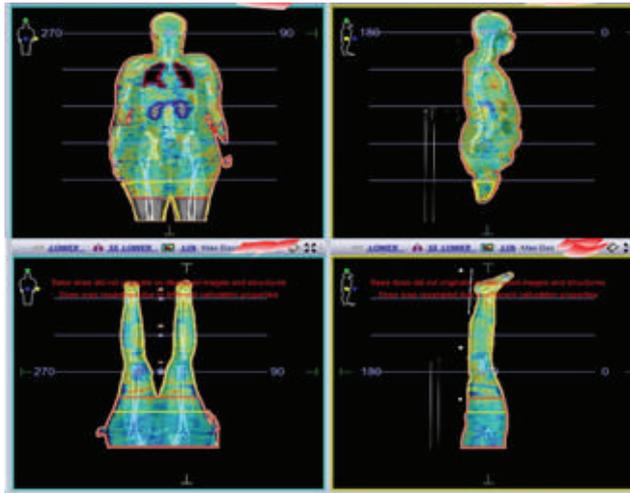


**Figure 2: Showing dose distribution and DVH of a Craniospinal Irradiation (CSI) using VMAT with 3 isocenters**

The use of VMAT techniques for CSI eliminates all the above-mentioned errors as it uses inverse optimization algorithm, field matching will not be an issue and uniform dose can be delivered hassle-free throughout the PTV. In this technique patient is positioned with supine position and 3 to 4 isocenters were used depending upon patient height and age. Full arc will be used for treating brain area (360 degree) and posterior partial arc (30 to 60 degree) will be used in case of dorsal and lumbar spine regions. When position isocenters only longitudinal value can be changed to ease the treatment delivery. Using inverse planning optimization, 95% of dose can be delivered to the PTV by achieving OAR dose limits for all the OAR's. The figure 2, shows the dose distribution of CSI patient treated in our institution with DVH. The prescribed dose was 36Gy in 20 fractions. Three isocenters were used for this patient, each 17 cm apart to cover 61 cm length of PTV. This technique does not require weekly isocenter shift as it had no matching fields. Patient positioning can be achieved with daily cone beam CT before the treatment. The DVH analysis showed 35Gy to 95% of PTV and other OAR's are well within the RTOG stipulated dose limits.

### **Total Body Irradiation with VAMT:**

Total body irradiation is another technique, where they will use large treatment fields and extended SSD's. The disadvantage of this techniques is it requires additional treatment accessories like Beam spoiler, Patient in-vivo dosimetry system, shielding, patient positioning couch etc. But due to the availability of VMAT techniques the same can be delivered with nominal treatment distance and with multiple isocenters with careful treatment planning techniques.



**Figure 3: Showing dose distribution of TBI sparing Lungs, Lens and Kidneys with 8 isocenters using VMAT technique**

This technique starts with making the patient immobilization of the whole patient with a vacuum cushion and steps are taken care for positioning extremities. The CT scan is acquired in 2 parts upper and lower part as shown in figure3, and a generous overlapping of 5 to 15 cm is mandatory matching the doses at the junction and achieve better fusion. The PTV is generated by clipping body 0.3 cm and all other OAR were drawn and Lungs, lens and Kidneys were included in optimization to reduce the dose as per the published data. The treatment plan is generated for the two set of CT series and first part of the plan will be used a base plan for the second part to match in field borders precisely. As we use the VMAT inverse optimization algorithm, it will take into account the junction dose and provide us a smooth matching as shown in figure 3.

### Summary:

VMAT technique is a versatile technology and it helps clinicians and medical physicist to overcome the conventional limits of large field irradiation and high precision radiotherapy treatments. It helps in delivering adequate dose coverage to the target and limiting dose to OAR's with the ease of treatment deliver to radiotherapy technologists. The image guidance gives us the confidence of reproducibility during treatment. With summarized example cases, it can be understand that the with careful selection cases, proper placement of beams with adequate knowledge of the limitation of the MLC system, the VMAT technology can be utilized effectively in our clinics to maximum benefits to cancer patients.

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# Argument and Contention Over the Use of Low-dose Irradiation to COVID-19 Pneumonia: A Review

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## Abstract:

COVID-19 is a disease caused by a single-stranded RNA virus of the *Coronaviridae* family with highly contagious in nature and can cause pneumonia by spreading to the lungs, first reported in December 2019 in Wuhan, Hubei Province, China, and has since spread to other parts of the world. As a result, thousands of lives are being lost in the world every day. On March 11, 2020 the world health organization recognized the disease as a global epidemic which has no certified medicine and vaccine yet. Low-dose of ionizing radiation has the nature to create an anti-inflammatory response against inflammation and has a past history to use the in the treatment of several pneumonias from 1930 to 1948. Following the past conception of treating pneumonia with low-dose of ionizing radiation, some human clinical trials using a single low-dose of radiation to the entire lung has already been completed. Some recent publications have also raised concerns about the use of low-dose radiation in the treatment of elderly dying patients with COVID-19 pneumonia, since there are also some harmful aspects of radiation in the human body. Our aim of this paper is to review the use of low dose radiation in the treatment of several pneumonias in the past and based on those ideas the arguments and contentions that are currently being made about the use of low level of radiation in treatment of COVID-19 pneumonia and also by analyzing the result and outcomes of recent human Clinical trials, we will express some of our personal ideas and thoughts which could accelerate further research about the use of low-dose radiation to treat COVID-19 pneumonia.

## Introduction:

The discovery of X-rays in 1895 and nuclear radiations in 1896, triggered the application of radiation in medicine that continues to this day. Though high dose of radiation produced a painful burn and some complications in the body but a small dose often resulted in beneficial health effects that were attributed to stimulation of biological protection mechanism. Among The treatment of many important diseases (cancer, arthritis, tendonitis, asthma, carbuncles and boils, sinusitis, inner ear infections, deafness, inflamed adenoids, pertussis, and gas gangrene) which were very successful due to the use of low dose of radiation discovered in early 1900s, pneumonia was one of them. Pneumonia is such an inflammatory condition of the lung that affect primarily the small air sacs known as alveoli and Symptoms typically

include some combination of productive or dry cough, chest pain, fever and difficulty breathing and usually caused by infection with viruses or Bacteria and less commonly by other microorganisms, certain medications or conditions such as autoimmune diseases. About 450 million people globally (7% of the total population) and results in about 4 million deaths that occurred due to pneumonia in each year.

Though Pneumonia has long been a serious risk of mortality, it has a successful treatment history by using low dose of radiation in its treatment. During the first half of the 20th century, X-ray therapy was used to treat pneumonia. Leading to disease resolution, based on clinical symptoms, objective disease biomarkers, and mortality incidence, fifteen studies report that approximately 700 cases of bacterial (lobar and bronchopneumonia), sulfanilamide non-responsive, interstitial, and atypical pneumonia were effectively treated by low doses of X-rays. During the same time period, the capacity of the X-ray treatment to reduce mortality was similar to serum therapy and sulfonamide treatment. Studies with four experimental animal models (i.e., dog, cat, guinea pig and mice) with viral and bacterial pneumonia supported the clinical findings. The X-ray treatment acts upon pneumonia by a mechanism of involving the induction of an anti-inflammatory phenotype that leads to a rapid reversal of clinical symptoms, facilitating disease resolution.

As irradiation with high dose is established to exert pro-inflammatory effects, low-dose radiotherapy (LD-RT) with single fractions below 1.0 Gy and a total dose below 12 Gy is clinically well known to exert anti-inflammatory and analgesic effects on several inflammatory diseases and painful degenerative disorders.

At present, the novel coronavirus diseases 2019 (COVID-19) caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has had a subversive impact, with the number of deaths worldwide by July over 507 thousands. Among all other organs in the human body the lung represents one of the organs most commonly affected by COVID-19.

As there are currently no proven, effective treatments, medicines and certified vaccine the scientists and the doctors desperate to find a solution for the treatment of this diseases. By following the ideas about the historical use of low dose of radiation in the treatment of pneumonia during the past half of 20th century the scientists and doctors are thinking to use low-dose of ionizing radiation in the treatment of COVID-19 pneumonia patient.

By considering the idea of treating pneumonia using low-dose radiation in the past and the anti-inflammatory effect of low-dose radiation against inflammations, scientists and physicists become interested with the use of low-dose radiation to the COVID-19 pneumonia patients which has now become a focal point of discussion. Several human trials have already been successfully completed and many papers have published in favor of using low-dose radiation in the treatment of COVID-19 pneumonia patients, as well as some of the harmful aspects of its use have also been highlighted. Besides, human trials and investigations are going throughout the world.

## Materials:

In the human trial of Clayton B. Hess et al. researcher at Emory University hospital, led by Dr. Mohammad Khan, associate professor of Radiation Oncology treated five COVID-19 patients with several pneumonias visible on chest x-ray, required supplemental oxygen and had clinically declined. The mean age of the patients was 90 years (range: 64-94 years), four were female, four were African- American and one was Caucasian. The delivered dose for these patients was a single low-dose of radiation (1.5 Gy) to both lungs by a front and back beam configuration.

In the publication Ahmed Ameri et al. in their human trial they enrolled five patients (four males and one female) with COVID-19 who were older than 60 years with a positive polymerase chain reaction (PCR) of the nasopharyngeal swab, antibody test, or radiographic pneumonic consolidations that required oxygen supplementation (with  $SpO_2 \leq 93\%$  and/or  $PaO_2/FiO_2 \leq 300$  mmHg) and hospitalized to receive supplementary oxygen for their documented pneumonia. Their treatment protocol was low-dose whole-lung irradiation in conjunction with the standard national guideline for the management of COVID-19. Their radiation therapy planning was done on patients' diagnostic CT scans with patients in a supine position using a multislice spiral CT scanner without intravenous contrast.

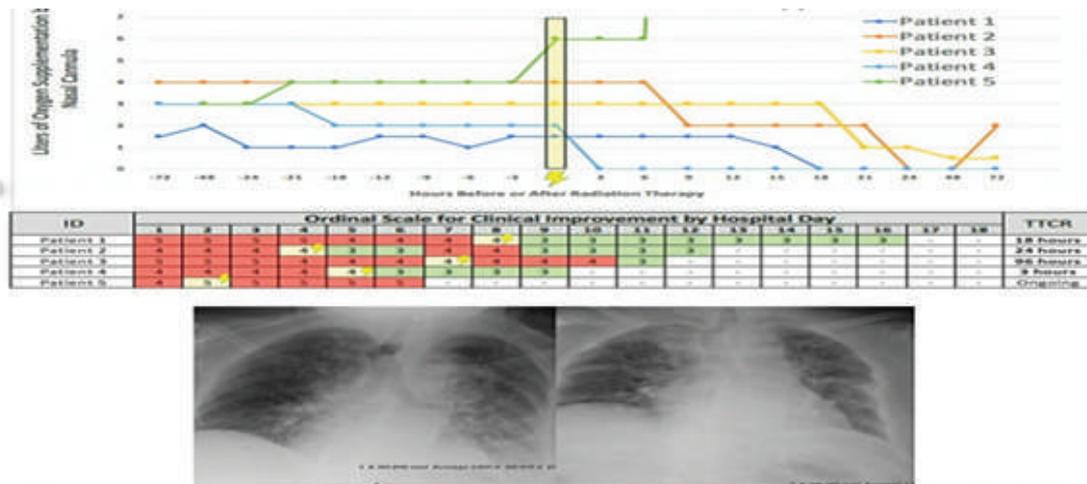
## Method:

In the publication of Clayton B. Hess et al. the treatment protocol approved by the Emory University Institutional Review Board. The patient inclusion criteria were, to be nonpregnant, to be hospitalized with a positive for COVID-19 by PCR, have radiographic pneumonic consolidations, require oxygen supplementation, and be clinically deteriorating (i.e. mentation, oxygenation, dyspnea). In case of exclusion criteria, receipt of any COVID-directed drug therapy within one day before or three days following LD-RT. a single-fraction radiation dose of 1.5 Gy to the bilateral lungs, which was delivered via an anterior-posterior beam configuration. Clinical recovery was defined as the first day a subject was discharged or weaned from supplemental oxygen.

In the article of Ahmed Ameri et al. Covid-19 was confirmed by PCR. The  $SpO_2$  was measured within one hour before the patients' transportation to the RT department (Using Pulse oximeter). To record the  $SpO_2$  at the resting position, the patients were kept on room air for 3 minutes. The  $SpO_2$  was recorded once a day between 8 to 10 a.m. The exclusion criteria were with requiring mechanical ventilation, history of malignancy or heart failure, contraindication for radiotherapy, septic shock or end-organ failure, severe ARDS (with  $PaO_2/FiO_2 \leq 100$  mmHg). The Clinical recovery was defined as the first day a subject was discharged or weaned from supplemental oxygen with  $SpO_2 \geq 93\%$  in room air.

## Results:

In the human trial of Clayton B. Hess et al. LD-RT was delivered on median hospital day 5 (range 2-8). During an observation period of 14 days, 4 patients (80%) clinically recovered, 3 within 24 hours. Mean time to recovery was 1.5 days (35 hours). Mean time to discharge was 12 days for the 4 patients. Median GCS rose from 10 (range 9-15) to 14 (range 13-15) at hour 24 with. No acute skin, GI, cardiac or pulmonary toxicities were noted (Fig.1).



**Fig: Time to clinical Recovery (TTCR) and oxygen saturations 72 hours pre and post Radiation Therapy. (Clayton B. Hess, Zachary S. Buchwald et al. 2020. <https://doi.org/10.1101/2020.06.03.20116988>)**

In the human trial of Ahmed Ameri et al. (Table:1) the median Karnofsky Performance Score (KPS) and Glasgow Coma Scale (GCS) were 60 (range 50-80) and 15 (range 10-15), respectively. LD-RT was delivered one to three days after the admission. Four (80%) showed initial improvement in their O<sub>2</sub> saturation and body temperature. One patient (patient #3) chose to opt-out of the trial on the third day of irradiation. Due to deteriorate in O<sub>2</sub> saturation and body temperature on the first day of irradiation, patient #4 died on the third day after irradiation. The laboratory findings (IL-6 and CRP) were in line with the clinical findings regarding IL-6.

## Discussion:

For both trials, the age of the patients was over 60 years. Their COVID-19 test was confirmed by PCR for both trails. In the first trial 4 participants were female and one was male and four were male and one was female in case of the second trail. LD-RT was delivered on median hospital day 5 (range 2-8) and to three days after the admission day (median 2 days) for the first and second trail respectively. The delivered radiation doses were 1.5 Gy and 0.5 Gy for the first and second trial respectively. No patients died in the first trial but one patient (patient #4) died in the second trial on the third day after irradiation. In the first trial, during an observation period of 14 days, 4 patients (80%) clinically recovered, 3 within 24 hours and in the second trail, 4 patients 80% clinically recovered within 3-7 days after irradiations. In both cases, no acute skin, GI, cardiac, or pulmonary toxicities were noted. From the 2 clinical trials

Characteristics	patients#1	patients#2	patients#3	patients#4	patients#5
Gender	Male	Male	Male	Female	Male
Age	60	69	82	84	86
comorbidity	HF	HTN, IHD	IHD	HTN	HTN
KPS at admission	80	80	60	50	60
GCS at admission	15	15	10	15	15
Presenting Symptoms	shortness of breath	Fever & cough	Depressed level of Consciousness	Fever & cough	Shortness of Breath and & Cough
<b>Vital Signs at admission</b>					
Pulse Rate (per minute)	75	88	90	82	90
Respiratory Rat(per minute)	12	16	20	12	15
Systolic Blood Pressure(mmHg)	110	130	110	140	120
Temperature (°C)	37.5	38.1	37.6	37	39
O2 saturation (%)	87	86	75	89	74
P/F ratio	192	126.7	160	101.4	110
Between onset of symptoms and RT	1 day	3 days	3 days	2 days	2 days
Diagnosis of COVIS-19	Clinical findings & PCR	Clinical findings & PCR	Clinical findings & PCR	Clinical findings & PCR	Clinical findings & PCR
O2 Supplementation	facial mask	Nasal cannula	Facial mask & Reservoir bag	facial mask	facial mask with bag
Length of stay at hospital after RT	7 days	5 days	3 days	3 days	6 days
Outcome	Discharged	Discharged	opted out from trail	Expired	Discharged

**Table: Patients demographics and Clinical Characteristics**  
(Ahmed Ameri at al. 2020: <https://doi.org/10.1016/j.ijrobp.2020.07.026>)

it has observed that, in both cases patients recovered 80% and within 24 hours they get-rid of having the necessary of ventilation and the second trial able to achieved the same rate of recovery that is 80% by applying 0.5 Gy which is twice less than first trial's applied dose(1.5 Gy).

### Conclusion:

Our world has been experiencing COVID-19 for the first time and it has no certified treatment, medicine and vaccine yet. As this therapy has been proven in the past to be effective against pneumonitis of diverse etiology so, could be used to prevent death of older infected patients. Thus, LDRT radiotherapy may be a cost-effective treatment for this frail patient population whom radiation-induced malignancy is not a concern because of their advanced age. Due to the outbreak of coronavirus, low-income and developing countries in the world are suffering the most. Due to the high incidence of infections, the need for ICUs and ventilators in dying patients is not being met. As a result, the death rate is increasing day by day. From the human trails, the use of low-dose radiation in the treatment of elderly dying patients with Covid-19, it has shown that, patients get-rid of having the necessary of ventilation within 24 hours. Therefore, the use of low-dose radiation in the treatment of elderly patients with Covid-19 is expected to save the lives of dying patients and meet the demand of ventilators in developing and low-income countries around the world. So, it should be better to go for a massive human trial and investigation regarding this issue.

# Designing New Tools for Curing Cardiovascular Diseases to Avoid Angioplasty, Coronary, Bypass & Open Heart Surgery

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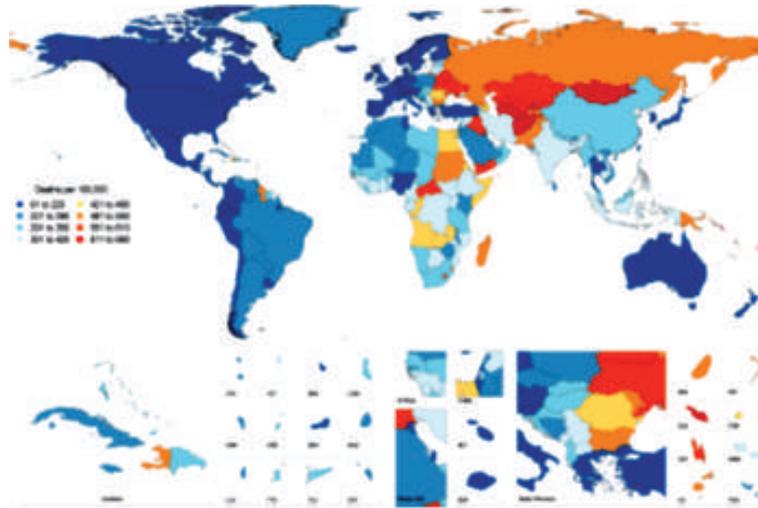
## Abstract:

An estimated 17.9 million people died from CVDs in 2016. Where 75% of CVDs deaths take place in low & middle income country like Bangladesh. In real world perspective cardiovascular surgery (CVS) are very expensive & globally billions of dollar expense behind the CVS each year. 3 out of 4 peoples affected CVDS in Bangladesh & average one death every 38 sec in U.S.A. We developed A New Idea for curing the CVDs via simulation, developing algorithms, designing cost-effective new drugs & stimulus. Focusing the blocked vessels through angiogram & collect ECG data for observing blood flow, mass & heat transfer via simulation of heart & vessels. Putting bio-fluid mechanics Property (Navier-stokes equations of Newtonian flow), BVP model, Hodgkin\_Huxley-1952 mathematical model for Heart simulation & transport phenomena of blood developed two new algorithms to design a primer individually. Show the genetic engineering techniques for how to produce or push the condition on primer. it's big Labyrinth & big challenges to cure CVDS. Traditional CVS are time consuming, Risky & Entirely not effective or accurate especially over seventy years old peoples. I hope Without CVS technique is time saved, cost-effective & more accurate than traditional CVS. It's open a new era for curing CVDs.

## Introduction:

In 2016, there were an estimated 422.7 million cases of CVD (95% uncertainty interval: 415.53 to 427.87 million cases) and 17.92 million CVD deaths (95% uncertainty interval: 17.59 to 18.28 million CVD deaths). Declines in the age-standardized CVD death rate occurred between 1990 and 2015 in all high-income and some middle-income countries-global survey.

Purpose of this project is to develop a new approach for to cure major cardiovascular diseases (only for angina, arteriosclerosis, coronary atheroma as well as myocardial infraction, Bradycardia & heart failure) to avoiding angioplasty, coronary bypass & open heart surgery. Designing two stimulus (hormone) using genetic engineering techniques (Based on developing algorithms for primer) & discovering cholesterol decaying drug based on computational drug design techniques.



**Fig 1: Global Map, Age-Standardized Death Rate of CVD in 2016**

### Background:

Coupled fluid structure interaction model was used to demonstrate how blood flowed through a stenosis artery and deformed the plaque. The shape of the plaque was governed by a sinusoidal function:

$$y_1 = \frac{D-A}{2} \cdot (1 + \cos x) \text{ and } y_2 = \frac{D-A}{2} \cdot (1 + \cos x) - d,$$

The flow was assumed to be laminar, Newtonian, viscous, and incompressible. The incompressible Navier Stokes equations in Arbitrary Lagrangian-Eulerian formulation were used as the governing equations:

$$\rho \frac{\partial u}{\partial t} \nabla[(-p)I + \eta(\nabla u + (\nabla u)^T)] + \rho(u - \psi) \cdot \nabla u = F \text{ and } -\nabla \cdot u = 0$$

In this case BVP model used in stimulus simulation through ring (blood vessels)

$$\dot{x} = c(y + x - x^2/3 + z)$$

$$y = -\frac{(x - a + by)}{c}$$

Where,

$$1 - 2b/3 < a < 1, \quad 0 < b < 1, \quad b < c^2$$

Simulation of cardiac cell using Hodgkin\_huxley\_1952 mathematical model & applying Basic Hemodynamics property.

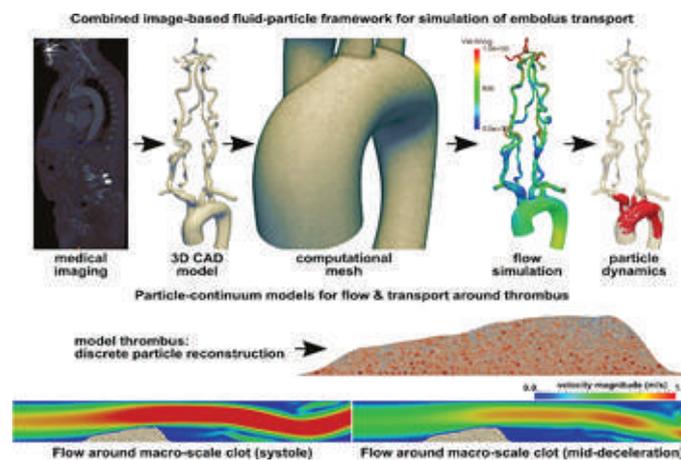
This method are applying for only computer based simulation by using Simvascular & physiodesigner simulation software.

## Requirements:

This Study is based on fully computational method. There are no hardware requires. There are some High Configuration Software are used for simulation such as Physio-designer--physiological system Simulation, Sim-vascular – vascular Simulation, BIO-RENDER- Biological Template design & MATLAB for Algorithm Designing.

## Prototype Construction and Theory: Analysis

This simulation collected from shadden lab (university of California- Berkeley). This study shows that flow simulation, particle dynamics & 3D CAD model of the Arch of Aorta. In that case fibrous thickness Cover 50% area of actual cardiovascular artery area. Blood flow becomes turbulent because of the 50% fibrous thickness, also homeostasis of the blood flow are changes. As Study showed,



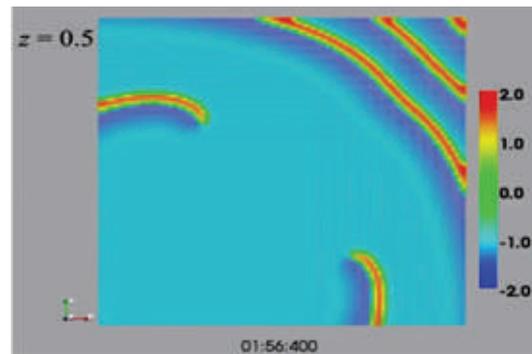
**Fig 2: Simulation of blocked cardiovascular artery**

## Result:

In that case, we simulate the mass & heat flow for both blocked & healthy artery. Note that the value of  $z$  for blocked artery is 0.5. As we see the figure in blocked artery, the mass & heat flow are does not entirely spread at particular time.

## Blocked

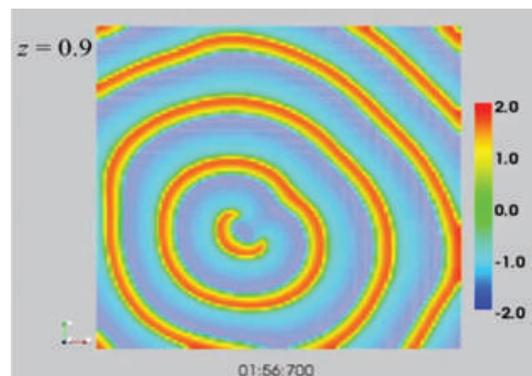
In contrast, in case of healthy artery the phenomenon is totally reverse. Mass & heat flow are entirely spread in artery at particular time. Note that, in this case the value of  $z$  is 0.9. As we see like this figure



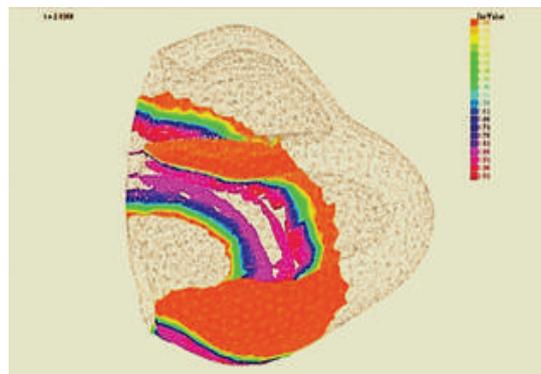
**Fig 3: Mass & heat transfer simulation (flow) in Blocked Cardiovascular artery**

### Healthy

then we simulation the heart for blocked artery & we see the heat & mass flow are does not managed full area of the heart chamber, that's mean blood flow does not cover full area of the heart chambers. As we see like this Figure,

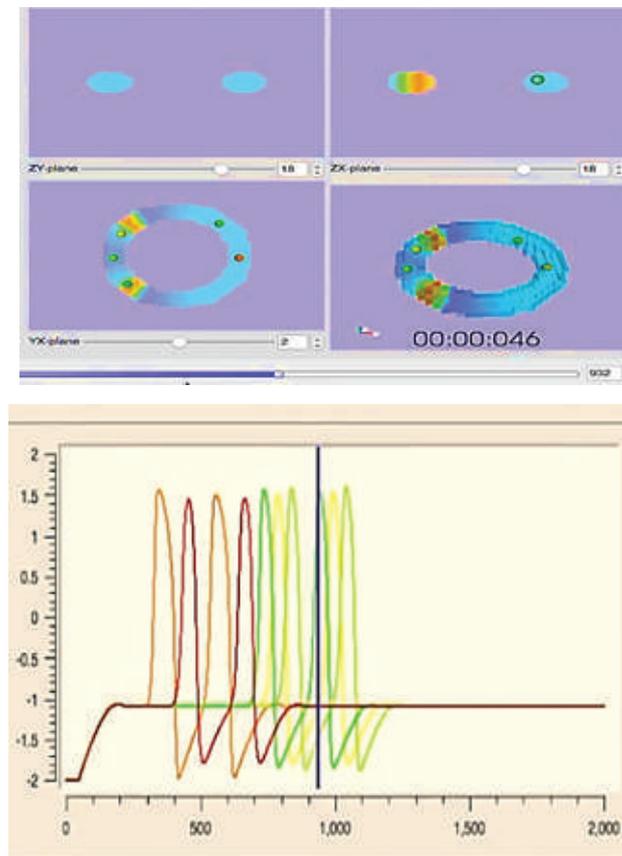


**Fig 4: Mass & Heat transfer Simulation (flow) in Healthy Cardiovascular artery**



**Fig 5: Blood Flow Simulation in Patient Heart due to Blocked Artery (Both Mass & Heat)**

If we pushing the stimulus in Patient then the resultant simulation shows that like this figure, the velocity



**Fig 6: For Primary Stimulus**

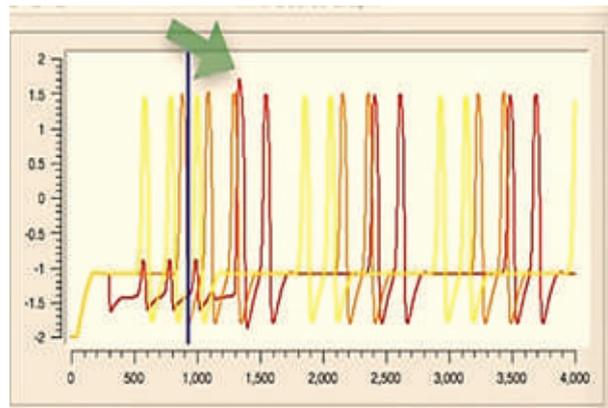
Simulation showed that how action potentials are rapidly increased at particular time as we defined in algorithm. That's mean this stimulus increase the blood flow velocity.

If greater action potential amplitudes & large numbers of action potential, this stimulus increased the blood velocity. This Phenomenon occurs at when fibrous thickness is greater such 80-85%. This stimulus is known is secondary stimulus. This stimulus pushed when fibrous thickness is greater. As we see the figure it Generate greater amplitude & large number of action potentials. That's mean it increased the greater blood velocity than primary stimulus. It working within 24 hours or 86,400 second.

### **Materials and Methods:**

In there we developed three different techniques for curing major cardiovascular diseases without any major cardiovascular surgery. There are the techniques listed below,

There are we developed two new algorithms, one is increased blood flow velocity from normal states & other is decaying cholesterol from blocked vessels.



**Fig 7: For secondary stimulus**

### **For rising blood flow velocity (primary stimulus):**

Step\_1: define the Aorta, capillaries, heart rate, time etc.

Step\_2: Set stimulus across through heart 0.7s per heart cycle

Step\_3: set heart beat 85 times/min & 123429 times pumping within 86400s or 24 hours

Step\_4: set blood flow velocity through "Aorta = 33 cm/s" & through "capillaries = 0.027 cm/s".

Step\_5: set for 50% plaque heart rate 1.1s / heart cycle.

Step\_6: set for 50% plaque heart beat 55 times/min & 78545 pumping within 86400s or 24 hours.

Step\_7: set for 50% plaque blood flow velocity through "Aorta= 20 cm/s" & through "capillaries = 0.015 cm/s".

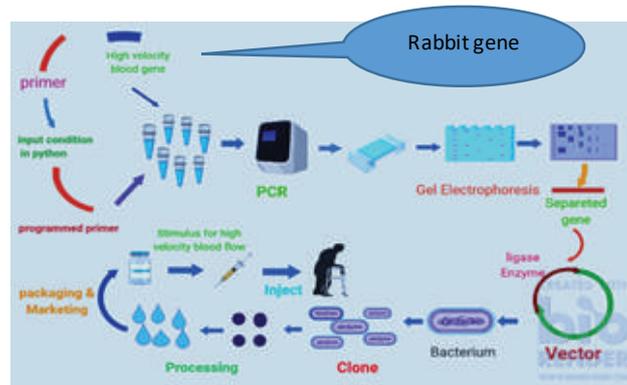
Step\_8: run the loop's for increasing flow velocity, time= 1.1s – 0.7s = 0.4s, Aorta= 33-20 = 13 cm/s, capillaries = 0.027 – 0.015 = 0.012 cm/s

Step\_9: "0.4s= 13 && 0.012, ++" (Aorta && capillaries) cm/s this loop is return after 0.4s interval for 216000 times repeats in 86400s or 24 hours.

Step\_10: "heart beat= 55 + 30, heart beat 30++" (for every 0.4s), "216000 times running loops in 86400s".

Step\_11: 24 hours or 86400s after the Loops were stopped.

This Algorithm is implement on the bio-nano chips for the designing primer. This chips attached with primer & conduct the stimulus in blood. Study showed that, Rabbit contains high velocity blood gene. Then hybridized the rabbit gene with programmed primer. Then making stimulus by using traditional genetic engineering techniques.



**Fig 8: producing methods of new stimulus for high velocity blood flow (Algorithm I)**

### Algorithms for decaying cholesterol:

Step\_1: define chol\_dec\_molec = chemical substances & car\_wall = intima, detached = function

Step\_2: set chol\_dec\_molec\_paas\_diam = < 2.05 mm - < 3.75 mm

Step\_3: Set general carotid lumen diameter = 6.15 mm

Step\_4: set stimulus across through heart 0.7s per heart cycle

Step\_5: set heart beat 85 times/min & 123429 times pumping within 86400s or 24 hours

Step\_6: set blood flow velocity through "Aorta = 33 cm/s" & through "capillaries = 0.027 cm/s".

Step\_7: set carotid\_lumen\_diameter value for 50% stenosis.

Step\_8: set fibrous cape thickness = 2 mm for 50% stenosis.

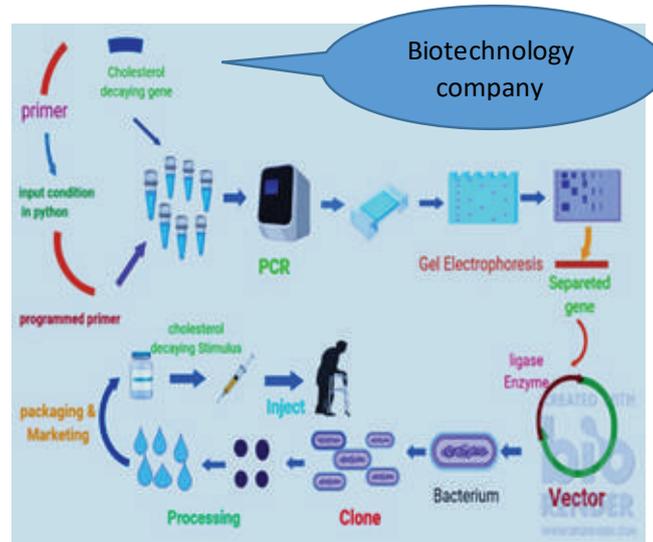
Step\_9: if carotid lumen diameter at 50% stenosis <= half of the general carotid diameter (3.75 mm) or fibrous cap thickness <= one third of the general carotid lumen diameter (2.05 mm) == chol\_dec\_molec\_paas\_diam then chol\_dec\_molec attach to the car wall.

Step\_10: attached to car\_wall "chol\_dec\_molec = 172800s or 48 hours".

Step\_11: detached after 172800+1 = chol\_dec\_molec.

Similarly, this algorithm implement on a Bio-Nano-chips as described earlier. The process of making stimulus are same as previous method. But cholesterol decaying gene are not identified yet as my knowledge. Cholesterol decaying molecules mechanism process is different.

This molecule Operate when carotid lumen diameter less than 3.75 mm then this molecule Bind in most inner layer of the blood vessel (intima). After the binding this molecule started decay the cholesterol from intima of the blood vessels.



**Fig 9: Producing methods of cholesterol decaying stimulus**

N.B: condition, statement & input-output value will be changed for secondary stimulus & different types of stenosis (say 70%, 80% etc.) also lumen diameter can be changed. In this case it's developed for 50% stenosis. Appropriate command & condition will apply by the professional programmer.

Drug discovery & development are broad area in pharmaceutical industry. In that case, we showed the Computational method of the drug discovery & development. We use a lot of software for computational calculation, drawing drug molecules, analyzing protein sequences & molecular docking between 1192 & cholesterol decaying molecule.

Molecular docking is important phenomena in drug discovery. When A specific ligand appropriately Bind with desired protein molecule than this Phenomena is called molecular docking. Then we Occurs auto-dock & pharmacophores between these Molecules.

Then we occur patch-dock & fire-dock between this Molecules which is both online based. After the docking online we occur molecular dynamic simulation on YASARA. Molecular dynamic simulation takes 24 to 72hours for completing. After the computational processing it takes on industrial processing. Completing the whole process of the drug discovery takes approximately 10 to 12 years & about 2.6 billion dollars.

## Remarks & Discussion

1. cardiovascular disease alone kills 2.56 lakh people in Bangladesh (WHO 2018)
2. Angioplasty, Coronary artery bypass (CAB) surgery, open heart surgery is very expensive specially for middle or low income country like Bangladesh, more risky, time consuming & Entirely not effective or accurate specially over seventy years old peoples.

3. Cost for discovering a new drug approximately \$2.6 billion in more than ten years. But only in BD perspective normal CAB surgery is 3 lakhs taka & angioplasty (coronary & carotid jointly) cost is 2 lakhs taka. In worldwide billions of dollar expense behind this surgery every years.
4. This approaches are coast effective than traditional CVS & this approaches not injure the body & will be helpful for over
5. This approach is most effective for low or middle income country peoples specially for Bangladesh.

### Conclusion:

3 out of 4 peoples affected CVDS in Bangladesh & average one death every 38 sec in U.S.A. major cardiovascular diseases occurs in Bangladeshi peoples due to high blood pressure in most of the times. So controlling the blood pressure by using stimulus idea. Published new drugs accuracy is approximately 71–85%. This ideas one of the main cons is complete processing takes more than fifteen years. But this Ideas can be cure mentioned CVDs without taking risky CVS & injuring body I hope that.

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## Continuous Professional Development (CPD)

### Clinical Fellowship in National Cancer Center – Japan: December 2019

K. M Masud Rana

K. M. Masud Rana, General Member of BMPs was invited in National Cancer Center Japan (NCCJ) as a clinical fellowship trainee for the duration of two weeks (December 1st to 14th, 2019). In a regular interval every year NCCJ used to select applicant for this type clinical fellowship .

National Cancer Center Japan (NCCJ) was established by the Japan Ministry of Health and Welfare in 1962, commissioned to lead the nation's cancer treatment, prevention, control programmes, research and education with a workforce over 3.500, including 600 physicians and 1.200 nurses. The Center provides comprehensive clinical services to patients at its two hospitals with 1.000 beds.



**Photo: Orientation about Cyber Knife by  
Chief Medical Physicist of NCCJ**



**Photo: Doing Hands-on Dosimetry for  
the Cyber Knife Machine**

Topics of this training were advanced & high precision radiotherapy treatment techniques (IMRT, VMAT, SBRT, SRT & SRS) & treatment delivery, treatment planning and its practical implementation, treatment verification, quality assurance, facility visit.

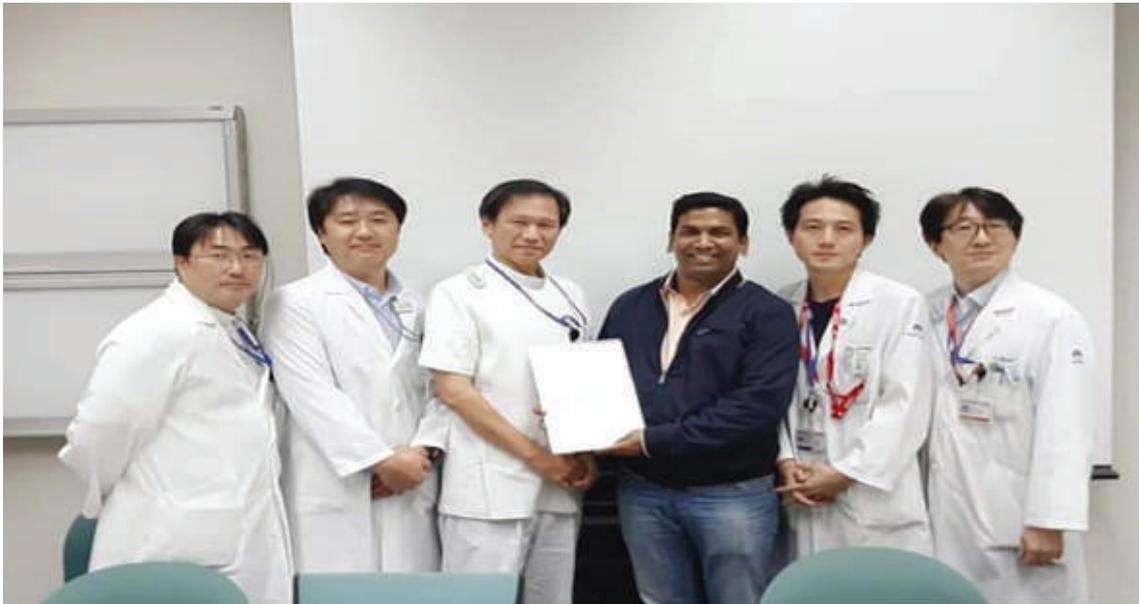
K. M. Masud Rana, presently working at Evercare Hospital Dhaka as a Medical Physicist cum RCO in a Radiation Oncology Department.



**Photo: Attended day long Workshop on Proton Therapy Treatment**



**Photo: Attended day long Workshop on Tomotherapy Treatment**



**Photo: Receiving Completion Certificate from Dean of National Cancer Center-Japan**

## Internship Program: Narayana Superspeciality Hospital, Kolkata, India

Sadia Afrin Sarah

BMPS Treasurer, Sadia Afrin Sarah, participated five (5) months Internship program at Narayana Super-Speciality Hospital, Howrah, Kolkata from 13<sup>th</sup> November 2019 to 7<sup>th</sup> April 2020. The internship is made up in the basis of the cooperation agreement between Narayana Super-Speciality Hospital, Howrah, Kolkata and Department of Medical Physics and Bio-medical Engineering (MPBME), GonoBishwabidyalay, Dhaka, Bangladesh.

NH Narayana Super-speciality Hospital (formerly known as West Bank Health and wellness institute) is a hospital in Howrah, West Bengal. It's a sister concern of the Narayana Health group, headed by renowned cardiac surgeon Dr. Devi Prasad Shetty in the year 2014.



***Photo: Working in Narayana Superspeciality Hospital***

The Radiotherapy Department of Narayana Super-Speciality Hospital, Howrah, Kolkata was well equipped with 3DCRT, IMRT, VMAT, Stereotactic radiotherapy, Linac based Radiosurgery, Stereotactic Body radiotherapy for External Beam and Brachytherapy machine using Ir-192 radioactive source. She has got opportunity to learn and acquire data on Stereotactic Body radiotherapy (SBRT) for research. The Internship program was very fruitful to gathering update knowledge of clinical orientation in a radiotherapy department.

## Achievement of “Master of Science in Radiological Science” degree from the Graduate School of Human Health Sciences, Tokyo Metropolitan University, Japan

Puspen Chakraborty

Being a BSc degree holder from the Department of Medical Physics and Biomedical Engineering (MPBME), Gono University, I got an opportunity of scholarship from the Graduate School of Human Health Sciences at Tokyo Metropolitan University (TMU) in Japan for post-graduation in Medical Physics funded by Asian Human Resource Development Project for Medical Professionals

TMU is well-equipped with modern laboratory facilities for Medical Physics relevant study and research. My thesis was on “A study on estimation of photon energy spectrum emitted from electron linear accelerators”, Varian Clinac 21EX under supervision Professor Hidetoshi Saitoh, Ph.D.

I have got also an opportunity to observe acceptance testing and commissioning of the Versa HD was installed in March 2019 during my study period.

Moreover, the scholarship provided an excellent opportunity to become familiar with distinct, fascinating and unique culture of Japan, explore new places and also to learn the Japanese language. Learning Japanese is a very important thing not only to study in Japan but also to communicate and understand the culture in a better way.

In addition, during this time, I have received the “Student abstract awards” in ECR (European Congress of Radiology) 2020 with the abstract entitled “A simplified method to estimate the energy spectrum for megavoltage photon beams by monenergetic depth dose library.”

## Pioneer QMP in Nepal: Experience of IMPCB Examination

Suresh Poudel

I would share my experience on the journey of IMPCB certification examination to be a certified Radiation Oncology Medical Physicist. I initiated my examination process by communicating with IMPCB officials via email and thereafter providing the IMPCB authority necessary documents as their requirements to submit my candidacy. It was very interesting to appear as examinee in different countries and also passes in a first chance.

**PART I Exam , Dhaka, 2018**

I took the first part of IMPCB exam (written) in March 2018, in Dhaka, Bangladesh immediately after ICMPROI-2018. I thank the organizers, particularly, Prof. Dr. Hasin Anupama Azhari and Prof. Dr. Golam Abu Zakaria for their tireless efforts to bring the IMPCB exam center in South Asia . It brought a great opportunity for me and others candidates from South Asia to appear the exam. Me along with three other Nepalese physicists appeared and passed the first part of IMPCB examination then. The first part exam covered basic aspects of medical physics. All the nepalesse student appeared in IMPCB were the student of Gono University.

**PART 2 Exam, ICTP, Trieste, Italy, 2018**

I appeared second part of the exam (written), which concentrates on chosen speciality by candidate, which in my case was Radiation Oncology Physics, on December 2018, at International Center for Theoretical Physics (ICTP) in Trieste, Italy. It was a long journey from Mannheim, Germany where I was staying for my PhD practical trainings then. I successfully completed the second part then. It was very challenging for me to travel overnight across four European countries to attend the exam but everything went well and brought success for me.

**Oral Exam, Doha Qatar, 2019**

Again in October 2019, I travelled to Hamad Medical Corporation, Doha, Qatar, to attend the third part of the certification exam. It was a viva exam and was very interesting which covered wide range of clinical knowledge in aspects of Radiation oncology Physics. A workshop was conducted at HMC before the exam, which I attended and had the opportunity to learn many things.

Today I feel proud to be IMPCB certified Radiation Oncology Medical Physicist working in Nepal. The certification has made me more confident in my work, and I feel honored to be first IMPCB certified physicist in the country. My success in the exam has brought interest among other physicists to appear the certification exam in coming days. I would like to convey the message to all medical physicists working in countries to appear IMPCB exam for their professional development.

Finally I would like to thank IMPCB and its officials, specially Prof. Dr. Colin Orton, Prof. Dr. Raymond Wu, Prof. Dr. Tomas Korn and Prof. Dr. Golam Abu Zakaria for their tireless efforts to make IMPCB examination wide, popular and prestigious among medical physicists and hospitals around the world.

## Internship Program through German Academic Exchange Service (DAAD) Scholarship: University Medical Centre Mannheim (UMM)

Md. Jobairul Islam

Department of Medical Physics & Biomedical Engineering Gono Bishwabidyalay (University), Dhaka, Bangladesh

This is a comprehensive experience about the five (5) months internship program at the Department of Radiation Oncology of the University Medical Center Mannheim, Heidelberg University, Germany from 1<sup>st</sup> August 2019 to 31<sup>st</sup> December 2019 which was covered by a scholarship of German Academic Exchange Service (DAAD), Germany. It was a great chance for learning and professional development.

During this internship period I worked on 3D printing in radiotherapy, quality assurance program in radiotherapy.



*Photo: Designed and printed End term applicator using 3D printer*

### Preparing Idealized 3D Printed Electron Applicator and Introduction to the 3D Printer

I made a 3D printed end term applicator for electron beam radiotherapy using 3D printer and SolidWorks Software. The purpose of this work was to demonstrate that an inexpensive 3D printer can be used to manufacture end term electron applicator for electron beam therapy and verify the validity of the 3D printed electron applicator.

Usually in square field sizes ranging from  $5 \times 5 \text{ cm}^2$  to  $25 \times 25 \text{ cm}^2$  applicator is using in treatment. However, it's difficult to treat using this type of field in critical patient positions such as canthus, nose, etc. using existing applicator. In order to solve this problem, the idea of a 3D printed end term applicator is introduced. By efficiently using this 3D printed end term applicator for different anatomically small lesion and the patient-specific lesion can be treated. After modeling the end term applicator in SolidWorks, the model printed and measurement the dose. In this work it has been seen that lower Electron Energies the measured absorbers

worked well for 3D printed applicator. This is the classic energy spectrum for surface treatments for skin cancer.

In the meantime, I also joined some daily, weekly, monthly, quarterly, half-early quality assurance program for developed my professional activities.



**Photo: Attending a QA session in the Universitätsklinikum Mannheim**

That was a wonderful experience and I learned a lot about QA from the session. PhD student Ms. Lena Merten, Mr. Luis Probst, Mr. Marvin Willam assisted me in this QA program. They were very helpful throughout the session and they explained all the ins and out of the QA of LINAC.

Also, I got several opportunities to attend the 16th annual joint workshop on Digitalization in Radiation Oncology between the University Medical Center Mannheim (UMM) and Harvard Global Health Catalyst (GHC) was held on September 6, 2019, in Mannheim, Germany. In this workshop, more than 100 participants from different countries were participated and exchange their knowledge, experience, and buildup a network. Organizing Committee invited me to participate this workshop. The workshop was well organized, and the participants were learned a lot from the workshop.

University Medical Centre Mannheim (UMM) arranged a seminar on working group of medical physics in developing countries on 17<sup>th</sup> to the 22<sup>nd</sup> September 2019 at Radiation Oncology Department, UMM.



**Photo: Participants of the workshop and BME**

In this seminar, they discussed the role of medical physics education and ways of development skilled manpower in South Asia.

On behalf of the South Asian expertise personnel Prof. Dr. Qazi Mushtaq Hussain (BD), Dr. Md Anwarul Islam (BD), Prof. Arun Chougule (IN), Dr. Mansoor Naqvi (PK), and Dr. J. Jeyasugithan (LK) participated this seminar. On behalf of DAAD Collaboration, Prof. Dr. Golam Abu Zakria, and Dipl. Ing. Volker Steil joined this program.

In addition to that, a visit to the Imaging department, Fraunhofer institute and Heidelberg University have been conducted throughout the internship.



*Photo: South Asian Experts in UMM*

### **Conclusion**

The training was very potential and I have learned a lot from the training. I have learned QA, QC, 3D printing, Vessel segmentation, Image processing, etc. Germany is such a country that is ideal to be followed in order to achieve improvements and innovation. They are one of the most developed countries in the world with the highest standard. I hope this cooperation between Gono University and DAAD will continue long run to develop the Medical Physics Education System in Bangladesh.

### **Acknowledgement**

I expressed my deepest thanks to Prof. Dr. Golam Abu Zakaria for taking part in useful decision and given necessary advice and guidance and arranged all facilities to make the training easier. He has been a great academic supervisor and he has been working for Medical Physics in Bangladesh for a very long time.

I am deeply indebted to my respected teacher Prof. Dr. Hasin Anupama Azhari, Head, Department of Medical Physics and Biomedical Engineering, Gono Bihwabidyalay (University) for making my visit possible by doing all the administrative processing.

Finally, my heartiest thanks to Dipl. Ing. Volker Steil, who supervised my entire training in University Medical Center Mannheim and arranged all the additional visits to different institutes and departments. Without his great cooperation I could not have done the work. I choose this moment to acknowledgement his contribution gratefully.

## List of Publications of BMPS Members, 2019-2020

### **Starting Stereotactic Radiosurgery Facility in Bangladesh at Evercare Super Specialty Hospital: An Initial Experience.**

Narendra Kumar, Murugan Appasamy, Taohida Yasmin, K. M. Masud Rana..et.al. Asian Journal of Oncology, ISSN 2454-6798, 2020.

### **Refractory Trigeminal Neuralgia: Successful Treatment with LINAC Based Stereotactic Radiosurgery (SRS): First Case in Bangladesh.**

Taohida Yasmin , Narendra Kumar, Sandip K Das , Murugan Appasamy , K M Masud Rana , Porama Zafreen , R. Arun Kumar , Sania Ahsan.  
Bangladesh Journal of Neurosurgery, Vol. 10, No. 1, July 2020.

### **Dosimetric Verification of reference AKR for HRD after-loading units with Ir-192 and Co-60 photon sources: Comparison of different international protocols.**

Islam M J, Sarah S A, Azhari Hasin Anupama, Zakaria Golam Abu ..et al. Japanese Journal of Medical Physics, Vol. 40 Supplement No. 1, Page No. 163 (Excellent Paper Presentation of JSMP 2019) April 2019.

### **Stereotactic Body Radiotherapy for Localized Peripheral Lung Tumor with Deep Inspiration Breath Hold Technique.**

Md. Mahabub Alam, Azhari Hasin Anupama, Zakaria Golam Abu ...et al. Japanese Journal of Medical Physics, Vol. 40 Supplement No. 1, Page No. 97 (Excellent Paper Presentation of JSMP 2019) April 2019.

### **A Hybrid IMRT Technique for Treatment of Breast Cancer: A dosimetric Study**

Md. Mokhlesur Rahman, Md. Hafizur Rahman, Azhari Hasin Anupama, Zakaria Golam Abu ...et al. International Journal of Scientific and Engineering Research (IJSER), accepted on 25 June 2020, ISSN 2229-5518, visit us at: [www.ijser.org](http://www.ijser.org)

### **Acceptance Testing of HDR Co-60 Brachytherapy Unit**

Md. Atiquzzaman Md. Mokhlesur Rahman, Azhari Hasin Anupama, Zakaria Golam Abu ...et. al: Bangladesh Journal of Physics ,25,41-54. (June 2019).

### **Acceptance Testing of a Varian Linear Accelerator for Electron and Photon Beams**

Md. RustamAlli, Md. Mokhlesur Rahman, Azhari Hasin Anupama, Zakaria Golam Abu,....et al: Bangladesh Journal of Physics ,25,41-54. (June 2019).

### **Verification of Treatment Time in Interstitial Brachytherapy Using Paris System**

Md. Sujan Mahamud, Azhari Hasin Anupama, Zakaria Golam Abu,....et al: Japanese Journal of Medical Physics, Vol 39 Supplement No. 1 April 2019.

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## Celebration of IDMP - 2019

The Bangladesh Medical Physics Society (BMPS) was founded in 2009 to serve the purposes of medical physicists in Bangladesh. The purpose of this society is to foster and coordinate the activities of country medical physicists, promote scientific activities and to build a relationship with the national and international organizations. Currently, BMPS has about 360 national and international members who are working actively to improve the standard of medical physicists.



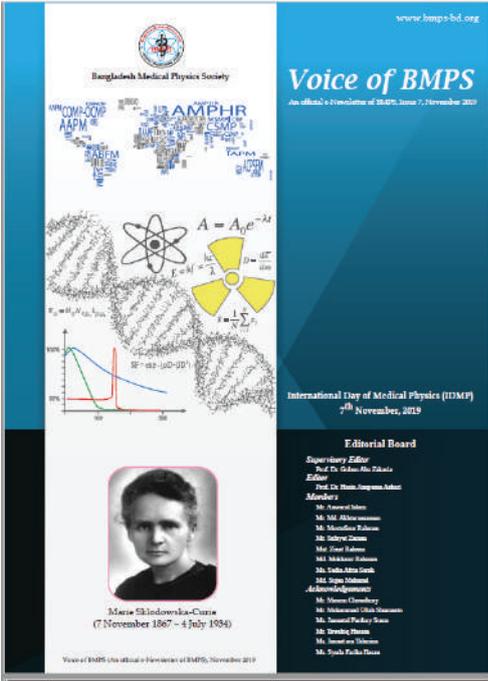
Regularly BMPS issue Voice of BMPS , Newsletter on the occasion of IDMP 2019 since 2013.

BMPS Newsletter Issue 2019 is inaugurated in a seminar on IDMP.

BMPS EC Members, Teachers, students, BMPS former president and other members were presented there. The Present Members and former President presented their speech and highlighted the importance of medical physics.



To raise awareness about the role medical physicist's play for benefit of patients, the Bangladesh Medical Physics Society (BMPS) organized the International Day of Medical Physics (IDMP) on November 7, 2019 in the different hospitals and also at the Department of Medical Physics and Biomedical Engineering (MPBME), Gono Bishwabdayalay (University). The theme of IDMP 2019 was 'It's a Medical Physics World.'



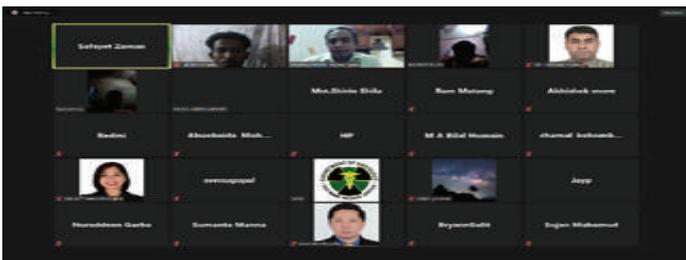
Voice of BMPS

## A Series of Webinar Programs: BMPS June 2020

Each national, international Organization is trying to continue their activities virtually in COVID pandemic. In the recent COVID-19 incidences Bangladesh Medical Physics Society (BMPS) is regularly organizing monthly Webinar program following the International Medical Physics Week (IMPW) celebration for medical physicists in collaboration with several national and international experts. More than 100 participants attended in every program from overseas. The first monthly webinar program started from month of June 2020.



The recordings of these webinars have been posted on BMPS YouTube Channel. Participants praised these webinar programs for knowledge dissemination.



## Celebration of BMPS: IMPW 2020

International Organization for Medical Physics (IOMP) launched the International Medical Physics Week (IMPW) during 11 – 15 May 2020 with the objective to motivate organizational activities in this week that result in the promotion of medical physics globally. The Bangladesh Medical Physics Society (BMPS) was also part of this celebration.

Bangladesh Medical Physics Society (BMPS) organized four online Webinars to celebrate IMPW from 13 May to 15 May, 2020 due to the COVID-19 pandemic situation. Each webinar was scheduled for 45 minutes followed by questions and answers for 15 minutes.

The IMPW Webinars program were presided by Mr. Jobairul Islam, Joint Secretary of BMPS, he also welcomed the participants and highlighted the importance of celebrating IMPW. The webinar was started with the inaugural address by President of BMPS. The key note speakers were Mr. Md. Anwarul Islam, Md. Mostafizur Rahman, K M Masud Rana, Dr. Md. Akhtaruzzaman. It's noted that participants joined webinar from all over Bangladesh including India, Nepal, Sri Lanka, Bhutan, Qatar, USA, Australia. More than 300 participants attended in these webinars.

Series of Webinar: BMPS  
On the Occasion of IMPW 11-15 May, 2020

Webinar Topics	Speaker	Moderator	Date & Time
<b>Physical and Biological Approaches of Treatment Plan evaluation</b>	<b>Mr. Md. Anwarul Islam</b> President, BMPS and Coordinator Medical Physicist, Square Oncology & Radiotherapy Centre, Square Hospitals Ltd, Dhaka, Bangladesh.	<b>Mr. Jobairul Islam</b> Joint Secretary of BMPS	<b>13 May 2020 at 8.00 PM</b>
<b>Experience of Radiotherapy Practice during Corona Period</b>	<b>Mr. Md. Mostafizur Rahman</b> Senior Medical Physicist, Dept. of Radiotherapy, Delta Hospital Limited	<b>Mr. Jobairul Islam</b> Joint Secretary of BMPS	<b>14 May 2020 at 9.00 PM</b>
<b>Radiotherapy Workflow and Protection Procedures during the Coronavirus Diseases 2019 (COVID 19 Outbreak Experience of the Hubei Cancer Hospital in Wuhan, China.</b>	<b>Mr. K M Masud Rana</b> Medical Physicist cum RCO, Department of Radiation Oncology, Evercare Hospital Dhaka	<b>Mr. Jobairul Islam</b> Joint Secretary of BMPS	<b>14 May 2020 at 9.45 PM</b>
<b>Artificial Intelligence and Machine Learning in Radiation Oncology: Prospects and Challenges.</b>	<b>Dr. Md. Akhtaruz-zaman</b> General Secretary of BMPS and Head of Medical Physics, Labaid Cancer Hospital, Dhaka Bangladesh)	<b>Mr. Jobairul Islam</b> Joint Secretary of BMPS	<b>15 May 2020 at 8.00 PM</b>

## BMPS Monthly Webinar: June - October 2020

Webinar Topics	Speaker	Moderator	Date & Time
<b>Prostate Brachytherapy- An Overview of HDR Treatment Technique</b>	<b>Abdul Sattar Khalid</b> Medical Physicist, National Center for Cancer Care and Research (NCCR), Doha, Qatar.	<b>Dr. Md. Akhtaruz-zaman,</b> General Secretary of BMPS and Head of Medical Physics, Labaid Cancer Hospital, Dhaka Bangladesh)	<b>19 June 2020</b> 2.30 PM GMT
<b>Recent Trends in Radiation Oncology: Medical Physics Perspective</b>	<b>Dr. Md. Akhtaruz-zaman</b> Head of Medical Physics, Labaid Cancer Hospital, Dhaka Bangladesh)	<b>Mr. Md. Mostafizur Rahman</b> Senior Medical Physicist, Dept. of Radiotherapy, Delta Hospital Limited	<b>7 July 2020</b> 2.30 PM GMT
<b>Patient-Specific Radiation Dose and Risk of CT Examination</b>	<b>Dr. Jeyasingam Jeyasugiththan</b> Senior Lecturer (Medical Physics), Department of Nuclear Sciences, University of Colombo, President, Sri Lanka Medical Physics Society.	<b>Mr. Safayet Zaman,</b> Vice president, BMPS, Medical Physicist, Dhaka Medical College Hospital	<b>30 August 2020</b> 2.30 PM GMT
<b>Beyond DVH – Normal Tissue Complication Models that Incorporate Spatial Radiotherapy Dose Information</b>	<b>Prof. Martin A Ebert</b> Director of Physics Research, Department of Radiation Oncology, Sir Charles Gairdner Hospital, Australia.	<b>Dr. Md. Akhtaruz-zaman,</b> General Secretary of BMPS and Head of Medical Physics, Labaid Cancer Hospital, Dhaka Bangladesh)	<b>29 September 2020</b> 2.30 PM GMT
<b>Radiation Planning Techniques in CA Breast: In view of upcoming challenges</b>	<b>Mr. K M Masud Rana</b> Medical Physicist cum RCO, Department of Radiation Oncology, Evercare Hospital Dhaka	<b>Mr. Jobairul Islam,</b> Joint Secretary of BMPS	<b>30 October 2020</b> 2.30 PM GMT

# IMPW- 2020 Banners at a Glance

**Speakers & Moderator**



Md. Anwarul Islam



K.M Masud Rana



Md. Mostafizur Rahman



Dr. Md. Akhtaruzzaman



Md. Jobairul Islam

**Bangladesh Medical Physics Society (BMPS)**

Launching Monthly WEBINAR PROGRAMS

First Web Meeting Date: 19 June 2020

**Topic:**  
Prostate Brachytherapy- An Overview of HDR Treatment Technique

**Speaker:**  
  
Abdul Sattar Khalid  
MEDICAL PHYSICIST  
NATIONAL CENTER FOR CANCER CARE AND RESEARCH INCORPORATED, DOHA, QATAR

**Moderator:**  
  
Dr. Md. Akhtaruzzaman

**Special Guest:**  
  
Safayet Zaman

**Bangladesh Medical Physics Society (BMPS)**

International Medical Physics Week (IMPW)

11 May-15 May 2020

**WEBINARS PROGRAM**

Web Meeting Date: 13 May- 15 May

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**BMPS Monthly Webinars**

**BMPS Webinar: September**

**Beyond DVH – Normal Tissue Complication Models that Incorporate Spatial Radiotherapy Dose Information**

  
Prof. Martin A. Ebert  
Director of Physics Research, Department of Radiation Oncology, Sir Charles Gardner Hospital, Australia.

**BMPS Webinar: October**

**Radiation Planning Techniques in CA Breast: In view of upcoming challenges**

  
K. M Masud Rana  
Medical Physicist cum RSO, Department of Radiation Oncology, Evercare Hospital Dhaka, Bangladesh.

**BMPS Monthly WEBINAR PROGRAM: September 2020**

**Topic:**  
Beyond DVH – Normal Tissue Complication Models that Incorporate Spatial Radiotherapy Dose Information.

**Speaker:**  
  
Prof. Martin A Ebert  
Director of Physics Research, Department of Radiation Oncology, Sir Charles Gardner Hospital, Australia

**Moderator:**  
  
Dr. Md. Akhtaruzzaman  
Senior Medical Physicist, Larkana Cancer Hospital, Dhaka, Bangladesh

**BMPS Monthly Webinars**

**BMPS Webinar: June**

**Prostate Brachytherapy- An Overview of HDR Treatment Technique**

  
Abdul Sattar Khalid, Medical Physicist, National Center for Cancer Care and Research (NCCR), Doha, Qatar

**BMPS Webinar: July**

**Recent Trends in Radiation Oncology: Medical Physics Perspective**

  
Dr. Md. Akhtaruzzaman, Senior Medical Physicist, Labaid Cancer Hospital, Bangladesh.

**BMPS Webinar: August**

**Patient-Specific Radiation Dose and Risk of CT Examination**

  
Dr. Jayasingam Jayasugithan, Senior Lecturer (Medical Physics), Department of Nuclear Sciences, University of Colombo, Sri Lanka

### Meeting in BAEC February 2020

An official meeting between two different leading organizations of medical physics in Bangladesh Medical Physics Society (BMPS) and Bangladesh Medical Physics Association (BMPA) was held on 10<sup>th</sup> Feb. 2020 in Bangladesh Atomic Energy Commission (BAEC). Meeting was hosted by Prof. Dr. Md. Sanowar Hossain, Chairman, BAEC in honor of Prof. Dr. Salahuddin Ahmad, University of Oklahoma, USA visit in Bangladesh as per request of MP organizations.



Four members on behalf of BMPA and from BMPS Vice President Mr. Safayet Zaman and Mr. Md. Mostafizur Rahman along with General Secretary Dr. Md. Akhtaruzzaman were present in that meeting.



**Photo: Meeting in BAEC**

Also other members of the organizations, medical physicist of the universities and hospitals were attended. All the future trends and development goals about medical physics of Bangladesh were discussed there. Also every member of that meeting shared their thoughts and views about the process of progress to enlarge the medical physics field with proper study guideline and manpower.

### The Sixth International: ICRM February 2020

The sixth International Conference on Radiation Medicine (ICRM 2020) was held in Riyadh, Saudi Arabia from 09-13 February 2020. The event was organized by King Faisal Specialist Hospital & Research Centre (KFSH&RC) in collaboration with International Atomic Energy Agency (IAEA), Al-Faisal University, the Saudi Society of Medical Radiologic Technology (SSMRT) and with leading national and international organizations and professional societies. The goal of the conference was to bring together renowned clinicians, scientists and other health professionals to share and discuss the latest advances and future innovative approaches in the field of radiation in medicine in various aspects of radiation applications in medicine in support of providing state-of-the-art, effective and safe quality healthcare.



The ICRM 2020 prospective audience included radiologists, oncologists, medical physicists, neurosurgeons, cardiologists, clinical scientists, radiological technologists, dentists, nurses, radiochemists, radiation therapists and biomedical engineers.

The scientific program included didactic lectures followed by hands-on workshops in which the latest clinical techniques were discussed and demonstrated to offer the audience the hands-on experience. The conference ended up with more than 1500 attendees from more than 40 countries, 50 international speakers, 60 local speakers with 100 continuing education courses that included 400 sessions, and 80 workshops.

**Mr. Md. Anwarul Islam**, President of Bangladesh Medical Physics Society (BMPS) presented a scientific paper titled “Elekta Synergy 6 MV Accelerator Modeling and Dosimetry with BEAMnrc and DOSXYZnrc Monte Carlo Simulation Code and Validation with Measurement” on the second day of the evening of the conference. He earned 30 CME Hours from Saudi Commission for Health Specialties (SCHM).

## International Conference: ICMP February 2020

Bangladesh Medical Physics Association (BMPA), Bangladesh Atomic Energy Commission (BAEC) and Department of Biomedical Physics and Technology, University of Dhaka jointly arranged International Conference on Physics in Medicine (ICMP-2020) on 6-7 February 2020. Executive Member of Bangladesh Medical Physics Society (BMPS), general member were attended the conference and presented their scientific papers as follows:

Scientific Papers	Author's Name
Radiotherapy Gap Correction Methods for Missed Treatment Days: A Radiobiological Study	Md Khairul Islam, Chowdhury Md. Ibrahim Naser, Md Mahmudul Hasan Manna
Measurement of Correct CT Value: Experimental Comparison of Ultra-High Resolution CT and High Resolution CT by a Handmade Phantom	Chawdhury M, Tsujioka K, Azhari H A, Yamada K, Nakano Y, Zakaria G A
Comparison between CT Images and CT-MRI Fusion Images of Planning Target Volume Delineation in Radiotherapy Treatment Planning for Brain cases	Akhter R, Kausar A, Islam A M, Zakaria G A
Acceptance Testing and Commissioning of Co-60 Teletherapy Machine	Parvin S, Kausar A, Zaman S, Zakaria G A
Implementation of the IAEA-AAPM Code of Practice (TRS-483) for the dosimetry of small static fields used in external beam radiotherapy	M. M. H. Manna, M. A. Islam, G. A. Zakaria
The influence of photon beam quality index variations on tissue inhomogeneity correction factors	Md Akhtaruzzaman, Pawel Kukulowicz
Estimation of Patient Effective Dose from Whole Body 18F-FDG PET/CT Examination in Malignant Cell Screening	Md Khairul Islam, Chowdhury Md. Ibrahim Naser, Md Mahmudul Hasan Manna
Design and Fabrication of Human Bone by using 3D Printer	Soma JF, Amin RA, Azhari HA, Zakaria GA

Scientific Papers	Author's Name
Radiation Emergencies and Preparedness in a Radiation Oncology: Achieving Safe Care in Practice	Rana K. M. Masud, Murugan Apassamy, Narendra Kumar, Bishwajit Bhattacharjee, Taohida Yasmin, R Arun Kumar, Taslima Afrin



Photo: Mr. A. Islam BMPS President, EC Member Mr. S Mia with Dr. Ashim Kumar Ghosh, HOD Department of Radiotherapy & Oncology, RMCH



Photo: BMPS EC Member Presented scientific paper: in ICMP-2020

**Courtesy visit: Chairman BAEC  
January 2020**

Prof. Dr. Md. Sanowar Hossain was congratulated by the new Executive committee of Bangladesh Medical Physics Society (BMPS) on becoming the honorable Chairman of Bangladesh Atomic Energy Commission, Bangladesh. The President, Vice President, Secretary and Executive Members of BMPS have visited him on 21<sup>st</sup> January 2020 and showed their gratitude for all the cooperation he has been providing to BMPS till now.

**Courtesy Visit: RMCH  
February 2020**

**Mr. Md. Anwarul Islam**, President of Bangladesh Medical Physics Society (BMPS), visited the Department of Radiotherapy & Oncology, Rajshahi Medical College Hospital on 2nd February 2020 and meet with the Head of the department **Dr. Ashim Kumar Ghosh** and Medical physicist Md. Shahidul Mia. They discussed about different issues such as treatment facilities, physicist post in government hospital etc. He observed new facilities of the department. He also showed the advanced treatment planning process for both teletherapy and brachytherapy planning to the concerned persons



Photo: BMPS President, EC Member and Chairman, BAEC

Voice of BMPS

## Celebrating MACROMEDICS Day January 2020

A workshop was held on 24<sup>th</sup> January 2020 at Ahsania Mission Cancer&General Hospital (AMCGH), Uttara, Dhaka, Bangladesh. This workshop is organized by Trade House Ltd. This workshop was arranged for trained people about the proper use of Immobilization Devices. Macromedics is an Immobilization Devices supplier company. We gave the name of that day "MACROMEDICS DAY".



**Photo: MACROMEDICS Day Celebration**

In this program there speakers were shared their experiences and their knowledge also. The presenters were Mr. Jaap Drenth & Christa Timmermans Netherland and Mr. Sundararaj from India. Mr. Md. Sajan Hossain, Medical Physicist of Tread House Ltd. was the program coordinator. About 130 participants joined this workshop and they have learn about so many things.



**Photo: Mr. Sundararaj from India and  
Mr. Md. Sajan Hossain, BMPS Member**

## Courtesy visit : BSMMU December 2019

Prof. Dr. Hasin Anupama Azhari and Prof. Dr. Golam Abu Zakaria, Advisory Member of Bangladesh Medical Physics Society (BMPS) visited Bangabandhu Sheikh Mujib Medical University (BSMMU) to meet with Prof. Dr. Kanak Kanti Barua ,Vice Chancellor on 9<sup>th</sup> December, 2019. Prof. Dr. Md. Sarwar Alam Head of the Department, Dr. MD. Zillur Rahman Bhuiyan, Dr. Sadia and some other



Photo: Advisory Members, BMPS, with Honorable VC, BSMMU

also from the Dept. of Oncology were present in this meeting. They have discussed about developing the collaboration between BSMMU, Gono Bishwabidyalay & BMPS. They also discussed about the development of Medical Physics in Bangladesh. After the discussion Advisory members of BMPS was visited the Radiotherapy unit.



Photo: Prof. Zakaria with Medical Physicist Ms Taskin Dilshad, Dept. of Oncology, BSMMU

### Meeting of BMPS Executive Committee November 2019

A new Executive Committee (2019-2021), BMPS is formed for the year of 2019-2021. The first Meeting was held on 22 November, 2019. All the action points are taken in obedience to the decision of every executive member. Due to COVID 19 BMPS Executive Committee are held virtually regularly. The EXCOM are trying hard to execute all the decisions taken in the meeting. In the meeting four committees are formed as per constitution Science Committee, Accreditation Committee, Education and Training committee, Professional development committee.

### Bangladesh Breast Cancer Conference November 2019

Bangladesh Breast Cancer Conference was held on 29 November, 2019 in Pan Pacific Sonargaon, Dhaka. This Conference was organized by **Bangladesh Society for Breast Cancer Study** chaired by Prof. Dr. Qamruzaman Chowdhury. More than 25 speakers from different countries like Australia, Singapore, India, Germany, Poland, Canada, and Bangladesh were given their valuable speech at that conference.

Prof. Golam Abu Zakaria, the Advisory member, BMPS was one of the guests in the inaugural session along with o Health Secretary, Ministry of Health & Family Welfare (MOHFW), Director General, Directorate General of Health Services (DGHS) and Chair of the conference.



Photo: Bangladesh Breast Cancer Conference  
November, 2019

The Medical Physics session of the conference was chaired by Prof. Dr. Md. Ehteshamul Haque & Prof. Dr. Hasin Anupama Azhari, Moderator: Dr. Shafatujjahan. BMPS Member also participated in the session as speaker. The program schedule are as follows:

**29 November 2019, Friday: Surma (Parallel Session), Pan Pacific Sonargaon, Dhaka**

**Prof. Dr. Golam Abu Zakaria**, Invited Speaker  
Radiation Indication and Accidents in Radiotherapy.

**Prof. Dr. Pawel Kukolowicz**, Invited Speaker  
Radiotherapy of breast cancer patients - from preparation to irradiation- medical physicist perspective.

**Dr. Katharina Mair**, Invited Speaker  
Breast Cancer Irradiation-Concepts and Techniques: A Medical Physics Review.

**Dr. Akhtaruzzaman**

Comparison of different radiotherapy planning techniques for left-sided breast cancer after breast conserving surgery.

**K. M. Masud Rana**

Comparison of Different Dose Calculation Algorithms used for the Treatment Planning of Carcinoma of Breast.

**Md. Mokhlesur Rahman**

A Hybrid IMRT Technique for Treatment of Breast Cancer: A Dosimetric Study.

#### Participation in AMPICON-2019, Kolkata

The 40<sup>th</sup> Annual conference of Association of Medical Physicist of India was held from 7th to 9th November 2019 in Netaji Subhas Chandra Bose Cancer Hospital, Kolkata. On the occasion of celebration of 7 November AMPICON had organized a special session on International Day of Medical Physics. Four renowned medical physicists were invited in that session, Dr. Hasin Anupama Azhari, the advisory member BMPS was one of them. Others are Dr. Yakov Pipman, Dr Arun Chougule, Dr. S. D. Sharma, Dr.V. Subramoni.



Photo: Speech of AFOMP Secretary, AMPICON 2019, Kolkata

Her speech was on SCMPCR: A Center of excellence to fight against cancer. The conference provided a platform for sharing developments and future trends in medical physics applied in diagnostic radiology, nuclear medicine, radiation therapy as well as radiation protection and biomedical engineering.

**Participation in Perth, Australia:  
EPSM- AOCMP 2019**

The 19th Asia-Oceania Congress of Medical Physics “AOCMP – 2019” In conjunction with Engineering & Physical Scientists in Medicine Conference EPSM-2019, was held on the 28th -30th October 2019,Perth, Australia.

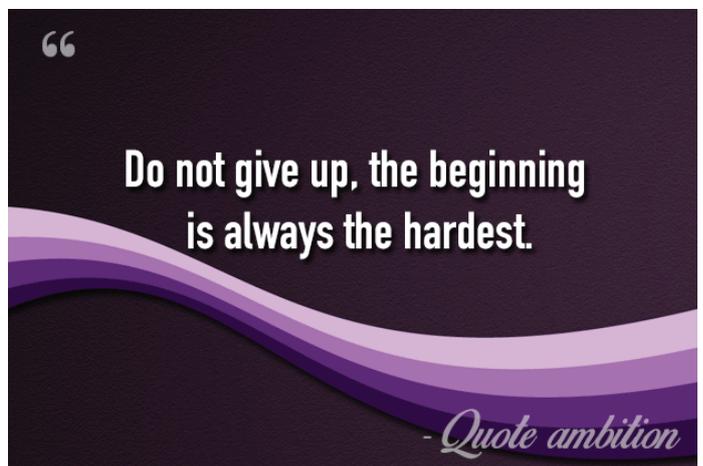
The theme of conference was “Elements and Interactions”. Professor Dr. Hasin Anupama Azhari, secretary of AFOMP along with the AFOMP president Prof. Dr. Arun Chougulae, and Chair of the conference inaugurate the opening ceremony EPSM-AOCMP 2019. She also organized AFOMP council meeting and AFOMP ExCOM meeting during the conference. She acts as a chair in a session Radiotherapy Treatment Planning.



*Photo: Participants with President, Secretary, Treasurer, AFOMP*



*Photo: Inaugural Session, EPSM-AOCMP 2019 ; AFOMP Council Meeting; Participants with President, Secretary, Treasurer , AFOMP*



**A Meeting of BMPS:  
Dr. F. Hensley, Germany, 2019**

Dr. Frank William Hensley, Germany was one of the collaborator partner in Bangladesh for MP education in Gono University. He used to visit several times with Prof. Zakaria in different program , workshops arranged by BMPS as well as in Gono University.



*Photo: Meeting in Bangladsh with BMPS*

In the year 2019 he had visited Bangladesh for a meeting with the BMPS executive committee on 25<sup>th</sup> October 2019 in Square Hospital Ltd. Dr. Hensley basically directed his thoughts about development of medical physics in aspects of Bangladesh. He also discussed raising awareness about the role of medical physicists here.

He has talked about the agreements and collaborations with various countries in South Asia and organizations related to medical physics to ensure developments. Honorable president of BMPS Md. Anwarul Islam, Vice President Mr. Safayet Zaman and General Secretary Md. Akhtaruzzaman was present in that meeting. He also visited Nepal on behalf of Collaboration.



*Photo: Meeting in Nepal*



## Charity Organizations in Bangladesh working for Cancer Treatment

### 1. Alo Bhubon Trust (Alo-BT)

The establishment of the organization Alo Bhubon Trust (Alo-BT) in July 2018 by Prof. Dr Golam Abu Zakaria along with some of his close like-minded majestic persons. Alo Bhubon Trust is a non-profit, charitable and voluntary welfare association with its primary motto "Serving Humanity and Sustainable Development our Vision."

The first and prime project of Alo Bhubon Trust is the establishment of the South Asia Centre for Medical Physics and Cancer Research (SCMPCR). He has the goal to develop for advanced and innovative treatment of cancer patients not only in Bangladesh but also in the South Asia region, considering the urgent need of qualified manpower in these treatment sectors.

The projects of other sectors will be started successively under Alo Bhubon Trust. All the projects will be run by the efficient manpower defined in the organigram for each project. The board of trustee is well experienced and will act as a good advisor to run the Alo Bhubon Trust.

#### Contact Details

- Address: B-66,E/4, Eastern Housing, 2nd Phase, Pallabi, Mirpur, Dhaka-1216, Bangladesh.
- Phone: +880 1711841063
- Email: alobhubon@gmail.com
- Web: www.alobhubon.org



### 2. ASHIC stands for A Shelter for Helpless Ill Children

This is a non-profit organization in Bangladesh, serving children living with cancer. It was started in 1994. ASHIC is the first foundation in Bangladesh that focuses solely on Childhood Cancer. Through our work we have encountered countless families from all socio-economic backgrounds, which helps us identify and modify programs and activities that can have a positive impact on the Survival Rate of cancer affected children. Ever since ASHIC started addressing these issues, survival rate for cancer children in Bangladesh has been on a dramatic uptrend, while overall quality of life for the terminally ill children and their families has

## Contact Details

- House-52, Road-3/A, Dhanmondi R/A, Bangladesh
- Phone: +88 025 861 3594
- Mobile: +880-1552100293
- Email: info@ashic.org
- Web: www.ashic.org



### 3. The Blue Sky Charitable Foundation (BSCF)

This is a non-profit, non-political charitable organization dedicated to providing the most reliable, complete and up to date information's regarding awareness and treatment facilities to cancer patients especially for Breast cancer patients in Bangladesh and its region. The Blue Sky Charitable was formed on 26<sup>th</sup> May 2016 as a charitable foundation. It was registered under the society Registration Act XXI of 1860 and approved as an institution of a public character in Bangladesh since 26th May 2016.

The Blue Sky Charitable Foundation (BSCF) has expanded its role to provide help and inspire those affected by Breast cancer and their loved ones. Our aim to create awareness on early detection and complex medical procedures and to provide information about breast health and breast cancer. The foundation wants to help those who are financially disadvantaged, especially women, by giving them the support to cope during a very difficult period of life. The Blue Sky Charitable Foundation (BSCF) is dedicated to eradicate and reduce cancer specially breast cancer as a life threatening disease from Bangladesh. BSCF is proud to launch awareness and early detection campaigns for women and breast cancer patients in Bangladesh.

## Contact Details

- Hasan Court (1st Floor) 23/1, Motijheel, Dhaka-1000, Bangladesh
- Phone: +88 029553407
- Email: blueskycharity@gmail.com
- Web: www.theblueskycharity.org



### 4. Cancer Awareness Foundation of Bangladesh

This is a Government registered non-profit, non-government, community based voluntary organization in Bangladesh established in 2016.

Cancer Awareness Foundation of Bangladesh has been working to spread awareness, prompt early detection, and ensure proper treatment and rehabilitation. It is also involved in cancer research to enrich cancer care and steering health policies in Bangladesh.

It has fast growing volunteer network composed of people from different age group and socio-economic which is vital for sustained development and success.

#### Contact Details

- o Hasan Court (1st Floor) 23/1, Motijheel, Dhaka-1000, Bangladesh
- o Phone: 01703-046946
- o Email: info@cancerfoundation.org.bd
- o Web: www.cancerfoundation.org.bd

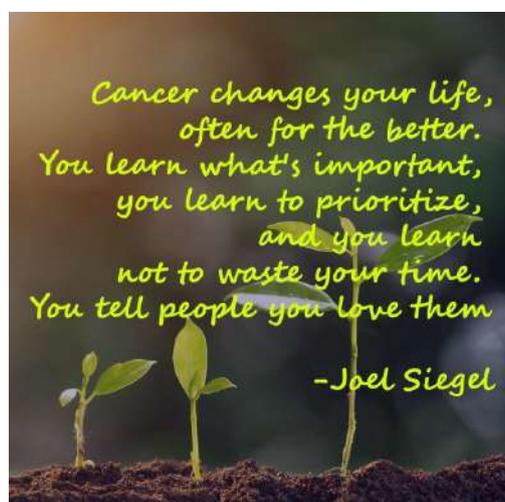


### 5. **BANCAT - Bangladesh Cancer Aid Trust** (formerly known as Bangladesh Cancer Aid Foundation)

This is an organization that makes an effort to help those brave hearts who fought or are fighting their war against this terminal disease. We, at BANCAT, are here to assist those affected people in taking control of their lives. We are striving not only to create an organization, but a society to motivate and inspire patients, survivors and their families so that they can come together and share their experiences. We hope that this will further encourage and create awareness for the disease and connect present patients with survivors to promote a positive mindset.

#### Contact Details

- o Rangs Bhaban, 117/A, Bijay Sarani, Bir Uttam Ziaur Rahman Rd, Dhaka 1215, Bangladesh.
- o Phone: +880-1612226223
- o Email: support@bancat.org.bd
- o Web: www.bancat.org.bd



## SCMPCR Breast Cancer Awareness Program for the Indigenous Ethnic Group of Khagrachari District October 2020

The rate of breast cancer in Bangladesh has an estimated rate of 22.5 per 100000 females of all ages. The indigenous people living in the southeast part of Chittagong are ignorant about the counteraction and treatment of breast cancer because they are deprived of the opportunity to join awareness seminar and programs. In Bangladesh, every year almost 20 to 30 thousand women are newly diagnosed with breast cancer.

Awareness plays a key role and a major strategy of the South Asia Centre for Medical Physics and Cancer Research (SCMPCR) to improve access to health. SCMPCR aims to empower communities, medical professionals and patients with appropriate tools, information and skills so that they can make high-quality, informed decisions on prevention, diagnosis, treatment, care, and support.



*Photo: Live Program on Social Media*

This year 18 October, SCMPCR organized an e-health awareness program on breast cancer. The speakers present on the seminar were Prof. Dr. Golam Abu Zakaria (Founder Chairman, Alo Bhubon Trust and SCMPCR & Former Chairman and Chief Medical Physicist, Gummersbach Teaching Hospital, University of Cologne, Germany), Dr. Aliya Shahnaz (Associate Professor, Oncology Department, Dhaka Medical College and Hospital) and Dr. Shahida Alam (Assistant professor, Department of Radiation Oncology, National Institute of Cancer Research and Hospital). The seminar was moderated by Prof. Dr. Hasin Anupama Azhari (CEO, SCMPCR and Chairman, Department of Medical Physics and Biomedical Engineering, Gono Biswabidyalay). The seminar was focused on Preventive measures and Treatment Approaches.



*Photo: Live Broadcast of the program at Matiranga, Khagrachari*



*Photo: Participants of the Program at Matiranga, Khagrachari*

The seminar was broadcasted at Jalpahar Hall, Matiranga, Khagrachari among the indigenous ethnic group of the South-eastern part of Bangladesh. Also, it was broadcasted live on the official Facebook page of SCMPCR where many people around the country joined the seminar. The seminar was later uploaded to the official YouTube channel of SMPCR so that more people can watch the program.

The program started off with the welcome and introductory speech from Prof. Dr. Golam Abu Zakaria. He also explained the Mission and vision of SCMPCR. Then Assoc. Prof. Dr. Aliya Shahnaz talked about the awareness of breast cancer. She simplified the topic so that the participants can get a basic grasp of the importance of learning about breast cancer. She also gave tips about the prevention. Next Assistant Prof. Dr. Shahida Alam talked about the available treatment of breast cancer in Bangladesh. After the speakers finished their speech, a Question and answer session was held. Where the participants asked various question about the topic and the speakers answered them.

The participants were really pleased with the program and wanted more programs like this in the future. They also agreed to convey the awareness message to their family and friends. The overwhelming positive response from the participants really inspired the SCMPCR team to arrange more seminars and programs for the people who are deprived of such awareness and health facilities.

# Celebration of World Cancer Day February 2020

I AM  
AND  
I WILL



In the world

**17** people 

**die** every **minute**

from **cancer**



Voice of BMPs



Delta Hospital Limited



Rajshahi Medical College Hospital

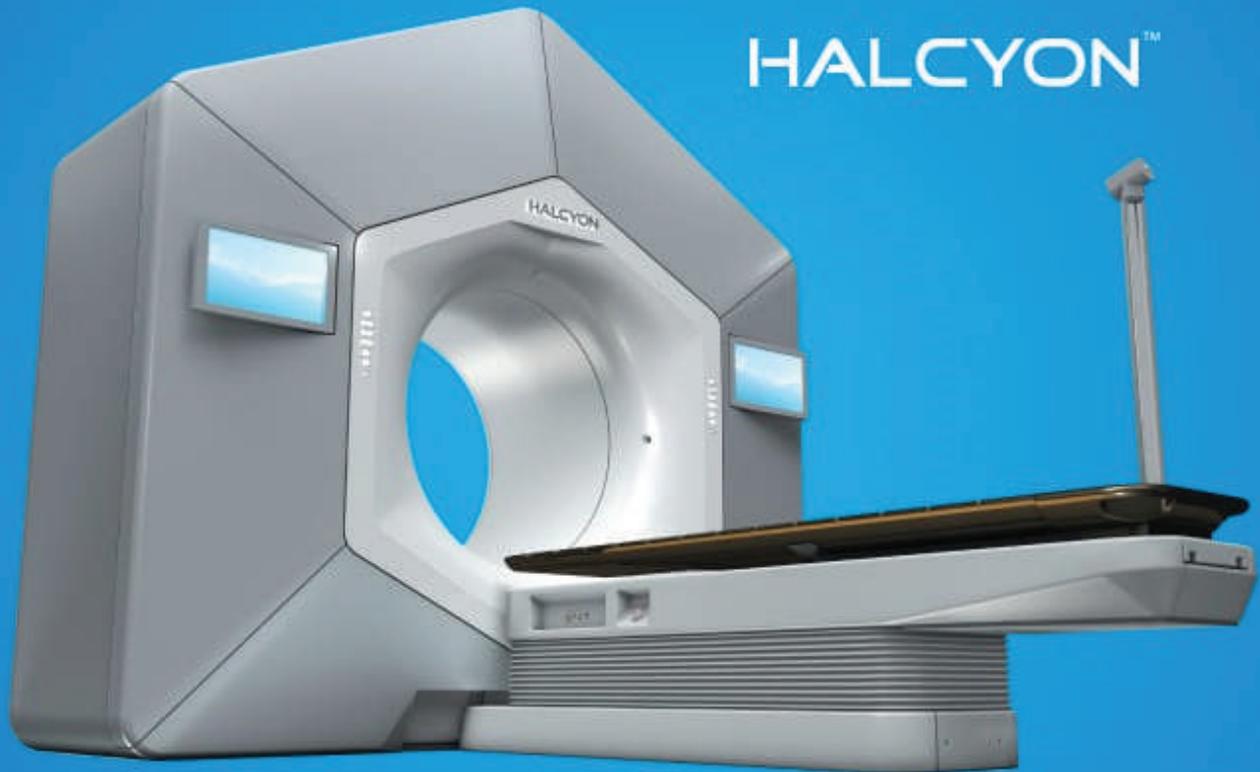


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## Awards & Honors

### AFOMP's Outstanding Medical Physicist Award



**Prof. Dr. Hasin Anupama Azhari**  
General Secretary, (AFOMP)

Founder President and Advisory Member of Bangladesh Medical Physics Society (BMPS)  
Head, Dept. of Medical Physics and Biomedical Engineering, Gono University

On the occasion of 20<sup>th</sup> anniversary of Asia-Oceania Federation of Organizations for Medical (AFOMP), AFOMP decided to recognize contribution of medical physicist from Asia Pacific region. AFOMP has introduced the Outstanding Medical Physicist Award for medical physicists who worked in the AFOMP region for the last 20 years and put tremendous effort into the development of medical physics as a profession and as a subject, and into medical physics education & research. They also organized scientific activities in the AFOMP region to disseminate scientific knowledge for the welfare of the profession and society. AFOMP congratulates and is proud of all the 21 outstanding medical physicist awardees. They have served in national medical physicist organizations and AFOMP, have served their country, the AFOMP region and the community. Prof. Dr. Hasin Anupama Azhari is one of the awardee out of 21 awardees from Bangladesh. She was the first woman elected as a General Secretary, of Asia Oceania Federations of Organizations for Medical Physicists (AFOMP). She is the Founder President and Advisory Member of Bangladesh Medical Physics Society (BMPS) At present she is working as a Dean, Faculty of Physical and Mathematical Sciences and Professor & Chairman, Dept. of Medical Physics and Biomedical Engineering (MPBME) Gono Bishwabidyalay (University), Dhaka, Bangladesh. She has academic experience more than 15 years in academic field and got many clinical trainings in radiation oncology and diagnostic radiology from India, Germany, and Italy.

## The First IMPCB Certified QMP: Bangladesh and Nepal



Md. Anwarul Islam  
President, BMPS



Suresh Poudel  
Foreign Member, BMPS

To work as a QMP in a hospital, certification of individual medical physicist is mandatory. The International Medical Physics Certification Board (IMPCB) was formed on May 23rd 2010 by eleven Charter Member Organizations in medical physics. IMPCB is working on collaboration with IOMP and IAEA. It is to be mentioned that IMPCB provides individual certification in specialized field of MP (diagnostic radiology, nuclear medicine and radiotherapy) through oral and written examination. Two years Residency program is mandatory after a master's degree in medical physics to appear Part II examination.

For the first time in Bangladesh, **Md. Anwarul Islam**, Coordinator medical physicist, Square Hospital Ltd. He has achieved IMPCB Board Certified International Qualified Medical Physicist (QMP) Certificate. He is the pioneer QMP in Bangladesh. He is serving as the President of Bangladesh Medical Physics Society.

**Mr. Suresh Poudel** has also achieved IMPCB Board Certified International Qualified Medical Physicist Certificate. He is the pioneer Qualified Medical Physicist (QMP) in Nepal. We are proud to inform you that Mr. Poudel is one of the first Nepalese student who has completed M.Sc. in medical physics at the Dept. of Medical physics and Biomedical Engineering (MPBME) in Gono university. Mr. Suresh Poudel, currently working in the B P Koirala Memorial Cancer Hospital, Bharatpul, Nepal.

## Achievement of PhD Degree



Dr. Md. Akhtaruzzaman  
General Secretary, BMPS

General Secretary of BMPS, **Md Akhtaruzzaman** achieved his PhD degree in January 2020 from Maria Sklodowska-Curie National Research Institute of Oncology, Warsaw, Poland under direct supervision of Prof. Pawel Kukolowicz. His research topic was “Dependence of Inhomogeneity Correction Factors on Photon Beams”. He finished his PhD in three and half years. To conduct his doctoral studies, he has also received a five-month stipend from DAAD (German Academic exchange Programme) under the collaboration between Gono University and Heidelberg University. This work is also partly supported financially by Bangladesh Study and Development Center (BSEZ), Wiehl, Germany.

Dr.Md. Akhtaruzzaman, General Secretary of Bangladesh Medical Physics Society (BMPS), is working as a Senior Medical Physicist at Lab Aid Cancer Centre, Dhaka, Bangladesh

## JSMP Travel Award 2020



Sadia Afrin Sarah  
Treasurer, BMPS



Md. Al Noman  
General Member, BMPS

The 119<sup>th</sup> Scientific Meeting of the Japan Society of Medical Physics (JSMP), JSMP-2020, was organized in Yokohama, Japan from 9<sup>th</sup> – 12<sup>th</sup> April 2020. The main theme of the conference is “The power of Imaging”. The scientific program of the conference was designed to contain recent information in medical physics. Two BMPS members were selected for the JSMP award-2020.

Ms. Sadia Afrin Sarah, M.Sc. final year student of the department of Medical Physics & Biomedical Engineering (MPBME), Gono University and treasurer of Bangladesh Medical Physics Society (BMPS) was submitted a paper and selected as an oral presenter of the JSMP-2020.

Md. Al Noman was a B.Sc. student of the department of Medical Physics & Biomedical Engineering (MPBME), Gono University and also member of Bangladesh Medical Physics Society (BMPS). Now, he is an M.Sc. final year student of the department of Biomedical Engineering, Khulna University of Engineering & Technology (KUET).

## Elekta Award 2020



**Sadia Afrin Sarah**  
Treasurer, BMPS



**Md. Jobairul Islam**  
Joint Secretary, BMPS



**Nazmul Hasan Mehedi**  
Associate Member, BMPS

The Engineering and Physical Sciences in Medicine (EPSM) virtual conference, 2 -4 November 2020 . This is the national conference of the Australasian College of Physical Scientists and Engineers in Medicine (ACPSEM). This year multiple Medical Physicists from across the Asia-Pacific was selected for this award and receive a free registration for attendance at the Engineering and Physical Sciences in Medicine (EPSM) virtual conference. Two BMPS members were selected for the Elekta Award-2020.

Ms. Sadia Afrin Sarah, M.Sc. final year student of the Department of Medical Physics & Biomedical Engineering (MPBME), Gono University and currently she is working as Treasurer of Bangladesh Medical Physics Society (BMPS).

Md. Jobairul Islam, M.Sc student of the Department of Medical Physics & Biomedical Engineering (MPBME), Gono University and currently he is working as Joint-Secretary of Bangladesh Medical Physics Society (BMPS).

Nazmul Hasan Mehedi, associate member of Bangladesh Medical Physics Society (BMPS) also received Elekta Award. He has successfully completed BSc in Medical Physics & Biomedical Engineering from MPBME, Gono University.

## COVID-19 Pandemic Activities at a Glance



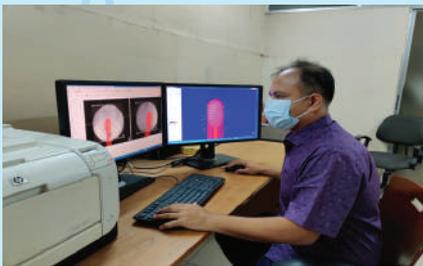
Square Hospitals Ltd



Square Hospitals Ltd



Dhaka Medical College and Hospital



Dhaka Medical College and Hospital



Dhaka Medical College and Hospital



Evercare Hospital Dhaka



Gonoshasthaya Nagar Hospital



Gonoshasthaya Nagar Hospital



Square Hospitals Ltd



Square Hospitals Ltd



Gonoshasthaya Nagar Hospital

## Upcoming Events

### **World Congress on Medical Physics and Biomedical Engineering 2022 (WC2022)**

Date: 12<sup>th</sup> June to 17<sup>th</sup> 2022

Venue: Sands Expo and Convention Centre, Marina Bay Sands, Singapore

Website: <https://wc2021.org>

### **20<sup>th</sup> Asia-Oceania Congress on Medical Physics (AOCMP)**

Date: 3<sup>rd</sup> -5<sup>th</sup> December, 2020

Venue: Phuket, Thailand

Website: <https://www.aocmp-seacomp2020.com>

### **77<sup>th</sup> scientific assembly and annual meeting of the Japanese Society of Radiological Technology (JSRT)**

Date: 15<sup>th</sup> -18<sup>th</sup> April, 2021

Venue: Yokohama, Japan.

Website: <https://www.jsrt.or.jp>

### **21<sup>th</sup> Asia-Oceania Congress of Medical Physics (AOCMP)**

Date: 10<sup>th</sup> -12<sup>th</sup> December 2021

Venue: Cox's Bazar, Bangladesh.

Website: [www.aocmp2021.com](http://www.aocmp2021.com)

### **3<sup>rd</sup> European Congress of Medical Physics (EFOMP)**

Date: 16<sup>th</sup> -19<sup>th</sup> June, 2021

Venue: Torino, Italy Website: <http://www.ecmp2020.org>

### **The International Atomic Energy Agency (IAEA) is organizing the third International Conference on Advances in Radiation Oncology (ICARO3)**

Date: 16<sup>th</sup> -19<sup>th</sup> Feb 2021

Venue: Virtual conference platform

Website: <https://www.surveymonkey.com/r/MT7X5PP>

## BMPS Executive Committee 2019-2021

At the end of ACBMPS-2019, Annual General Meeting (AGM) was held with all members of BMPS. A new executive committee has been formed for the year 2019-2021. The new members are as follows:



Mr. Md. Anwarul Islam  
President



Mr. Safayet Zaman  
Vice President



Mr. Md. Mostafizur Rahman  
Vice President



Dr. Md. Akhtaruzzaman  
General Secretary



Mr. Md. Jobairul Islam  
Joint Secretary



Mrs. Sadia Afrin Sarah  
Treasurer



Capt. Md. Khairul Islam  
Member



Mr. Md. Sajan Hossain  
Member



Mst. Zinat Rehana  
Member



Mr. Md. Nazmul Islam  
Member



Mr. Md. Shahidul Miah  
Member



Mr. Sujan Mahamud  
Member



# SOUTH ASIA CENTRE FOR MEDICAL PHYSICS AND CANCER RESEARCH

## MESSAGE FROM CHAIRMAN

Cancer affects people in all countries regardless of their age, gender or socio-economic conditions. According to WHO, it is estimated that the global cancer burden will increase from 12.7 million new cases per year in 2008 to 21.4 million per year by 2030, with nearly two-thirds of all cancer diagnoses occurring in low- and middle-income countries. The South Asia region with its eight countries (Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka) has approximately one-fourth of the world's and 40% of Asia's population. This region is presently experiencing a shift in infectious disease to an increasing incidence of non-communicable diseases like cardiovascular and cancer. South Asian countries face a big challenge in all four key components of cancer control such as prevention, early detection, diagnosis and treatment. With respect to the global context, about 24.59% populations are present in South Asian area where the incidence of new cases is 10.23 % and the the burden of cancer death is 68.85%. This well-known fact indicates that this region of the world requires improvement strategies in cancer management.

For a better oncologic care, a team consisting of physicians, medical physicists and technicians is necessary. However, unfortunately, in some countries including Bangladesh of this region, still medical physicists are not mandatory personnel in the public hospitals, which will lead to inaccurate diagnosis and treatment. In order to create awareness of the importance of medical physicists in cancer treatment, medical physics education starts through some seminars at the Bangladesh University of Engineering and Technology (BUET) in 1996 in cooperation with the Task Group 16 "Medical Physics in the Developing Countries" of the German Society for Medical Physics (DGMP). As a result, a fully-fledged "Department of Medical Physics and Biomedical Engineering (MPBME)" is established in 2000 at Gono University, Dhaka, which offers a two-year Master and a four-year Bachelor course in Medical Physics and Biomedical Engineering presently.

In that time, there was a huge lack of potentials and resources to continue this new subject. Therefore, a collaboration programme between Gono University and Heidelberg University started under the financial support of German Academic Exchange Programme (DAAD) in 2002. Until now, 90 manpower (teachers, physicians, medical physicists, technologists, PhD & MSc students) has already been received training through this collaboration. In addition, from the beginning of the MPBME, German experts have been visiting Gono University for a standard period to strengthen medical physics education and train the respective personnel involved in cancer care.

However, being professional in medical physics discipline in South Asia region we have a long way to go compared to developed countries. Accreditation and certification of medical physicists is apivotal issue nowadays, which requires defined residency training, qualified medical physicist (QMP) and accredited center in the respective country or region. Among the South Asian countries, medical physicist professionis well recognized in both public and private hospitals only in India. Although medical physics education has already been established in Bangladesh and number of medical physicists is increasing gradually, still it is far from the goal due to the lack of national recognition and defined training programme. Therefore, in order to address the aforementioned issues, South Asia Center for Medical Physics and Cancer Research (SCMPCR) started its journey in July 2018with a mission to advance cancer care practice in Bangladesh, other countries in South Asiaby disseminating scientific and technical information, fostering the educational and professional development and promoting the highest quality medical services for patients. It will also expand its activities in other developing countries.

## WE OFFER

- ★ To organize awareness, prevention and screening program for cancer disease.
- ★ To provide adequate training to the 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 promote building of Self-help Groups of 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 level.
- ★ To conduct research for cancer prevention by developing nutritional medicine and medical plant.

## MISSION

TO Achieve UNDP

SDG-goal 3 & 4

## OUR VISION

TO

PROVIDE QUALITY SERVICES IN CANCER TREATMENT BY 2021 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.

## OUR MOTTO

QUALITY EDUCATION AND HEALTH SCIENCE FOR PATIENT BENEFIT

# SCMPCR

PROJECT of ALO BHUBON TRUST (ALO-BT)

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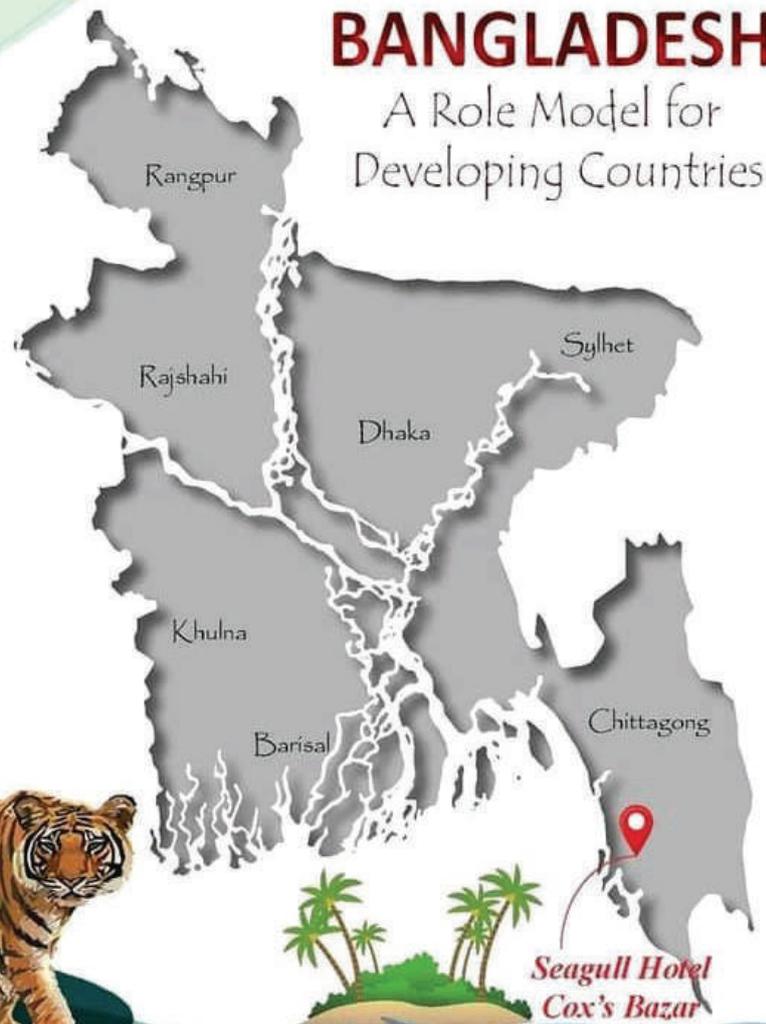


Welcome to  
The 21<sup>st</sup> Asia-Oceania Congress of Medical Physics  
“Science for Radiation Medicine”  
10 – 12 December 2021  
Seagull Hotel, Cox’s Bazar, Bangladesh

50<sup>th</sup>  
ANNIVERSARY  
1971-2021

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Bangladesh Medical Physics Society.