Voice of BMPS

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Bangladesh Medical Physics Society

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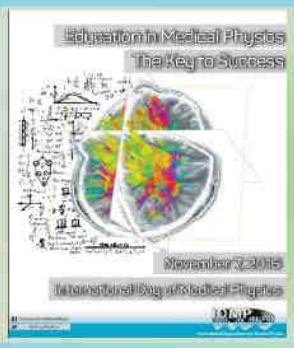
4th International Day of Medical Physics (IDMP)

7th November, 2016

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



International Day of Medical Physics

7th November 2016

Organized by

Bangladesh Medical Physics Society (BMPS)
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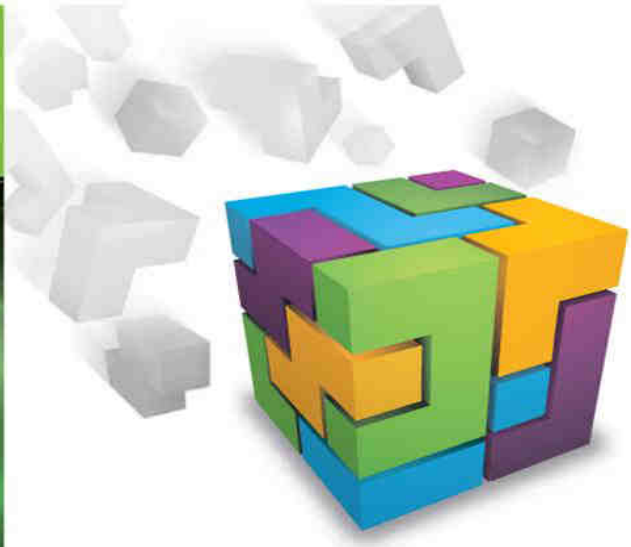

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Editorial

Welcome to "Electronic Medical Physics newsletter, BMPS, Issue 4 on the occasion of IDMP on 7th November 2016.

The theme of this year IDMP is **"EDUCATION IN MEDICAL PHYSICS: THE KEY TO SUCCESS".** "Education and Training builds the foundation of the profession. Taking active part in the education and training activities in your countries and institutions is of extreme importance for the profession and for healthcare in general, and also this is our best contribution to the young generation of medical physicists": **Quoted from the message of IOMP President Prof. Dr Slavik Tabakov.**

Bangladesh has now a young generation of medical physicists who are committed to improve education research and health care situation in their native land. They gather knowledge on job as well as receive individual training from aboard. Therefore BMPS already started a training program for the students, hospital physicists, nuclear physicists from Atomic Energy Commission with the support of foreign friends and international institutes in near future to develop qualified medical physicists in specialized fields (Radiotherapy/ Nuclear Medicine) in Bangladesh. On the basis of that, this issue of newsletter specially cover an experience of Medical Physicists undergone the training program.

Besides this you will also read different activities done by BMPS for public awareness in education, seminar conference, training on this subject which will expedite in the development of Medical Physics in Bangladesh. The readers can read this development in our newsletters.

At present a few universities (3) are offering the medical physics education. In present situation without MSc degree in Medical Physics we cannot provide them in all the sectors (Radiation Oncology, diagnostic Imaging, Nuclear Medicine) of medical Physics. Though a pool of manpower in Nuclear Medicine are developed through training, IAEA as they are recruited by BAEC as scientific officer.

The BMPS is comprised of members who span the gamut of medical physics activities; we have full-time academic researchers, full-time clinical medical physicists. They are involved in both research with the students of medical Physics. Virtually all of our members are involved in education, by participating as students in continuing education courses and in many cases teaching those courses.

I envision that we can invigorate scientific excellence with gathering more updated knowledge through attending more conferences, doing research, taking note of the problems that face clinical medical physicists and coming up with research solutions for those problems. BMPS will are in a position to take appropriate steps for accreditation and certification with other organizations, government bodies.

This year BMPS first started Quality Control of diagnosing Imaging in Bangladesh through a training program in Annual Conference, BMPS 2016. Afterwards BMPS will communicate with other societies to liaison with the government and will try to make a proposal for QC of Imaging equipment.

I believe that commitment, participation and great support of each member of this society will bring us achievement which is intended to promote the growth of medical physics professionals within and outside our country.

I am looking forward to interact with members of different MP organizations and to bring their ideas and concerns on the issues which we care most both as professional medical physics and as patrons of health care. Our editorial office will look forward to receiving contributions of news, announcements, obituaries, and essays.

Please feel free to offer any suggestions for the improvement of our newsletter. If you miss anything there, do let us know, we still can include it on the website editions on various schedules.

Last but not least, we have the pleasure to invite you in 3rd International Conference on Medical Physics in Radiation Oncology and Imaging (ICMPROI-2017) . I would like to encourage all colleagues from home and abroad to take part in the coming conference.

Prof. Dr. Hasin Anupama Azhari

Message

It is well documented that radiation awareness among medical staff is inadequate. Lack of knowledge in radiation protection and dosimetry may lead to unjustified X ray examinations, overdoses during CT and fluoroscopically-guided procedures, therapeutic abortions due to accidental exposures of pregnant patients and various other accidents and incidents in imaging and radiotherapy. What are the true social and economic costs of these events? Nobody knows. We might be able to estimate the direct cost of a nuclear accident. However, we are not able to do the same for medical accidents. Some events involving accidental or unintended medical exposures are not analyzed and some remain unrecorded. Furthermore, the visibility of accidents in imaging and radiotherapy remains low. A radiation accident in medicine is less obvious than in nuclear sector because harm in radiation medicine occurs only to one individual at a time.

An improved education and training in medical physics and radiation protection of physicians and other staff performing examinations involving ionizing radiation is the key to avoid incidents and accidents and keep the radiation as low as possible. Medical physicists should play the main role by providing high-quality education and by designing and implementing effective training of medical personnel. Important aspects should be taken into consideration: the body of participants has considerably expanded and diversified; the new participants, mainly radiologists and other physicians performing fluoroscopically-guided procedures call for new teaching methods; the educational needs in the poorest countries remain great; new approaches in medical physics and radiation protection education aligned with the needs of growing economies should be examined.

Medical Physicists play a fundamental role in the development and application of medical radiation technologies and ensure the quality and safety of imaging and treatment procedures. We have the knowledge and skills to change the landscape of education and training in medical physics and radiation protection. Let's do it!

EDUCATION IN MEDICAL PHYSICS IS THE KEY TO SUCCESS
ENJOY THE 4th INTERNATIONAL DAY OF MEDICAL PHYSICS!

Prof. John Damilakis
Chairman of the IDMP Task Group

Measurement of Displacement Effect of Cylindrical Ionization Chambers with High Energy Photon Beams

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Introduction:

In present world there have several cancer treatment modalities such as: Surgery, Chemotherapy &Radiotherapy. Radiotherapy treatment technique is developed on the basis of TCP (Tumour Control Probability) & NTCP (Normal Tissue Complication Probability).It is known that radiation dosimetry is a very crucial matter in radiotherapy and its success depends on optimization of dose to the tumour and minimum dose to the healthy cells. Cancer treatment with radiation is significantly dependent on depth dose distribution so several protocols (IAEA TRS 398, AAPM TG-51, DIN (68002) etc.), steps (dosimetry measurement, acceptance testing, commissioning, safety check, monitor unit calculation etc) has developed for this and in dosimetry normal practice there have use several chambers such as:Cylindrical ionization chamber & Plane parallel ionization chamber and cylindrical ionization ionization chamber has several problems due to its different volume. So the aim of this study was to measure the displacement effect of cylindrical ionization chamber in comparison with the most established plane parallel (Roos) chamber for high energy X-ray photon beams because of accurate absorbed dose to water determination at a reference depth. Alternatively it is called the determination of the effective point of measurement (EPOM). The different volume of Cylindrical ionization chamber will effect the chamber geometry and chamber composition and the chamber geometry is completely related to cavity theory. The dose to the medium of the cylindrical ionization chamber and the dose to the phantom medium are not same so cavity theory arises.

$$D_{cav} \neq D_{med} \quad \ldots\ldots(1)$$

The Bragg-Gray cavity theory was the first cavity theory developed for dose determination.

Condition 1: The cavity must be small when compared with the range of charged particles incident on it, so that its presence does not perturb the fluence of charged particles in the medium.

Condition 2: The absorbed dose in the cavity is deposited solely by those electrons crossing the cavity.

In this case (ideal case):

$$D_w = D_{air} S_{w,a} \quad \ldots\ldots(2)$$

($S_{w,a}$ Mass stopping power ratio water to air)

All practicing protocols use air filled ionization chambers. In this case (real case):

$$D_w = D_{air} S_{w,a} P_u \quad \ldots\ldots(3)$$

(P_u perturbation factors)

Total Pu is the product of individual perturbation factor.

$$P_u = (P_{dis} P_{wall} P_{cell} P_{cav} P_{\Delta})_Q \quad \ldots\ldots(4)$$

Here the main objective is Pdis: Displacement perturbation factor

Or

Peff: Effective point of measurement

The recommended Peff value in the international protocols are:

For high energy photon beams

-0.6 rcyl (IAEA TRS-398, AAPM TG-51)

Or

-0.5 rcyl (DIN 6800-2)

where rcyl is the radius of the measuring volume.

Material and method:

The study was performed with the help of percentage of depth dose (PDD) curve of the master's thesis named "Determination of Effective Point of Measurement of Cylindrical Ionization Chambers for High-Energy Electron and Photon Beams in Water Phantom" performed by Huang, Yanxiao in Germany in the year June 2008. Printout of the PDD curve was taken on graph paper to count the values of depth versus PDD and the new PDD curve was redrawn using Microsoft Excel program for the study.

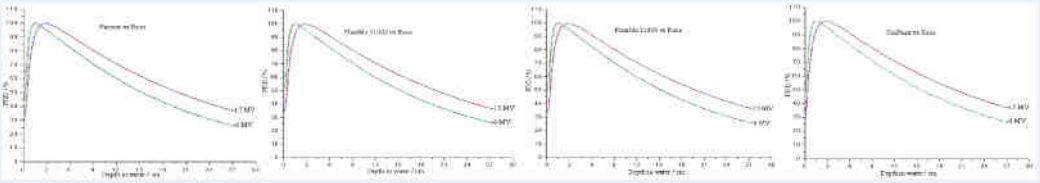

Figure 1: 4 PDF graph

The successive steps were taken:

A) Data/values were extracted from the PDD curves.

B) Redrawn of the PDD curves.

C) Determination of the effective point.

Displacement (P_{dis})= $Z^{cycl}_{d\%} - Z^{Roos}_{d\%}$

$P_{eff} = P_{dis}/r$

P_{eff} = Effective point of measurement.

P_{dis}= Displacement

r= Radius of the measuring volume.

Results:

Table -1: Extracted value of Peff for cylindrical ionization chambers are given below:

Chamber	Energy	P_{eff}							
		$d_{80\%}$	Displacement (mm)	$d_{70\%}$	Displ.	$d_{60\%}$	Displ.	$d_{55\%}$	Displ.
Farmer 30006	15 MV	0.52	1.60	0.65	2.0	0.55	1.7	0.65	1.99
	6 MV	0.54	1.64	0.55	1.7	0.68	2.1	0.69	2.10
Flex. 31002	15 MV	0.58	1.595	0.61	1.7	0.55	1.5	0.52	1.43
	6 MV	0.54	1.492	0.61	1.7	0.55	1.53		1.53
Flex. 31003	15 MV	0.55	1.50	0.50	1.4	0.58	1.6	0.64	1.75
	6 MV	0.58	1.60	0.65	1.8	0.65	1.8	0.61	1.69
Pin. 31006	15 MV	0.55	0.55	0.60	0.6	0.60	0.6	0.61	0.61
	6MV	0.50	0.50	0.60	0.6	0.60	0.6	0.64	0.64

Discussion and conclusion:

The obtained results were comparable with the recommended value of 0.6rcyl of international IAEA, TRS-398 AAPM, TG-51 and of 0.5rcyl of DIN 6800-2 (German) protocol. In the comparison of the PDD curve of the cylindrical & plane parallel chamber of energy 6 MV &15 MV,there have found that with the increase of depth, there had arise some displacement due to Zmaxreason.In this work displacement varies with the change of energy and depth also.The value of EPOM varies under the changes of radiation quality and depth.The obtained results also varies with the reference paper for Pinpoint.

Table-2: Comparison the Peffof extracted data and reference data for 6 MV and 15 MV at d80% depth were given below:

6MV		6MV		15MV		15MV		Chamber	Observation
$d_{80\%}$		P_{eff}		$d_{80\%}$		P_{eff}			
Ref. dis. (mm)	Extr.Dis. (mm)	Ref.	Extac.	Ref. dis. (mm)	Extac. Dis. (mm)	Ref.	Extrac		
1.54	1.64	0.50	0.53	1.46	1.60	0.49	0.52	Farmer	P_{eff} is comparable with the reference work. Lower energy shows higher displacement.
2.54	0.50	2.54	.50	1.56	.55	1.56	.55	PinPoint	P_{eff} varies significantly with reference work. Here lower energy shows lower displacement. Use of pdf curve may be the cause.
1.31	1.49	.47	.54	1.32	1.59	.48	.58	31002	P_{eff} values are near to the reference work. The lower energy shows lower displacement.
1.33	1.60	.48	.58	1.17	1.50	.43	.55	31003	P_{eff} values are near to the reference work. Lower energy shows higher displacement.

Uncertainty was not considered here because of manual collection of data. No electron data were considered for the study. Still the scope is there to carry out the work considering electron and photon beams with different manufacturer's chamber for better conclusion.

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What you should know about the radiation therapy in cancer treatment

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1.Introduction:

Radiation therapy uses high energy X-rays or particles to kill cancer cells. The radiation source may be external (from outside the body) and come from beams and X-rays aimed at the cancer or the radiation source may be internal (from inside the body) and come from radioactive implants. The goal of both external and internal radiation therapy is to kill the cancer cells while limiting the damage to healthy normal cells around the tumor. Most healthy cells that are damaged by the radiation can quickly repair themselves.

Radiation therapy is used:

1. Alone, as the only treatment you need
2. Before surgery to shrink the tumor
3. During surgery to protect the area around the tumor
4. After surgery to destroy any remaining cancer cells
5. With chemotherapy, which makes the cancer cells more sensitive to radiation treatment
6. After chemotherapy to kill remaining cancer cells
7. To control symptoms such as pain or bleeding

2. Types of Radiation Therapy

The type and dosage of radiation receive by patient is tailored to treat the type, size, stage, and location of different cancer and medical condition is also considered.

2.1 External Radiation Therapy

External radiation therapy uses a machine called a Linear Accelerator (LINAC) to direct beams of high energy X-rays atcancer tumor. The machine can change positions so the beams may enter the body from any angle. By changing the angle of the beams, themedical physicist is able to match the shape of the tumor and spare as many healthy cells as possible.

2.1.1 Types of Advanced External Radiation Therapy

3D conformal radiotherapy (3DCRT)

3D conformal radiotherapy or 3DCRT is a very commonly used type of radiotherapy.Conformal radiotherapy uses a specialized planning CT scanner and sometimes other scans, such as MRI scans. This allows the treatment team to plan the radiotherapy treatment area very precisely in 3 dimensions – width, height and depth.

Intensity Modulated Radiation Therapy (IMRT)

Intensity modulated radiation therapy (IMRT) uses a computer to combine precise images of the tumor with a special linear accelerator to vary the angle, shape, and intensity of the radiation beams to different parts of the tumor or treatment area. The precision of IMRT delivers the maximum dose such as the brain, head and neck, lungs, and prostate.

Volumetric modulated arc therapy (VMAT)

Volumetric modulated arc therapy (VMAT) is a novel radiation technique, which can achieve highly conformal dose distributions with improved target volume coverage and sparing of normal tissues compared with conventional radiotherapy techniques. VMAT also has the potential to offer additional advantages, such as reduced treatment delivery time compared with conventional static field intensity modulated radiotherapy (IMRT). VMAT is used for prostate, pelvis (lower gastrointestinal, gynecological), head and neck, thoracic, central nervous system, breast and other tumor sites.

Stereotactic Body Radiation Therapy (SBRT)

Stereotactic Body Radiation Therapy (SBRT) uses special positioning of the body and implanted markers. A higher dose of radiation can then be delivered to a precise area in the body, such as the lung. This precision helps spare healthy tissue.

Stereotactic Radiosurgery (SRS)

Stereotactic radiosurgery (SRS) aims a precise and intense dose of radiation at a targeted area. SRS is used in place of surgery for some brain tumors. SRS can treat tumors in parts of the brain where surgery is not recommended or possible. SRS differs from other types of radiation because it can be aimed at a small area of tumor tissue without harming the normal brain tissue around the tumor.

2.2 Internal Radiation — Brachytherapy

Internal radiation therapy or brachytherapy, means that the radiation source is placed inside patient body. These implants hold the source of the radiation and can be thin wires, plastic tubes, capsules, or seeds. Brachytherapy or implants can be used with many types of cancer like cervix, esophagus, breast and prostate etc. With high dose rate (HDR) brachytherapy, a special machine inserts the radioactive substance into the tumor and delivers a high dose of radiation rapidly. Brachytherapy can sometimes require a short hospital stay of one to three days. Your doctor or nurse will make sure you understand the type of treatment you will have and what you can and cannot do.

3. Radiation Treatment Team

The radiation oncology treatment team is made up of many different health care professionals. Each has special training and experience in treating cancer with radiation therapy. The team members are as follows:

• **Radiation Oncologist** - Doctors who specialize in using radiation to treat cancer. They work with cancer patient and their other cancer doctors to develop the treatment plan. The radiation oncologist leads the radiation treatment team and decides which type of radiation and equipment will best treat the particular patient. Throughout the treatment, the radiation oncologist continues to monitor the progress of treatment process.

• **Oncology Medical Physicist** - A scientist who helps plan the technical part of particular cancer treatment. They are responsible to decides the best shape and angles for the treatment beams and make sure the equipment works as planned and delivers the right amount of radiation as well.

• **Radiation Technologist** - A radiation technologistwith specialty training in the fields of radiation physics, biology, radiation safety, and computer aided biophysics. The therapist sets up your daily radiation treatment, positions the cancer patient, and delivers the prescribed dose of radiation.

• **Radiation Oncology Nurse** - A nurse with special training in the care and treatment of patients with cancer. Cancer patient can turn to any radiation oncology nurse with any question or concern they may have. They are responsible to talk with cancer patient about the radiation treatment and help them to manage any symptoms or side effects.

4. Planning for a radiation treatment

4.1 Radiation Consultation Visit

The first visit with the radiation oncologist is called cancer patient consultation visit when patient referred for. The radiation oncologist will review all records and pathology reports of the patient and give him/her a physical exam. It is important to bring a list of all medications include all prescription medications, vitamins, supplements and any over-the-counter medications that patient take.
The radiation doctor will go over the radiation treatment plan. This includes:

1. Why the treatment plan is best for you
2. What it can and cannot do
3. The type and amount of radiation therapy you will receive
4. How the treatment is done
5.What the side effects of treatment might be when you understand your treatment plan, you will be asked to sign a consent form before your first treatment.

4.2 Simulation

Radiation doctor will arrange a set up and plan the radiation therapy in a process called "simulation." The simulation consists of a CT scan or X-rays of the specific area where the tumor is located. Some scans require the use of a contrast material such as barium or dye or metal markers in or near the area to be treated, which makes certain organs visible on the X-ray. With the help of these X-rays and scans, radiation doctor will map out the exact location of cancer patient tumor and the area to be treated.

After the simulation process, radiation therapist may mark or tattoo on the skin of patient. A tattoo is a tiny ink dot marker injected under the skin that helps line up the treatment area. These marks or tattoos are very important because they allow the radiation therapist to position patient the exact same way for each treatment. Patient advised not to remove the marks during treatment. However, if the marks happen to come off, they can be reapplied.

Part of the simulation or planning session is finding and recording the best body position for patient during the treatment. Special devices, such as molds and masks, can help to keep patient body in the correct position. The molds and masks are made to fit the body at the time of the simulation. After the simulation, medical physicists develop a treatment plan based on the radiation oncologist's design. Once a plan has been made, the patient treatment can begin.

4.3 The Treatment Process

When patient come for their first radiation treatment, the daily check-in process will be explained. There are changing rooms where patient can put their personal belongings. Depending on the area of patient body being treated, they may be asked to change into a hospital gown.

In the treatment room, radiation technologist will check and recheck all of the equipment settings (calibrations) to make sure the treatment plan is followed exactly. Using the ink marks or tattoos on patient skin, the radiation therapist locates the treatment area. They then review the treatment record to place patient in the correct position. If a mold or mask has been custom-made to help with positioning, radiation therapist will place that on or around patient.

The radiation therapist will leave the room before the radiation begins. They will watch patient constantly on a television monitor. Using an intercom, the therapist can hear patient and talk with to them throughout the radiation treatment. Remember, the radiation treatments are painless. If patient feel uncomfortable for any reason, let your radiation technologist know right away.
Radiation therapy does not hurt. You will not even feel the radiation. However, there can be side effects from radiation therapy.

4.4 After Your Treatment Program Ends

When radiation treatment program ends, radiation doctor will send a complete report to patient referring physician. Patient should contact the referring physician to schedule follow-up exams. Radiation doctor will also schedule follow-up appointments with patient to monitor their progress. It is important to keep these appointments. The effects of radiation may continue for several weeks or months after the completion of patient treatment. It is important to notify both referring physician and radiation doctor if any symptoms or concerns develop after radiation treatment ends.

Verification of PTV margin based on Electronic portal imaging devices (EPIDs)

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Introduction: All radiotherapy involves risk because even a small error in treatment Planning, Delivery, or Dosimetry can lead to negative consequences. This is because the human body is a complex organism and tumors are often located in close proximity to sensitive normal tissues and critical organs.

Radiotherapy verification is the process that enables us to be certain we are treating the tumor volume as planned. In ensuring that the right radiation dose has been given to the right place, two measures are needed- Geometric and dosimetric verification.

The **Internal Target Volume (ITV)** consists of the CTV plus an internal margin.The internal margin is designed to take into account the variations in the size and position of the CTV relative to the patient's reference frame (usually defined by the bony anatomy), i.e., variations due to organ motions such as breathing, bladder or rectal contents, etc.

The **planning target volume (PTV) i**s a geometrical concept, and it is defined to select appropriate beam arrangements, taking into consideration the net effect of all possible geometrical variations, in order to ensure that the prescribed dose is actually absorbed in the CTV. The PTV includes the internal target margin and an additional margin for set-up uncertainties, machine tolerances and intra-treatment variations. The PTV is linked to the reference frame of the treatment machine and is often described as the CTV plus a fixed or variable margin (e.g. PTV = CTV + 1 cm).

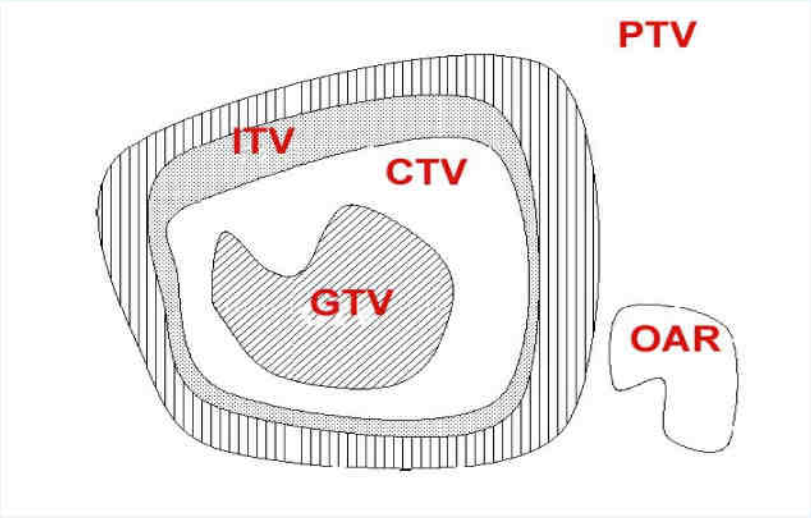

Figure 1: PTV-CTV margin

The aim of geometric verification is to ensure that the geometric accuracy of the radiotherapy delivered is within the limits set by the uncertainty margin allowed in the treatment plan. Verification is only one component of the treatment process. Accurate and reproducible planning procedures, including the acquisition of good quality reference images, are essential to successful verification. Treatment verification can be done using several ways. THE electronic portal imaging device system (EPIDs) is one them.

Classification of EPID: A number of EPIDs have been developed based on different philosophies. These systems fall into three main categories: video- or fluorescent-screen-based; matrix; and scanning diode systems.For this study a Portal Vision aS1000 EPID has been used in which is based on Amorphous Silicon (a-Si) technology.

Figure 2: The new generation of EPID system is amorphous silicon based system.

Verification: This is the process by which the accuracy of radiotherapy is assessed. It is achieved by comparing images of the treatment delivered with that planned. The verification methods are as follows:

Off-line treatment verification: This compares the reference images with the images taken in the treatment delivery room, and analyses the set-up accuracy at some time after the treatment has been given. The set-up data are not acted on until the next treatment.

Online treatment verification:This compares the reference images with images taken in the treatment delivery room, immediately prior to the treatment being delivered. Any necessary corrections are applied before the treatment is delivered.

Set-up verification: Verification is done in each steps of the planning procedure.
Reference imag:cThe reference image obtained shows the planned geometry of the treatment field placement relative to internal anatomy or anatomical surrogate such as bone or markers. This is used as the standard against which treatment images are assessed.

Pre-treatment verification: This is the process that compares the reference images with the planned treatment before the course of radiotherapy is started. It usually occurs away from the treatment delivery room.

Image-guided radiotherapy (IGRT): In its broadcast definition, this applies to all parts of the radiotherapy process from using imaging to define and delineate the target volume to evaluating treatment response.

The most widely used concept of IGRT is using imaging in the treatment room either immediately before or during treatment to evaluate and correct set-up errors.

For online treatment verification, IGRT uses images obtained immediately before treatment delivery and intervention to correct set-up before delivery. Images may be acquired using computed tomography (CT) (kilovoltage and megavoltage), portal images (MV), kv planar radiographs, ultrasound or other methods.

Intrafractional verification: This compares the set-up accuracy during a single treatment fraction and may be assessed over the course of a single beam being delivered or over a single fraction.

The effect of intrafractional movement can be compensated for when planning treatment margins, or reduced by the following methods:

- Terminating the treatment beam if movement occurs outside predefined tolerances.
- Timing the treatment beam to ensure delivery of radiation coincides with a known position of the patient's internal anatomy.
- Restricting variation in the position of internal anatomy.

Materials and Methods: This study was performed on 22 Head and Neck, 12 Lung, 22 Pelvis, 36 Breast, 8 Brain and 8 thorax cancer patients, treated with dynamic IMRT, 6 MV X-ray beam from Varian Clinac DHX 4526 of 120 leaves MLC.All the patients were immobilized with a thermoplastic mask, which was fixed to the treatment couch. Prior to treatment, all patients had three images of setup field, which were two orthogonal, anterior-posterior (AP) and lateral image at the upper neck level, and the other AP field at the shoulder level. The simulation images were acquired on the Acuity digital simulator and transferred into Eclipse (Version 8.6) as the reference images (DRR images). Weekly portal images of three setup fields were acquired for each patient with amorphous silicon EPID. All portal images were matched with the reference images (DRR images).The data of three treatment days of a patient has been collected and their average set up deviations long the three axes has been calculated. To represent true magnitude of errors, the positive and negative signs of the deviations have not been considered in the calculations. All the calculations have been carried out using Microsoft Excel 2007.

Figure 3(a): Reference image

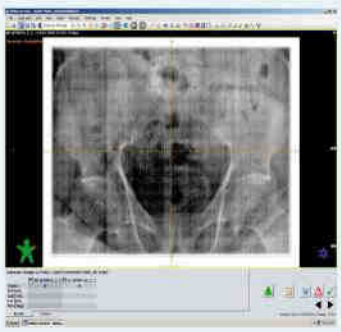

Figure 3(b): EPID image

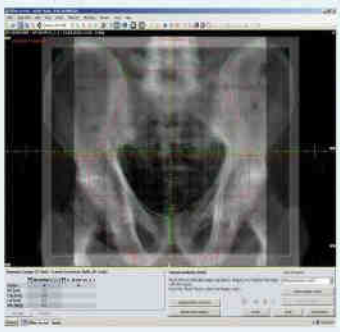

Figure 3(c): Matched images

Results:

The following data has been derived from the treatment records of 9 patients and 18 treatment fractions. The set up error of PTV margin in three directions and shows that in table 01.

Tolerance limit: ± 3 mm

Table 01: Average deviation along the three set up axes for Pelvis carcinoma.

Observations	Case Ca.	Directions	1. DRR image in cm	2. EPID image from three days final in cm	3. Deviation between 1 & 2 in mm	4. 2nd Week Of EPID images	5. Deviation between 2 & 4 in mm	6. Average deviation of 3 in mm	7. Average deviation of 5 in mm	Total average deviation Between 6 &7 in mm
01	Pelvis	Long.	141.3	141.3	0.0	141.4	-0.06667	Longitudinal -0.18889	Longitudinal -0.05926	Longitudinal -0.12407
		Lat.	1.4	0.7	0.7	1.0	-0.26667			
		Vrt.	8.4	8.5	-0.1	8.7	-0.23333			
02	Pelvis	Long.	138.5	138.8	-0.3	138.8	-0.03333			
		Lat.	999.5	999.6	-0.1	999	0.633333			
		Vrt.	9.7	10.2	-0.5	10.2	0.0			
03	Pelvis	Long.	144	144.1	-0.1	144.1	0.033333			
		Lat.	999.6	999.5	0.1	999.5	0.033333			
		Vrt.	6.5	6.4	0.1	6.4	0.066667			
04	Pelvis	Long.	139	138.8	0.2	138.9	-0.1	Lateral 0.081481	Lateral 0.022222	Lateral 0.051852
		Lat.	0	0.2	-0.2	0.4	0.16667			
		Vrt.	8	7.9	0.1	7.9	0.033333			
05	Pelvis	Long.	143.9	143.9	0.0	143.9	0.0			
		Lat.	0	0.1	-0.1	0	0.1			
		Vrt.	6.9	6.9	0.0	6.9	0.0			

06	Pelvis	Long.	142.4	142.5	-0.1	142.7	-0.2			
		Lat.	O.3	0.2	0.1	0.3	0.0			
		Vrt.	8.3	8.4	-0.1	8.4	0.0			
07	Pelvis	Long.	133.3	133.9	-0.6	133.9	0.033333			
		Lat.	999.0	999.4	-0.4	999.1	0.366667			
		Vrt.	10.4	9.8	0.6	9.8	0.03333			
08	Pelvis	Long.	144.8	145.6	-0.8	145.8	-0.2	Vertical	Vertical	Vertical
		Lat.	1.3	0.7	0.6	0.7	0.033333	0.011111	-	-
		Vrt.	9.5	9.4	0.1	9.4	0.0		0.07407	0.03148
09	Pelvis	Long.	140.2	140.2	0.0	140.2	0.0			
		Lat.	0.8	0.7	0.1	1.2	0.53333			
		Vrt.	9.2	9.3	-0.1	9.8	-0.5			

Conclusion: This study has been done by on line EPID analysis for those patients who have already been treated or in the course of treatment. This work has been done on the basis of the three treatment days of data of a patient's entire course of treatment. If we could have collected the data from the beginning of treatment i.e. when the first EPI has been taken and then everyweek, till the entire course of the treatment for every patient, the results could have been much authentic.

Image Guided Brachytherapy: Prostate Carcinoma

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Introduction

Prostate cancer is the most common cancer in men in the United States and is the second most common cause of mortality. Brachytherapy is an effective, low morbidity, cost effective treatment for carcinoma of the prostate. Treatment option of prostate cancer are different: Radical prostactomy, radiation therapy, androgen deprivation. Decision for different therapy depends on individual patient history (age, prior surgery), tumor stage and grading. 51% of the Urologists in USA recommend that Prostate Brachytherapy as alternative treatment to Prostatectomy (O''Leary et al J. Urol 168:649 Leary et al J. Urol 168:649--652, 2002 652, 2002). In prostactomy patients experience incontinence of urine. Brachytherapy is a simple, outpatient procedure that avoids hospitalization and allows the patient an early recovery and rapid return to normal activity. It has produced good 10-year outcome with relatively low morbidity. The whole procedure of Monotherapy and Boost therapy for prostate carcinoma and comparison between the complication of monotherapy and combitherapy are studied in this paper.

METHOD AND MATERIALS

Equipment needed for real time HDR prostate Brachytherapy are as follows:

- A portable Ultrasound unit together with ultrasound scanner system with standard video output: (S)VHS PAL or (S)VHS NTCS
- Transversal transrectal transducer probe

– Ultrasound unit with transrectal probe capable of visualizing organs at upto 7- 8 cm depths from probe surface.Ultrasound slice can be viewed in OBC mode for (one slice) of corresponding window or slice mode to view regular orthogonal plane.

- Template

template with needle holes at 5mm spacing arranged in a rectangular fashion and labeled both vertically and horizontally. The thickness is 15 mm . The distance between edge of the template to first hole is 2.5 mm. The type of template used in Offenbach clinic is Nucletron Santa Fe Saddle 6F.

- Needles or Catheter

In Offenbach Brachytherapy is done with stainless steel needle with 1.9 mm diameter.

- Remote Afterloader Nucletron BV Microselectron HDR V3
- Oncentra Prostate (Vs 3.0.9)

Manpower

A team comprising: of radiation oncologist , medical physicist, urologist, radiotherapy technician is needed in the operating room (OR) during the implant procedure.

Pretreatment evaluation

It include appropriate biopsy with Gleason scoring, serum PSA evaluation, and digital rectal examination (DRE). Bone scans are recommended for patients with PSA levels greater than 20 ng/mL, or Gleason scores >8.

Candidates for Mono and combined modality therapy
Patent selection criteria according to Offenbach protocol
HDR brachytherapy as a boost to EBRT
Clinical stage≥ T2b or PSA > 10.0 or
Gleason ≥ 7 (4+3) = intermediate / high risk
HDR brachytherapy as monotherapy
Clinical stage£ cT2aand PSA £ 10.0 ng/ml
Gleason £ 7 (3+4) = low risk for locally advanced disease (capsule penetration, seminal vesicle infiltration

Dosimetric Protocol in Offenbach
Monotherapy
Reference dose = 11.5 Gy
D90 ≥ 100 % (= 11.5 Gy), V100 ≥ 90 %,V150 ≤ 35 %
D10 - Urethra ≤ 115 % (= 13.2 Gy), D0.1cm³ - Urethra ≤ 120 % (= 13.8 Gy)
D10 - Rectum ≤ 75 % (= 8.6 Gy), D0.1cm³ - Rectum ≤ 80 % (= 9.2 Gy)
D10 – Bladder ≤ 75 % (= 8.6 Gy), D0.1cm³ - Bladder ≤80 % (= 9.2 Gy)
Combitherapy
Reference dose = 10.5 Gy
D90 ≥100 % (= 10.5 Gy), V100≥ 90 %, V150 ≤ 35 %
D10 - Urethra ≤ 115 % (= 12.1 Gy),D0.1cm³ - Urethra ≤ 120 % (= 12.6 Gy)
D10 - Rectum ≤ 75 % (= 7.9 Gy), D0.1cm³ - Rectum ≤ 80 % (= 8.4 Gy)
D10 – Bladder ≤ 75 % (= 7.9 Gy), D0.1cm³ - Bladder ≤ 80 % (= 8.4 Gy)
Methods
Preplan

Positioning of patient and required set up

The patient is placed in precisely the extended lithotomy position with buttocks flat, horizontal, and parallel to the floor, A foleys catheter is placed to define the urethra, and indicates the location of the bladder neck. A stepping and stabilizing device is used with the ultrasound probe in both the preoperative volume study and the actual implantation procedure to improve the stability and accuracy and decrease set-up time.Ultrasound probe is inserted in brachyballon and then this probe is rigidly fixed to a stepper device. Before fixation with stepper very little amount of water (10-30 ml) is pushed for the swelling of balloon surrounding the probe. Water causes compression of the prstate gland and push the lower border of prostate to move upwards for better visualization of whole prostate within the template.

Figure:1(a)

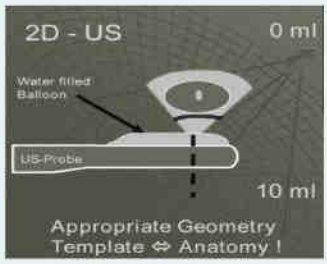

Figure:1 (b)

Figure:1 (c)

Figure:1 (d)

Figure:1 a.lithotomy position of the patient b. US probe with brachy balloon c.Show fixation needles in the template to fix the prostate gland.

Selection of the ultrasound frequency that optimizes the prostate image
Each brand and model of an ultrasound unit has an optimal working frequency for prostate gland visualization. In general, 6.5–7.5 MHz is the optimal range.

Adjustment of template:
The template which is used in patient (, needle template) has to be adjusted with the template display in US imaging system.it should be noticed that the lower boder of the template cover the whole prostate.

Stabilization of the prostate gland
Two fixation needles or anchor needles are needed to stabilze the prostate to the template.

Set up of the planning environment
It means before starting the treatment, system parameters such as specific template, needle, source, patient, afterloader has to be selected in TPS.as selected environment influences the treatment.

Determination of Base to Template distance
US probe is entered through rectum until base of the prostate gland is seen. At that position Z coordinate (along the probe) make 0.0 mm in the TPS. There is a marking over the probe. From the base of the prostate to the 0.0 marking over the probe is 200mm. The distance between the template to the 0.0 marking is measured (dmeasure) from which distanc form the base to template difference (dSWIFT) is determined.

$$dSWIFT = 200.0\ mm - dmeasure$$

Image Acquisition
A longitudinal ultrasound image is obtained at the longest cephalad-caudal axis to determine the number of transverse slices of the prostate. Then transverse ultrasound. images are recorded from 20 mm cranial to the base into the bladder to 20mm behind the apex of the gland at 1 mm intervals at a slice thickness of 1mm, which overlays a grid of dots on to these images that correspond to the template holes. Base plane, apex plane and reference plane are defined here.

Contouring
3D prostate contouring possible with SWIFT or Oncentra prostate (OCP). Medical oncologist contour the target (prostate gland) and other risk organs which are urethra, bladder and rectum. According to Offenbach protocol CTV1 is contoured by the oncologis as defined in GEC-ESTRO recommendations.

Prescription and Normalization
Before starting virtual plan in oncentra prostate dose is prescribed according to indication either monotherapy or boost.

Catheter placement in Virtual plan
Preplanning require no set-up problems, since preplan is directly followed by needle implantation, Planning can be done in manual or inverse plan (HIPO protocol) or auto method.

Manual method
In prostate implants potential needle positions are localized by the physicist with respect to a template that is placed in a fixed position relative to the treatment region (the prostate gland). There are some parameters which are placment setting, optimization setting, dose sample settings, have to be fullfilled.

Hybrid inverse plannig optimization (HIPO)

There is HIPO protocol or dosimetry protocol or protocols for dosimetry constraints rules for predefined needle placement and optimizing the DVH using dosimetry constraints and improving it. In this method the number of the catheters has to be proposed in the software then HIPO runs and trying to adjust the catheter placement in respect to target. Computer checks 140 catheter placement and done DVH optimization within 20 second. This program not only change geometrically but also optimized at the same time. Computer software plans according to needle placement and dose constraints. HIPO also adjust the depth of individual catheter. Other parameters such as 1st active dwell position 9.5mm behind the tip, source of dwell position in needles and dose constraints are fulfilled.Then dose planning and evaluation is done. Treatment calculation done according to TG43line formalism.

Figure:2 (a)

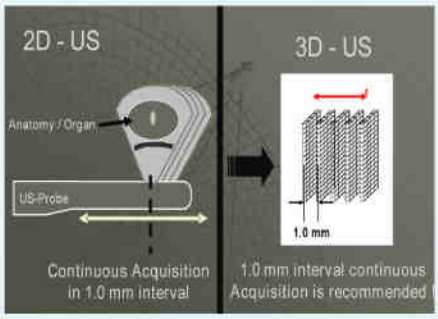

Figure:2 (b)

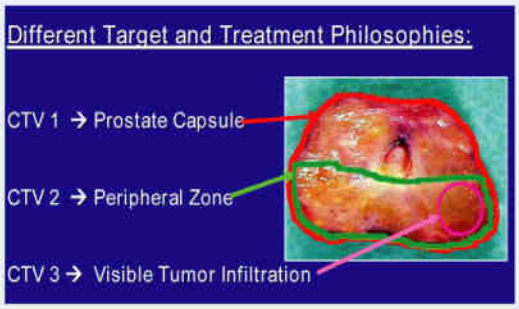

Figure:2 (c)

Figure:2 a. Set up of the planning environment. b. Acquisition picture at 1mm interval c. Contour of clinical target volume according to GEC-ESTRO recommendations.

Live planning

Needle placement

Needle has to be inserted within the template holes selected in virtual plan by manual or HIPO. method. As the first dwell position is 7 mm behind the tip of the catheter so from the base catheter should be at least 7mm towards bladder. After the all needle placement urologist check the depth individually. Pubic arch interference can prevent needles being placed anteriorly or laterally in men with large glands and narrow pelvic openings, angle of the probe can change (medial or lateral to the hole).

Image Acquisition

A contrast dye Endosgel with mixing of water is given in catheter for better visualization specially urethra. During pushing of the needle base is shifted about 1-2 cm cranially. Base to template distance is readjusted. So that image acquisition has been newly taken as preplan.

Contouring

Contouring done in preplan has little bit changed in postplan due to bulging of prostate gland as a result of insertion of catheters which significantly change the urethra position.

Catheter Reconstruction

Part of reconstruction process has already done during insertion of needle which can be seen.in navigation window. In sagital view when insertion is done from outside to inside each catheter can be seen clearly. Catheter is measured and record it in TPS. There is a locking system in oncentra prostate software. Computer knows the physical length and adjust continuously. With the help of free length, the tip of each cathter automatically adjusted and last part extrapolated by the computer.

The part outside the template is 100% corelated with the virtual plan is verified and corrected. Selection of the type of catheter in set up environment automatically the length from tip of the catheter to 1st dwell position , indexor are selected by data base.

Dose planning and evaluation

Dose prescription is selected, dwell position of all catheters are autoactivated. Presetted dose constraints are loaded.Then optimization done with inverse planning algorithm which wil immediately calculate a new dose based on updated needle position to reflect the real situation of the treatment.With DVH planning evaluation is done.Prescription dose be delivered to at least 90% of the target volume.

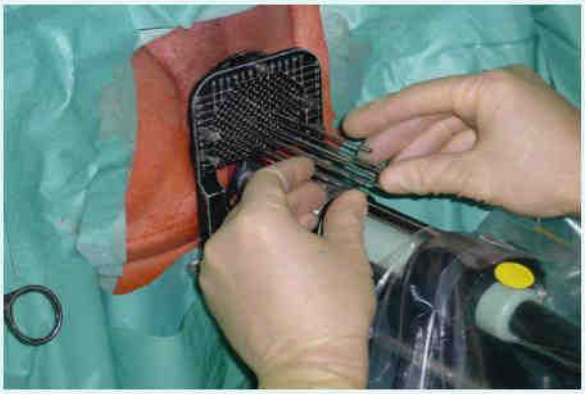

Figure:3 (a)

Figure:3 (b)

Figure:3 a.Implantation of the catheters according to preplan.

b. Optimization of dose distribution around each needle.

RESULTS

Combitherapy

This study is based on data of 1847 prostate cancer patients of intermediate or high risks from the year January 1997- December 2006 who received 3D- US based HDR- Boost treatment. The median age of these patients 73 years (50-90).

After a follow up of 5 years 73.3% , 91.9%, 76.2%, 76.8% are the overall survival (OS), cause specific survival (CSS), biochemical control (BC, 5-year), disease-free survival (DFS) of these patients. These parameters are compared with other hospitals in table 1.

Table: 1 Comparison of follow up parameters for prostate patients

	Galalae et. al.	Vargas et. al.	Offenbach
Cases	611	197	543
OS	85 %	92%	73.3 %
CSS	96 %	98 %	91,9 %
BC	77 %	78.4 %	76.2 %
DFS	67 %	84.8 %	76.8 %

Monotherapy

373 patients with 3D US monotherapy for prostate cancer are selected for this retrospective study. Selected patients were treated between August 2001- November 2006. The age, stage and serum PSA value of the patients are as follows:

Table: 2 Evaluated Parameters of Monotherapy patients

Age	45-84 years (mean: 67)
Stage	T1c 62% T2a 38%
Serum PSA	0.75-10.0 ng/ml (median: 6.9)

- Acute and chronic toxicity

The main complications are urogenital toxicity and gastrointestinal toxicity. Chronic toxicities are rectal ulceration, rectal and urethral fistula, definitive Colo- and Urostomie, urethro-prostatic fistula. The complication results of Boost therapy and monotherapy with two implants are shown in table: 3,4,5.

Table: 3 Rate of complication after Boost therapy

Stage	Urogenital toxicity		Gastrointestinal toxicity.	
	Acute	Chronic	Acute	Chronic
I	67	16	28	11
II	28	6	7	8
III	5	6	0	0
IV	0	0	0	0

Table: 4 Rate of complication after Monotherapy (2 implants)

Stage	Urogenital toxicity		Gastrointestinal toxicity.	
	Acute (%)	Chronic (%)	Acute (%)	Chronic (%)
I	33.9	2	96.4	3
II	51.8	1	3.6	1
III	3.3	0	0	0
IV	3.9	0	0	0

Table: 5 Rate of complication after Monotherapy (1 implant)

Stage	Urogenital toxicity		Gastrointestinal toxicity.	
	Acute (%)	Chronic (%)	Acute (%)	Chronic (%)
I	26.9	5	79.3	6
II	46.2	1	18.6	1
III	9.6	0	0	0
IV	0	0	0	0

Discussion

While brachytherapy alone in low risk patients can yield excellent disease control and a reported 93%, 5 years freedom from biochemical failure, brachytherapy as monotherapy in intermediate and high risk disease (Gleason score >6, and/or PSA >10 ng/mL) is less than optimal. Even with modern brachytherapy techniques, intermediate and high risk patients are fair poorly with brachytherapy alone.

The addition of EBRT provides a broader delivery of radiotherapy and the benefit of greater dose distribution and coverage of tumor that has extended beyond the prostate capsule. Brachytherapy alone, however, may be limited in its ability to deliver adequate doses to disease extending beyond the prostate. By combining brachytherapy and three- dimensional conformal radiotherapy (3D-CRT) one gains the benefit of higher dose delivery provided by brachytherapy along with coverage of disease that may extend outside of the prostate gland proper with the use of EBRT. Furthermore, if cancer cells have spread to the draining lymph nodes, brachytherapy will not address these areas of disease. An additional benefit of combined brachytherapy and EBRT is in patients who have received suboptimal implants. Combined modality may be justifiable in those patients who have received suboptimal implants and require supplemental doses of radiation to compensate for underdosed areas of disease. A second benefit of combining EBRT with brachytherapy is the added radiation doses to disease that has extended through the prostatic capsule and/or into the seminal vesicles. Both extracapsular extension (ECE) and seminal vesicle invasion (SVI) are adverse prognostic factors that can be estimated by PSA and Gleason scoring, using the following equations derived from Partin and described by Roach.

ECE= (3/2) PSA + [(GS .3)×10]

SVI=PSA+ [(GS .6) ×10]

Also patients with a prior history of transurethral resection of the prostate (TURP) should be cautioned about the potential risk of incontinence, but in our experience even these patients have faired well, likely owing to the modest doses that may be administered to the urethra without compromising peripheral zone coverage.

Activities of Bangladesh Medical Physics Society (BMPS) for International Day of Medical Physics (IDMP) 2016

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Every year Bangladesh Medical Physics Society (BMPS) doing different activities to pursue the public awareness about medical physics in Bangladesh through arranging rally, seminar, conference etc. Keeping in mind the theme of IDMP this year BMPS performed several activities related to this for improving the medical physics, educational status in this country. The several program arranged by BMPS are mentioned below:

1. Seminar on 'Introduction to Medical Physics in Bangladesh'

On 11th April 2016, a seminar was held on behalf of Bangladesh Medical Physics Society (BMPS) and department of Medical Physics & Biomedical Engineering (MPBME), GonoUniversity at the MPBME department.*The main aim was to disseminate the knowledge, necessity, importance and the present stand of medical Physics education in our country.*

A good number of participants from Dhaka Women's Polytechnic Institute and Gono University were attended the seminar. The president of BMPS Dr. KumareshChadra Paul and the head, Dept. of MPBME &founder president of BMPS Prof. Dr. Hasin Anupama Azhari were delivered their lectures on medical physics education, perspectives, cancer awareness and different challenges of this field. Finally, participants visited the MPBME department and showed their interest to work in this field.

Seminar on Medical Physics in MPBME

2. Training program on QC of Imaging Equipment: Annual Conference of Bangladesh Society of Radiation Oncologist (BSRO) & Bangladesh Medical Physics Society (BMPS); ACBSROBMPS-2016

In Bangladesh there is no medical physicist and no QC protocol in diagnostic imaging in Bangladesh.Quoted in message of Prof. John Damilakis, Chairman of the IDMP Task Group "Lack of knowledge in radiation protection and dosimetry may lead to unjustified X ray examinations, over-doses during CT and fluoroscopically-guided procedures, therapeutic abortions due to accidental exposures of pregnant patients and various other accidT) during the The Annual Conference of Bangladesh Society of Radiation of Radiation Oncologist & Bangladesh Medical Physics Society

(ACBSROBMPS-2016) was held on 24-25 September, 2016 by the joint effort of Bangladesh Medical Physics Society (BMPS) and Bangladesh Society of Radiation Oncologists (BSRO).On the second day, there was a training program entitled on 'Training on TPS & QC of Imaging by Foreign Experts'. Two German expertsDr Martina Treibar Radiation Oncologist and Ms Renate Waltar Medical Physicist were conducted the TPS training program. Besides that, QC of imaging training on Radiography, Fluoroscopy, Mammography and Computed Tomography (CT) was held in Padma Diagnostic Centre, Dhaka which also guided by the German expertsMr Daniel Boedeker and Prof Dr G A Zakaria.

The Conference was divided into two parts. On the first day it comprises Inaugural Ceremony, vendor presentation, two scientific parallel sessions, poster session and AGM of BMPS. The conference was inaugurated by the Chief guest Dr. GowherRizvi, International Affairs Adviser to the Honourable Prime Minister, Government of the People's Republic of Bangladesh.

More than 300 participants including many eminent scientists, young researchers from universities, hospitals and industries were exchanged their views, knowledge, experience by the fruitful interactive sessions.

The main aim of this annual conference is to take necessary steps to establish QC procedure in hospitals through cooperation with the Bangladesh Atomic Energy Commission (BAEC) and Bangladesh Atomic Energy Regulatory Authority (BAERA) and Bangladesh Society of Radiology and Imaging (BSRI).

Figure: Inaugural Ceremony

Figure: Participants ACBSROBMPS-2016

3. Public Awareness program on ' Medical Physics Education for Better Cancer Care'

On 5th October, 2016 another seminar was held on "Medical Physics Education for Better Cancer Care" at KumudiniGovt. Girls College, Tangail which was jointly conducted by the Bangladesh Medical Physics Society (BMPS) and Dept. of Medical Physics & Biomedical Engineering (MPBME), Gono University.

President and Joint Secretary of BMPS were discussed about necessity of medical physicists, importance of medical physics education,medical physics career, public awareness of cancer care and many other issues.

Public awareness program in Kumudini Govt. College

4. Publication of e Newsletter (Voice of BMPS)

As usual this year BMPS will publish official e newsletter on 7th November 2016 at the occasion of 4th International Day of Medical Physics (IDMP). Theme of IDMP " EDUCATION IN MEDICAL PHYSICS: THE KEY TO SUCCESS". This issue will contain different awareness program for medical physics education, conference reports, experience of foreign training etc.

5. Seminar and Rally on 7th November:

BMPS will also arrange a seminar on the theme of IDMP and will arrange a rally by the Medical Physicists.

Report on ACBSROBMPS-2016, Bangladesh

[1] Nupur karmaker, [1] Abu Saif, [1] Hasin Anupama Azhari and [1, 2] Golam Abu Zakaria

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[2] Dept. of Medical Radiation Physics, Gummersbach Hospital, Academic Teaching Hospital of the University of Cologne, Germany.

Introduction

Regarding development and improvement of Medical physics status in Bangladesh Bangladesh Medical Physics Society (BMPS) is continuously performing different activities throughout the year since its inception 2009.

As Medical Physics is a new era in our country, BMPS is playing an important role in various diversities such as post creation in the hospital, organization of different national and international scientific conferences, workshop with collaboration with different institutions, societies etc. BMPS arrange executive committee meeting (every month), quarterly meeting (every three months), annual conference (ACBMPS) and it arranges International conference in Radiation oncology and Imaging (ICMPROI), which is already occurred in 2011, 2014 (every three years). In addition BMPS celebrate 7 November in each year by publishing e-newsletter (Voice of BMPS).

In near future, BMPS will accomplish the goal of the infrastructure, requirements and examination procedures for the certification of medical physicists in accordance with the requirements of International Organization of Medical Physics (IOMP) guidelines with association of other societies.

Recently, BMPS has organized two days annual conference "Annual Conference of Bangladesh Society of Radiation Oncologist (BSRO) & Bangladesh Medical Physics Society (BMPS) (ACBSROBMPS-2016)" on 24-25 September, 2016 at Bangladesh Institute of Administration and Management (BIAM) auditorium.

Co-organizers

In this conference the co-organizers are Department of Radiotherapy, Dhaka Medical College Hospital (DMCH); Department of Medical Physics & Biomedical Engineering (MPBME), Gono Bishwabidyalay; Institute of Nuclear Medical Physics Project, Bangladesh Atomic Energy Commission (INMP, BAEC); Institute of Nuclear Medicine and Allied Sciences(INMAS), Dhaka Medical College Campus; Institute of Nuclear Medicine and Allied Science's (INMAS), Dhaka Medical College Campus and Military Institute of Science and Technology (MIST).

Participants

About 300 participants from different universities, hospitals, industries and foreign delegates from India, China, Nepal, Germany attended this program and exchanged their views, knowledge, experience and ideas.

This two days long program comprises of inaugural ceremony, vendor presentations, scientific parallel sessions, poster session, annual general meeting (AGM) of BMPS, award ceremony, training program on TPS & quality control of imaging and closing ceremony.

First Day

* Inaugural Ceremony

It was held on Saturday, 24 September 2016 in BIAM Auditorium and inaugurated by the Prof. Dr. Gowher Rizvi, Adviser for International Affairs & Special Representative of the honourable Prime Minister of Bangladesh was present to grace the occasion as the Chief Guest. Prof. Dr. M. Iqbal Arslan, Dean, Faculty of Basic Science & Para Clinical Science, Syndicate Member, Bangabandhu Sheikh Mujib Medical University (BSMMU) and **Dr. Gauranga Chandra Mohonta,** Project Director, (Additional Secretary), Higher Education Quality Enhancement Project (HEQEP), University Grant Commission (UGC) were present as special guests. **Dr. Martina Treiber**, Head of the Radiooncology Department, Caritas Klinikum Saarbruecken, Germany was present as guest of honor. **Prof. Dr. Golam Abu Zakaria,** Germany was present as the keynote speaker and **Prof. Dr. M. A. Hai** was the patron of the conference. The session was presided over by **Prof. Dr. Sheikh Golam Mostafa**, Vice President of BSRO and **Dr. Kumaresh Chandra Paul**, President of BMPS.

Fig. 1: Respected guests in the inaugural ceremony

- Scientific Sessions

It was designed by keynote speech, invited lectures, oral (22), poster (33), vendor presentations.

- Poster session and award ceremony

Thirty three posters were displayed in the gallery and judges of three members selected three posters out of them for first, second and third prizes. The title of first, second and third posters were "Design and Construction of Linear Variable Differential Transformer (LVDT)" by Fazlul Haque Rana, "Deep Inspiration Breath Hold Technique with Homemade LPT System For Left Breast Cancer Comparison between 3DCRT and IMRT" by Mokhlesur Rahman and "Deep Inspiration Breath Hold Technique with Homemade LPT system For Left Breast Cancer Using 3DCRT" by Md. Hafizur Rahman.

Fig. 2: Poster presentation and Three winner poster presenters with judges.

- Annual General Meeting(AGM) of BMPS

All categoris of BMPS members were present in the AGM. The President, joint secretary, treasurer have discussed the activities and related issues of the last one year. The honorary member and founder member have expressed the future activities and their implementation in AGM. Some new proposal from EC are unanimously accepted by general members.

Fig. 3: Annual General Meeting of BMPS-2016

Second Day

- Training Program on TPS (Eclipse)

Training program on TPS conducted by three groups from Bangladesh. In each group one radiation oncologist (RO) and one medical physicist (MP) from Bangladesh discussed our planning process, goals for different types of carcinoma (breast, cervical, prostaste and laryngeal carcinoma).

German experts Dr Martina Treiber, RO and Ms Renate Walter, MP discussed all casses individually with the participants as well as with the planner. It was very interactive learning session between oncologists and medical physicists.

Fig. 4: Training program on TPS

- Quality Control of Imaging

Still now there no established QC protocol in Bangladesh for imaging. On the basis of this, BMPS emphasize in the conference the training on 'Quality Control of Imaging training on Radiography, Fluoroscopy, Mammography and Computed Tomography (CT) which is conducted by two German experts: Mr Daniel Boedeker and Prof Dr G A Zakaria in Padma Diagnostic Center.

This is the first time in Bangladesh BMPS has started training program on this issue and consequently will take necessary steps to establish QC protocols in hospitals through cooperation with the Bangladesh Atomic Energy Commission (BAEC) and Bangladesh Atomic Energy Regulatory Authority (BAERA) and Bangladesh Society of Radiology and Imaging (BSRI).

Fig. 5: Honorable coordinator and experts for training program, at Padma Diagnostic Center.

Fig. 6: Practical secession in training program, at Padma Diagnostic Center.

- Closing Ceremony

The closing ceremony presided by the president of BMPS (Dr. Kumaresh Chandra Paul). Then the founder president of BMPS (Prof. Dr. Hasin Anupama Azhari) and the father of Medical Physics in Bangladesh (Prof. Dr. Golam Abu Zakaria) discussed the overall progress of medical physics situation and results of ACBSROBMPS-2016 followed by closing speech of the president of BMPS. Finally it is taken into importance that national and international cooperation and advice is necessary for the upgrowing further development of this subject which is now main concern of BMPS.

Fig. 7: Large number of male and female Participants of ACBSROBMPS-2016.

Acknowledgement

We are thankful to our colleagues, contributors, abstract reviewers, organizing committee, co-organizers sponsors, scientists, students and all other people who provided expertise for their assistance in the conference. Special thanks to Varian for there markable contribution to hold the conference succesfully.

BMPS Members Participation in Japan Radiological Congress (JRC) April 2016

Naima Jannat

The most powerful and influencing trend to share and exchange ideas, technologies, research methods have made the world to begin a completely new era. In this connection, Japan continuously arranges international events on Medical Imaging; Radiology and Medical Physics since 1988. Likewise, from 14th to 17th April 2016 Japan has arranged a gigantic conference in collaboration with the annual meeting of the Japan Radiological Society (JRS), the Annual scientific congress of the Japanese Society of Radiological Technology (JSRT), and the Scientific Congress of the Japan Society of Medical Physics (JSMP), at the most charming and famous Yokohama Exhibition Hall, Japan. Around 20,000 internationally conspicuous scientists and researchers from several countries have attended to the conference. On the behalf of two members of BMPS (Ms. Naima Jannat & Mr. Md. Mokleshur Rahman) were participated in this conference. They have presented their papers on "Deep Inspiration Breath Hold Techniques with Homemade LPT system for left breast cancer comparison between 3DCRT and IMRT", and "Displacement effect of cylindrical ionization chambers with high energy photon beams" by Ms. Naima Jannat & Mr. Md. Mokleshur Rahman respectively. Each day they have passed in Japan was extraordinary. They have also met with Dr. Shuichi Ozawa, Chief of Medical Physicist, Hiroshima High Precision Radiotherapy Cancer Center and extensively discuss with him regarding the opportunity for the students of Gono University for PhD, research, training, residency program in Japan. Also they have met casually with a prominent Medical Physicist named Professor Dr.Hidetoshi Saitoh, Graduate School of Human Health Science, Tokyo Metropolitan University and the President of JSMP in order to support the BMPS and to the prospective students of the Gono University.

Participation in JRC 2016

AMPICON 2015, Kerala, India, November 2015

Md. Safayet Jaman

Association of Medical Physicists in India (AMPI) organized their 36th Annual Conference of Association of Medical Physicists in India (AMPICON-2015) at G. V. Raja Convention Centre, KTDC Samudra, Kovalam, Thiruvananthapuram capital of Kerala, India. It was a three days scientific conference from 20 to 22 November 2015 with an additional pre-conference workshop on Radiobiology on 19 November 2015.

Inaugural Session, AMPICON 2015

I have participated in the conference for my poster presentation on "A New Experience of Co-60 HDR Brachtherapy Unit at Dhaka Medical College Hospital". It was a sharing of my experience of our then newly installed Co-60 HDR brachytherapy machine. I was the only person to participate in person from Bangladesh. There were four more participants from Bangladesh who submitted their poster but could not participate. The poster presentation was done for two days where my poster was presented on the first day on 20 November 2015. There were 205 posters presented in the event along with presentations from many oncologists and medical physicists from USA, UK, Europe, Middle East, Asia and Australia.

Poster presentation: BMPS Secreteery

It was my pleasure to attend the conference as the Secretary of Bangladesh Medical Physics Society. I had meeting with the AMPI president Prof. Dr. Arun Chougule, AMPI Secretary Dr. Vellaiyan Subramani and other executive members about the collaboration between the AMPI and BMPS. There were discussions about how to establish a better platform for the medical physicists of Bangladesh

through BMPS by establishing exchange programs, residency programs and allowance of Bangladeshi medical physicists to sit for CMPI examinations according to CMPI rules and regulations. This exam will evaluate and certify the medical physicists of Bangladesh as it is very important to be a qualified medical physicist to meet the objectives of medical applications of ionizing radiation. The history of medical physics in India is quite old and enriched with experience and recognized by different organizations like IAEA, IOMP, AFOMP. AMPI members have agreed to provide full support for the medical physicists of Bangladesh. They also showed interests to broaden the friendship and collaboration to uplift the medical physics of surrounding countries in Asia. They have also announced and distributed travel award for participants from outside India.

Secretary, BMPS with AMPI members

Some of the major sponsors of the event were Varian, Elekta, PTW, IBA, Teambest, Brainlab, Bebig etc. Different companies have demonstrated their then latest products in the field of Biomedical Engineering and Medical Physics. They have shown latest therapeutic machines, diagnostic and quality assurance equipments.

BMPS Secretary with Vendor persons

The event concluded with prize distribution for the best presentations, announcement of the next year AMPICON 2016 at Hyderabad, India and the annual general meeting of AMPI where all the members of AMPI discussed different agendas. They also highlighted the achievements of the past year and what have not been fulfilled and the future plan that would make the society flourish better.

15th AOCMP Congress in Medical Physics, Xian, China: November 2015

Hasin Anupama Azhari

15th AOCMP Congress Asia-Oceania Congress in medical physics was held in Xi'an, People's Republic of China, from 5 - 8 November 2015. In this conference the programme had focused on research & re-cent advancement to cover the whole spectrum of medical radiation physics: Therapy session (total 6), Imaging session (total 4), TG 100 Workshop, RTIS workshop, new technology/ radiobiology, Gamma Knife, Nuclear Medicine session, Dosimetry and Radiation Protection.

On the first day there was AFOMP council meeting. The personals of members countries, AFOMP were present. The needs for development of Medical Physics (MP) are discussed according to the appeal of different societies. A new Executive Committee formed and on behalf of BMPS we are congratulating to the new one.

There are some special programs other than presentations like IDMP celebration on 7th November. IMPCB symposium. All representatives from IOMP,AFOMP, EFOMP, AAPM had been elaborately and clearly defined the importance of this day. All the member countries organizations must celebrate this day for public awareness as well as for the future positive aspects for their country.

a. BMPS members with new AFOMP Executive Committee b.with Prof. Dr. Yimin Hu c.with Dr. Raymond Wu

In this conference the selection of awardees for poster presentations were done from students. This was an encouragement for the future generations of MP for more interested towards research and scientific work. In IMPCB symposium the member of the IMPCB showed the procedure of certification. Also AFOMP president shows the process how Korean Medical Physics Society has achieved the accreditation and certification from IMPCB. Following this a round table discussion was done with the participants of different countries which was extremely useful for us, as in many countries are need of this. Honorary Member and founder president of BMPS were invited in 15th AOCMP Congress as an invited speakers and Chair of a session.

Lastly it was a great honour for me as an awardee of this conference as well as for Bangladesh Medical Physics Society (BMPS). Young medical physicists will be encouraged for this type of support from AFOMP. I would like to express my sincere and outmost gratitude to the chairman of the award committee Dr. Kin-Yin Cheung for considering me for this travel award, special thanks to AFOMP Past President Prof Yimin Hu, AFOMP Secretary Prof Howell Round and other members for their continuous support for BMPS.

Report of the DAAD Scholarship Holder. November 2014-January 2015

Mr. Faruk Hossain

Medical Physicist
United hospital Ltd. Dhaka, Bangladesh

Invitor: Department of Radiation Oncology of the University Medical Centre Mannheim, University of Heidelberg, Germany.
Time period: 1st November 2014 to 31st january2015.

Introduction: After obtaining academic degree or post graduation certificate course like M.Sc in Medical Physics, it is not possible to work in a clinic as a medical physicist without clinical training or internship. But due to insufficient standard radiotherapy centre and qualified medical physicist, our Medical physics practice was very poor as a medical physicist. When I was straggling to survive for my work as a medical physicist with a very upgrading technology, then DAAD offer me 03 months internship program under the collaboration between GONO University and Heidelberg University enriched by the PAGEL project. So it was very right time initiative from the DAAD to upgrading the knowledge of clinical medical physicist and it was bless for me definitely.

Scientific Activities: My desire and expectation was little bit high as my centre have a very high tech machine like true beam and QA tools like matrix & compass. So I was trying to cover all my interested areas from 2D Conventional technique to Rapid arc planning, i.e. (2D, 3D-CRT, IMRT) for radiotherapy as well as the use of patient specific quality assurance (QA) with matrix and Compass. I was determined from the beginning for fulfilled my vision but it was not matched with the centre where I was placed first but I got it at last. By this time I visited 03 different radiotherapy centers During my stay in Germany, i visited three modern cancer center as follows, at first at Klinikum Coburg (Diacura Coburg-Strahlentherapie) for six weeks which was focused on radiation treatment planning techniques of 3DCRT, IMRT and VMAT, after that OGD-Ostprignitz Ruppiner Dineste GmbH, Berlin for three weeks where I learned absolute and relative dosimetry of high energy photon and electron beam and machine data QA, finally at the Ubbo Emminus Klinik, Aurich, I performed hands on procedures of different patients specific quality assurance(QA) with matrix & Compass verification tools. As a result I got experience with multi diversity in both my professional works and daily life. Every medical physicist was very much experienced in their work and co-operative. They always tried to give me their best knowledge and possible help. Even they (Dr. Martin Metzger, Medical Physicist, Klinikum, Coburg) attached me IBA dosimetry training program in Germany for five days expertise training. They shared their idea, different planning technique and the Patient specific QA on hand. I also tried to receive from them as possible as much. So after this training I got a wide range of knowledge to do my work confidently. I also interact with them regarding many clinical issues. Now I am very much confident in my profession as a medical physicist. So I can say proudly that it was very fruitful internship program for me and this internship training changed my professional life in a better way with skills and confident.

Experience: Obviously I got a different way of experience and enjoyment. I saw different geographical location and people. I traveled a long way from Frankfurt to Aurich in different time for the hunt of knowledge and I enjoyed it. Every people were co-operative and helpful. Still now for some people, I feel good and I can not forget them. I saw snow fall first time in my life and I was very excited. I tasted different delicious food especially different type of bread.

Acknowledgement:

1. Prof. Golam Abu Zakaria, my favorite teacher and pioneer in Medical Physics in Bangladesh.
2. Dr. Hasin Anupama Azhari, Head, Dept MP/BME., Gono University
3. Prof.Frederik Wenz, Chairman, Department of Radiation Oncology of the Mannheim Medical Centre
4. Dr.Frank Hansley
5. Mr. Volker Steil
6. Andrea Grabenbauer
7. Dr.Martin Metzger
8. Mr.Willi Breyer and many others whose name I cannot remember now.

Conclusion: I think and belief that it was a very fruitful and effective internship program. This Scholarship program is developing our knowledge in medical physics to work in a clinical environment confidently and we are becoming capable to provide a good physics support for the wellbeing of the cancer patients.

Training Program On Germany

Experience About German Academic Exchange Service (DAAD) Funded Clinical Medical Physics Internship in Germany November 2014 – January 2015.

K.M Masud Rana

Medical Physicist

National Institute of Cancer Research and Hospital (NICRH)

For me the internship opportunity at the Department of Radiation Oncology of the University of Mannheim, Heidelberg, Germany from 1st November 2014 to 31st January 2015 which was covered by a scholarship of German Academic Exchange Service (DAAD), Germany was a great chance for learning and professional development. Therefore, I consider myself as a very lucky individual as I was provided with an opportunity to be a part of it. I am also grateful for having a chance to meet so many wonderful people and professional led me though this internship period.

Firstly, I would like to explain some valuable information about my entire training procedure. From the beginning I got important theoretical and practical knowledge from my respective trainers which were really appreciated and friendly cooperative for me to upgrade my capability to perform professional activities. During my stay in Germany, i visited three modern cancer center as follows, at first at OGD-Ostprignitz Ruppiner Dineste GmbH, Berlin for six weeks which was focused on radiation treatment planning techniques of 3DCRT, IMRT and VMAT, after that Mannheim Medical Center, Mannheim for three weeks where I learned absolute and relative dosimetry of high energy photon and electron beam and machine data, finally at the Ubbo Emminus Klinik, Aurich, I performed hands on procedures of different quality assurance test on beam data configuration for treatment planning system. Moreover I attended two workshops as follows Ruppiner Klinikan, Neuruppin, Berlinon the treatment planning techniques of intracavitary 2D and 3D brachytherapy treatment, another one on 3DCRT, IMRT treatment planning techniques at Uniklinik Koln, Koln as well.

In addition, from different hospital trainers, I have got lots of QA guidelines and treatment protocols for medical physics aspect of cancer treatment plans.

Bearing in my mind previous, I am using this opportunity to express my deepest gratitude and special thanks to the Mr. Volker Steil, Chief Medical Physicist, Mannheim Medical Center, and representative of DAAD, Germany who in spite of being extraordinarily busy with his duties, took time out to hear, guide and keep me on the correct path and allowing me to carry out my project at their esteemed organization and extending during the training.

I express my deepest thanks to **Prof. Dr. Golam Abu Zakaria,** Co-ordinator International Cooperation of this project, for taking part in useful decision and giving necessary advices and guidance and arranged all facilities to make the training easier.I choose this moment to acknowledgement his contribution gratefully.

I am deeply indebted to my respected teacher **Prof. Dr. Hasin Anupama Azhari**, Head, Department of Medical Physics and Biomedical Engineering, Gono Bishwabidyalay (University), for sleeting me as a trainee under the project between Gono Bishwabidyalay (University) and German Academic Exchange Service (DAAD).

It is my radiant sentiment to place on record my best regards, deepest sense of gratitude to, Dr. Frank Hensle y, **Dr. Wolfgang Baus, Mr. Willomitzer** and **Mr. Brayer** for their careful and precious guidance which were extremely valuable for my study both theoretically and practically.

I perceive as this opportunity as a big milestone in my career development. I will strive to use gained skills and knowledge in the best possible way and I will continue to work on their improvement in order to attain desired careering objectives.

As a whole the entire training programs for me accelerating my professional ability but I would like to add one of my recommendations which indicate the inclusion of the training material and evaluation system of exam based could be more useful for the upcoming trainees of this project. I hope this cooperation between Gono University and DAAD will continue long run to develop the Medical Physics Education System in Bangladesh.

Hospital Physicist: training in Germany

Training Report on Medical Physics under DAAD Scholarship

Mr. Nazrul Islam

Medical Physicist
Shaheed Ziaur Rahman Medical College Hospital, Bogra

Abstract

This report provides the details about aim, activities, progress & achievement of my training on quality assurance, quality control, and advance treatment planning like IMRT, Rapid Arc and HDR Brachytherapy at different hospital in Germany. This training has been achieved under the supervision of Dr. Andreas Block, Mr. Bjorn Pandikow and Mrs. Walter Renate. This report has four parts. The first part is about how I got the DAAD scholarship, the second part is about clinical training experience in different hospitals, the third part Miscellaneous and the last part is discussion and conclusion.

Introduction

I am working at radiotherapy department of government hospital in Bangladesh as a medical physicist. The department is equipped with a modern Linear Accelerator, Brachytherapy HDR after loader, conventional simulator and commutated tomography (CT) machines.

Radiation therapy requires accurate localization of the tumor. Computer Tomography (CT) & nuclear radioactive medicine are used to allow accurate delineation of the target region(s) and any surrounding critical structures. After delineation of the tumor volume by oncologist we have to make a plan how we can deliver prescribed dose into the tumor and minimum dose to the surrounding normal tissue and critical structures. We should verify every plan before delivering into the patients. Finally according to the established protocol we must ensure quality control and maintain quality assurance programs for all machines, treatment planning and delivery systems.

Objective

As a medical physicist, I had three aims in this training period.
First aim was to work with quality assurance and control team which will be helpful to improve our treatment planning & verification quality and to ensure the proper treatment delivery according to the planning. I have learned how to find out a solution of a problem scientifically and how can we improve quality control team in my center. I have seen different and new QA program which is not common & similar with our country that I may try to start or introduce it in our country.

Second aim was to learn advanced treatment planning modality like IMRT, Rapid Arc and HDR Brachytherapy. After completion this training I must be try to implement these planning modality in our center as usual as remaining center who has not enough planning knowledge in our country.

Third aim was to learn the importance of documents and how can we maintain these documentation in proper way. Documentation carries important rules in radiotherapy treatment management.

Finally, it will be helpful to the other physicist in our department who is not trained clinically, students especially for Gono Bishwabidyalay who works in our department for practical part of their thesis work.

How was I selected for this DAAD Scholarship

We know that the German Academic Exchange Service (DAAD) is a publicly-funded independent

organization of higher education institutions in Germany. The DAAD provides scholarships in Germany for international students for a range of postgraduate courses at German Universities which aim at providing academically educated young professionals from developing countries with further specialized studies.

It is our great pleasure that a cooperation agreement is signed between Ruprecht-Karls-Universitat Heidelberg, Germany and Gono Bishwabidyalay, Bangladesh in June 2002. After that a cooperation agreement is also signed between Gono Bishwabidyalay and Shaheed Ziaur Rahman Medical College Hospital, Bogra since 2010 for the experimental part of their bachelor and master students. I am working at the department of radiotherapy in this hospital as a medical physicist and act as a tutor/supervisor during the experimental part of their project and thesis work that comes from this university. Under this project I submitted a application to Gono Bishwabidyalay at the dept. of MPBME for long-term training in abroad updating my theoretical and clinical knowledge.

It is my great delight to Prof. Dr. Golam Abu Zakaria, program coordinator at Gono Bishwabidyalay and Dr. Hasin Anupama Azhari, head Dept. of Medical Physics and Biomedical Engineering, Savar, Dhaka giving me the opportunity to enjoy this training in Germany.

Details of Training Experience:

Quality Assurance (QA)

Quality assurance is an essential part of the radiotherapy process. It ensure consistency of the medical prescription, and safe fulfillment of that prescription, as regards the dose to the target volume, together with minimal dose to normal tissue, minimal exposure of personnel and adequate patient monitoring aimed at determining the end result of the treatment. Again, it must be stressed that quality assurance in radiotherapy is concerned with all aspects of the radiotherapy process and should involve all groups of staff in a cooperative approach, since quality activities are interdependent.

we have some QA program which have to do at regular interval like daily, weekly, monthly, quarterly, half-yearly and yearly for diagnosis & therapy machine, treatment planning & delivery software and personal & public safety. There are some specific rules of IAEA about QA which are mandatory to follow getting a license for any therapy machine & radioactive sources for clinical uses.

Quality Control (QC)

The 'Quality control' is the regulatory process through which the actual quality performance is measured, compared with existing standards, and the actions necessary to keep or regain conformance with the standards. Quality control is one part of overall quality assurance. It is concerned with operational techniques and activities used:

- To check that quality requirements are met;
- To adjust and correct performance if the requirements are found not to have been met.

Quality Standards in Radiotherapy

Quality standards are the set of accepted criteria against which the quality of the activity in question can be assessed. Various national or international organizations have issued recommendations for standards in radiotherapy:

- World Health Organization (WHO) in 1988.
- American Association of Physics in Medicine (AAPM) in 1994.
- The German Institute for Standardization (DIN NORM) in 1972
- European Society for Therapeutic Radiation Oncology (ESTRO) in 1995.
- Clinical Oncology Information Network (COIN) in 1999.

In other words without quality standards quality cannot be assessed. Hence, local standards need to be developed, based on a local assessment of requirements. I have worked in Klinikum Dortmund from 2nd September to 15th October under Dr. Andreas Block and his working team with QA & QC Program of linear accelerator, simulator machines and treatment planning & verification. The whole programs are described as bellow:-

TABLE -1: Frequency of Dose Monitoring System According to IPEM, AAPM & DIN Protocols.

Test	IPEM, U.K.	AAPM, USA	DIN, Germany
Output calibration			
Photons	D	D/3D	W
Electrons	D	D/3D	W
Output stability			
During day			A
Moving beam			A
Reproducibility	M	A	
Proportionality	M	A	A
Output variation with			
Gantry position	M	A	A
Arcing	M	A	A
Factors			
Wedge factor	M	A	6M
Tray factor		A	
Applicator factors	3M		

1.Dosimetry : Photon

- 1.1 X-ray output constancy
- 1.2 X-ray output calibration
- 1.3 Backup monitor chamber constancy
- 1.4 Typical dose rate output constancy
- 1.5 Photon beam profile constancy
- 1.6 X-ray flatness, symmetry change from baseline
- 1.7 Spot check of field size dependent
- 1.8 Output factors (two or more FSs)
- 1.9 Off-axis factors
- 1.10 X-ray beam quality _PDD10 or TMR10,20
- 1.11 Physical wedge transmission factor constancy
- 1.12 X-ray monitor unit linearity vs output constancy
- 1.13 X-ray output constancy vs dose
- 1.14 X-ray output constancy vs gantry angle

2. Dosimetry : Electron

- 2.1 Electron output constancy
- 2.1 Electron output calibration
- 2.2 Output factors for electron applicators
- 2.3 Electron beam quality _R50
- 2.4 Electron beam profile constancy
- 2.5 Electron beam energy constancy

2.6 Electron flatness, symmetry change from baseline
2.7 Electron monitor unit linearity vs output constancy
2.8 Electron output constancy vs gantry angle

3. Mechanical
3.1 Laser localization
3.1 Distance indicator _ODI_ @ iso
3.2 Light/radiation symmetric field coincidence
3.3 Light/radiation asymmetric field coincidence
3.4 Collimator rotation iso-center
3.5 Gantry rotation iso-center
3.6 Couch rotation iso-center
3.7 Gantry/collimator angle indicators
3.8 Jaw position indicators
3.9 Treatment couch position indicators
3.10 Wedge placement accuracy
3.11 Compensator placement accuracy
3.12 Accessory trays
3.13 Latching of wedges, blocking tray Functional
3.14 Electron applicator interlocks Functional
3.15 Coincidence of radiation and mechanical iso-center
3.16 Treatment table top deflection under load.
3.17 Table travel maximum range movement in all directions
3.18 Distance check device for lasers compared with front pointer

4. Safety:
4.1 Laser guard-interlock test
4.2 Beam on indicator
4.3 Room entrance interlock
4.4 Door closing safety
4.5 Radiation leakage & survey
4.6 Manual door opening
4.7 Audio video monitor system
4.8 Beam ON/OFF indicators
4.9 Emergency off switches
4.10 Dead man`s switches

5. Enhance Dynamic wedges:
5.1 Morning check-out run for one wedge
5.2 Central axis transmission factors for all energies.
5.3 Check of wedge angle for 60°, full field
5.4 Check of off-center ratios @ 80% field width @ 10 cm
5.5 Dynamic wedge factor variation with gantry angle

6. Multileaf Collimator (MLC)
6.1 MLC field vs Light field
6.1 Alignment of leaf positions
6.2 Leakage between leaves.
6.3 MLC transmission factor.
6.4 MLC leaves speed check.

Practical QA Sheet:
Weekly QA for Linear Accelerator

Weekly Mechanical and Safty QA of LA

			Tolerance	
			Yes	No
1. Beam Signal Light (Green/Yellow/Red) Monitoring :			√	
2. Door Sensor (IN/OUT Sefty, PSS) Check :			√	
3. Beam ON/OFF Control Monitoring (Check Beam ON/OFF button, Open door during Beam ON)			√	
4. Dos1 Override (50MU, 6X &15X) **(Dose1 should be override 1st time)**	D1 (55MU)			
	D2 (55MU)			
	t (0.2min)	0.15 Min.	√	
5. Dos1, Dose2 Override (50MU,6X &15X **(Dose1& dose2 should be override 2nd time)**	D1 (89MU)			
	D2 (89MU)			
	t (0.3min)	0.30 Min.	√	
6. SF6 Gas Check (Wave Guide) HV-Line (220 kPa, 30-32 PSI)	31	PSI	√	
7. Water Temp. & Level	°C	**High / Medium / Low**	Medium	
8. Iso-Center Control at SSD 100 cm (set 5cm Polystyrol Plate on Couch top and check the distance from collimator to plate)	49	mm		
Laser Alienment Check	<1	mm	√	
Couch Vertical hight (50 mm)	49	mm		
9. MLC Field (Created Irregular Field)			√	

10. Jaws Field (100 X 100) mm2	X1	X2	Y1	Y2
	4.9 mm	5 mm	5 mm	5 mm

Report of DAAD Scholarship Training on Medical Physics November, 2015

Md. Masud Parvej

Medical Physicist
Institute of Nuclear Medicine and Allied Sciences, INMAS, Bangladesh Atomic Energy Commission (BAEC), Comilla

Abstract

This report provides the details about aim, activities, progress and achievement of my training which have been achieved under the supervision of Prof. Dr. Gerhard Glatting (Medical Radiation Physics/Radiation Protection) from 1st November, 2015 to 27th November, 2015.

This report has two parts. The first part is about learning knowledge from class of Prof. Dr. Gerhard Glatting on Nuclear Medicine. And the second part is just study about small part of research project to find the optimal cluster number which can be used for PET data.

Introduction

I have attended the eight lectures on Nuclear Medicine of M.Sc. class where I have learnt a lot of things. Most important things of lecture material which I have achieved, are described in method part. Data Clustering is a technique of finding similar characteristics among the data set which are always hidden in nature and grouping them into groups, called as clusters. The manual clustering is an operator dependent and time-consuming process. Automatic segmentation for dynamic PET images using cluster analysis offers advantages by reducing operator error/subjectivity and the time for data analysis. Different clustering algorithms exhibit different results, since they are very sensitive to the characteristics of original data set especially noise and dimension. The aim is to search for good criteria to find the optimal cluster number for PET data and make comparison between them. The criteria must take into account the noisy distribution for PET data.

Method

The title of first class was "Nuclear Medicine - Introduction". It was to introduce about Nuclear Medicine (NM) which are given below-
Nuclear Medicine (NM): It is application of radioactive or radioactively labelled substances for diagnostics or therapy.

Main fields of application of NM:

- Function diagnostics of internal organs.
- Detection/localization of tumors or of inflammation sites.
- Molecular Radiotherapy (MRT)/Targeted Radionuclide Therapy (TRT)

Imaging Methods of NM: In NM, there are 3 types of imaging method where are used NM.

a. Planar Scintigraphy: to get only 2D image.
b. Single Photon Emission CT (SPECT): every single arising photon is counted.
c. Positron Emission Tomography (PET): it produces always pairs of photons and only pairs will be detected as a valid signal.

In NM, Radiation comes from insides the patient's body and it is always detected outside of body. NM is not used only imaging or diagnostic. It's also used for therapy.

Tracer: The tracer principle, which forms the basis of nuclear imaging, is the following: a radioactive biologically active substance is chosen in such a way that its spatial and temporal distribution in the body reflects a particular body function or metabolism. In order to study the distribution without disturbing the body function, only traces of the substance are administered to the patient.

The radiotracer decays by emitting gamma rays or positrons (followed by annihilation gamma rays).The distribution of the radioactive tracer is inferred from the detected gamma rays and mapped as a function of time and/or space [1].

The most often used radio-nuclides are 99mTc in 'single photon' imaging and 18F in 'positron' imaging.

The title of second class was **"Nuclear Medicine - Basic Physics".**

It was about basic physics on radiation and its classification like electromagnetic radiation (photons) for example- X rays, γ rays, microwaves, radio etc., particulate radiation (charged/uncharged) for example- Helium nuclei (α), electrons, positrons (β), protons (p), neutrons (n) and ionizing radiation. Ionizing radiation is two types. One is direct ionizing, which is occurred by charged particles and second one is indirect ionizing, which is occurred by charge less particle like photons, neutrons. Natural sources of ionizing radiation are radioactive substances, cosmic radiation and artificial sources are particle accelerators (like X ray tubes, cyclotrons, linear accelerators etc.), nuclear power plants and nuclear fusion.

Then, it was focused on radioactive decays, which is a statistical process and it is a property of the atomic nucleus. There are some kinds of decays like α decay, β- decay, β+ decay, electron capture etc. which are primary emission. There are also described about secondary emission like γ-rays (quanta), internal conversion, characteristic x-rays, auger electrons, annihilation radiation. I have got some properties like the related process, particle & energy of each decay.

Then, it was also described about activity of radioactive source, Decay Law, Attenuation Law, Half-Life Typical Half-Lives, Effective Half-Life, Square law of intensity, Bremsstrahlung X ray and characteristic X-rays.

And finally, it was describe about the interaction of charge and uncharged particles with matter. I have known that the Photo Effect, Compton Effect and Pair Production are 3 groups of processes of interaction of uncharged particles (Photons) with matter.

The title of third class was **"Nuclear Medicine - Radionuclide Production".**

It was about characteristics of radionuclides which are useful for NM (Table 1). In NM, we need the radionuclides of short half-life. But, generally, Natural isotopes are long-lived. So, we have to produce artificial short half-life radionuclides. And there are three ways to produce those. First one is Fission product by using nuclear reactor, second one is Cyclotron and last one is Generator.

Table 1. – Characteristics of common radionuclides [2]

Nuclide	Photons (keV)	Production mode	Decay mode	Half-life ($T_{1/2}$)
^{67}Ga	93, 185, 296, 388	Cyclotron	EC	78 hr
^{99m}Tc	140	Generator	IT	6 hr
^{111}In	173, 247	Cyclotron	EC	68 hr
^{123}I	159	Cyclotron	EC	13 hr
^{125}I	27, 36	Reactor	EC	60 d
^{131}I	364	Fission product	β	8 d
^{133}Xe	80	Fission product	β	5.3 d
^{201}Tl	70, 167	Cyclotron	EC	73 hr

β, beta decay; EC, electron capture; IT, isomeric transition.

Then, it was described about the working principle of three production mood. And I have got some answer about Generator which is used more in my working field.

Generators consist of a parent-daughter radionuclide pair contained in an apparatus that permits separation and extraction of the daughter from the parent. The most important generator is the 99Mo-99mTc system. Because wide-spread use of 99mTc (gamma rays 140 keV, half-life~ 6h) for radionuclide imaging and favorable for planar scintigraphy, can be labeled to a wide variety agents.

And first time, I have seen the inside image of Generator.

The title of fourth class was **"Nuclear Medicine - Instrumentation".**
It was about the instruments which are used in NM. In NM, the radionuclides are used for two purposes. One is diagnostic and another one is therapy purpose. There are various kinds (in energy, range, half-life) of radionuclides which we have to detect, have to measure and get image. So, we need various types of detectors and nuclear imaging machine. And it is necessary to know its working principle too.

There are 3 types of detector. a. Gas-Filled Detectors, b. Semiconductor Detectors and c. Scintillation Detectors.

And, there are 2 types of Conventional Scintigraphy. a. Scintillation Camera b. SPECT [3].

Prof. G. Glatting described the working principle of these machines very well. And I have understood why the collimator is used in SPECT and why Lens is not used instead of collimators. And why we should keep minimum distance between the detector and the object.

He also made understand to me the difference between Computed Tomography (CT) and SPECT/PET, and the difference between SPECT and PET. CT is transmission process, where SPECT/PET is emission process. And, in SPECT, every single arising photon is counted, where in PET,it produces always pairs of photons and only pairs will be detected as a valid signal.

The comparison of PET vs. SPECT about energy, half-life of used nuclides, sensitivity etc. had been also described.

Finally, the class was ended by discuss about image reconstruction.

The title of 5th class was **"Radiochemistry/Radiopharmacy".**

Radiopharmacy/Chemistry consist of pharmacy, radiochemistry and organic chemistry.

In NM, we use radionuclides in imaging or therapy which depends on its properties like decay rays/particles, half-life, energy, penetrating, concentration and effect on target organ. We know that the whole energy of α and β is absorbed by target and penetrating power of γ is high than those. So, γ -ray is mostly used to diagnostic. For example- Usages of Iodine-Isotopes.: 123/124I is used for diagnostic purposes and 131I is used for therapy. The isotopes can be used as Sodium Iodide directly

Table 2. - Most important nuclides for therapy in NM (β- emitting)-

Radionuclide	Half-life (d)	median β^- energy (keV)	median β^- range (mm)
^{131}I	8.0	190	0.9
^{90}Y	2.7	900	3.9
^{177}Lu	6.7	130	0.7

99Tc is most important radionuclide in NM and it is widely used for diagnostic.
99Mo (T1/2= 66h) =>β- =>99mTc (140.5 keV, T1/2= 6h) =>γ =>99Tc => β- =>99Ru
I have learnt from this nuclear reaction equation why this is used more and how to produce 99Mo or 131I from nuclear reactor. Like-
235U(n,f) 99Mo ; which is high nuclide purity and much radioactive waste and
98Mo (n,γ) 99Mo ; which is little radioactive waste, low nuclide purity.
There are also described about Kit-Labelling, how a cyclotron produces the nuclides, the nuclides 15O and 13N can be used, which one nuclide is used more in PET and why we should chose it, Quality criteria of radiotracer like chemical purity, biological purity, radiochemical purity and specific activity etc.

The title of 6th class was "Dosimetry in Nuclear Medicine & Optimization in Molecular Radiotherapy".
Dosimetry is the measurement of the absorbed dose by the human body delivered by ionizing radiation. Internal dosimetry due to the ingestion or inhalation of radioactive materials relies on a variety of physiological or imaging techniques. Dosimetry is used extensively for radiation protection and is routinely applied to occupational radiation workers, where irradiation is expected, but regulatory levels must not be exceeded. In radiation therapy, dosimetry is the calculation of absorbed dose and optimization of dose delivery. It is necessary for accurate therapeutic dose prescription.
Internal Radiation Dosimetry is very important for prediction of the activity needed for achieving the desired effect in the planning target volume or organ and Prediction of the maximum tolerable activity for organs at risk (OARs) before therapy and for determination of the actual absorbed dose in the target volume or organ and other organs after therapy.
Difference between Teletherapy and Brachytherapy: Brachytherapy designates the use of radioactive sources within or in contact with the body as opposed to teletherapy, which is treatment with an external radiation beam.
Radionuclide Therapy: Radiolabelled substances with short range have to be injected into the patient [4].
Auger Electron: When a core electron is removed by external energy, leaving a vacancy, an electron from a higher energy level may fall into the vacancy, resulting in a release of energy. Although most of the time this energy is released in the form of an emitted photon, the energy can also be transferred to another electron, which is ejected from the atom. This second ejected electron is called an Auger electron.

There were also describes on physical component, geometrical component and biological component, describe dosimetry on the basis of Kinetic and Observation Model, How to calculate of absorbed dose for different organs by using OLINDA software, radiobiological modelling and standard therapy planning.
In another part, Radioimmunotherapy (RIT) has been also described briefly.

The title of 7th class was **"Nuclear Medicine -Evaluation of Diagnostic Systems".**
This class was about how to explain the efficiency measures relevant for diagnostic systems and about the method of Receiver Operating Characteristic (ROC) analysis.
Image quality could be evaluated combining two basic methods. One is Physical characteristics which depends on spatial resolution, contrast, noise of image and another one is Observer performance studies which is measured by ROC analysis.
There was described about ROC analysis curve and also described about the sensitivity and specificity of test, efficiency measures of Fourfold table which was very effective to understand the sensitivity and specificity.

The title of 8th class was "Nuclear Medicine - Tracerkinetic Modelling".
This class was about the pharmacokinetic modelling in NM and the "Compartment" and "Tracer" assumptions.
There was described why a model is necessary, described the aim of compartmental analysis, the definition of compartment model, given an example on two-compartment model, discussed about tracer, its advantages and an example of using tracer in a model.

Data Clustering is a technique of partitioning the data set without known prior information. It finds its use in most of the applications where unsupervised learning occurs. It is always an issue in finding an appropriate metric for measuring if found cluster configuration, number of clusters, cluster shapes etc. is acceptable or not.
Three different techniques are available to evaluate the clustering results: External, Internal, and Relative.
Two major parameters for the cluster validity indices are present for evaluation: Compactness and Separation.
a) Compactness: It measures how closely related the objects in a cluster are. A group of measures evaluate cluster compactness based on variance. Lower variance indicates better compactness. In addition, there are numerous measures that estimate the cluster compactness based on distance, such as maximum or average pairwise distance and maximum or average center-based distance.
b) Separation: It measures how distinct or well separated a cluster is from other clusters. For example, the pairwise distances between cluster centers or the pairwise minimum distances between objects in different clusters are widely used as measures of separation. Also, measures based on density are used in some indices.
As the goal of clustering is to make objects within the same cluster similar and objects in different clusters distinct, internal validation measures are often based on this two criteria [5] [6].

Conclusion

In conclusion, I am well satisfied with my training. I have learned many new knowledge about NM, acquired new technical skills. It is very good to acquire such a large number of skills in a three-month training period. So, this training of DAAD scholarship can be said to be very valuable.

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NEWS AND EVENTS

Seminar on Public Awareness for Better Cancer Treatment at Kumudini College: October, 2016

On 5th October, 2016 a seminar was held on "Medical Physics Education for Better Cancer Care" at Kumudini Govt. Girls College, Tangail which was jointly conducted by the Bangladesh Medical Physics Society (BMPS) and dept. of Medical Physics & Biomedical Engineering (MPBME), Gono University.

President and Joint Secretary of BMPS were discussed about necessity of medical physicists, importance of medical physics education, medical physics career, public awareness of cancer care and many other issues.

Public Awareness programme for Medical Physics at Kumudini College

Training of Personal INMP, BAEC: September - October 2016

Since 2004, BMPS started training program for Medical physicists in Germany to serve quality treatment in the radiotherapy department of the hospitals, Bangladesh. In the mean time since 2004, 30 manpower had undergone training in Germany in different updated radiotherapy technology. Honorary member, BMPS Prof. Dr. Golam Abu Zakaria arranged a one week visit cum training program of three medical physicists (Dr. Rajada Khatun, Ms.Shirin Akhter, Ms. Ashrafunnaher Monika) from Institute of Nuclear Medical Physics Project, Bangladesh Atomic Energy Commission in Gummersbach Academic Teaching Hospital, University of Cologne, Germany on LINAC operation, Dosimetry & Treatment Planning. Expenses of the training program borne by the Government of Bangladesh under project of INMP, BAEC.

Training of Personal INNP, BAEC: Germany

Visit to AMCGH, UHL, Apollo in Bangladesh, September 2016

In Bangladesh many of private and public hospitals are bringing updated radiotherapy technology. Recently two foreign experts, Dr. Martina Treiber, Head of the Radiooncology Department, Caritas Klinikum Saarbruecken, Germany and Ms Renate Walter, Medical Physicist, Ausburg Klinik, Germany visited UHL, Apollo on 26th September and AMGCH on 29 th September to see the radiotherapy treatment status in Bangladesh along with Founder President, President, Treasurer, Executive members, General members of BMPS. For the further progress of cancer treatment, the foreign experts discussed different issues during their visiting time which was very effective for the future plan.

Visit to United Hospital

Visit to AMCGH

1st European Congress of Medical Physics (ECMP), Athens, Greece: September 2016,

In order to gather international Medical Physics community from all over Europe and beyond and to offer them an inspiring environment to define common goals, 1st European Congress of Medical Physics (ECMP) was held from 1 - 4 September 2016, in Athens, Greece. The congress was organized by the European Federation of Organizations for Medical Physics (EFOMP), hosted by the Hellenic Association of Medical Physics and supported by the International Organization for Medical Physics (IOMP).

About 500 abstracts were presented (Oral and E-poster. during four days congress in 72 parallel scientific sessions. All accepted abstracts has been published in Physics Medical, the European Journal of Medical Physics (EJMP). Opening ceremony was held on the first day evening followed by cultural program and welcome reception. Welcome addresses delivered by Prof. J. Damilakis, ECMP 2016 & EFOMP President, Dr. V. Tsapaki, ECMP 2016 Vice President & IOMP Secretary General and Dr S. Tabakov, IOMP President.

European Congress of Medical Physics

Mr. Md Akhtaruzzaman, Vice-President of Bangladesh Medical Physics Society (BMPS) was present there and presented his scientific paper on the first day morning of the congress. The title of his scientific paper was "Dependence of Inhomogeneity Correction Factors on Nominal Photon Energy".

ECMP provides a unique opportunity for all participants to exchange ideas and share their knowledge and experience. Besides scientific programme, participants enjoy sightseeing and archaeological sites in Athens.

Meeting with Biomedical Engineers of Different Companies: August 2016

On 19th August 2016, Founder President and Treasurer of BMPS met with biomedical engineers working in different companies (Md. Nazmul Islam from Alive healtcare, ArabindoSarker and Saiyed Al Masud from Genetic Trading, Md. Tohidul Hasan from Trade Vison and Md. Fazlul Haque Rana from Unitrade Multicorporation). The demand of biomedical engineers are increasing day by day nationally and internationally. Importance of Biomedical engineers are thoroughly discussed in the meeting. Also it is urged to take appropriate steps to include BME in each hospitals, companies etc.

Meeting with Biomedical Engineers

Ambassador of Bangladesh to Poland visits to Maria S. Curie Memorial Cancer Centre, Poland: August 2016.

Mr. Md Akhtaruzzaman, Vice-President of Bangladesh Medical Physics Society (BMPS), currently conducting his research work at the medical physics department of the Maria Sklodowska-Curie Memorial Cancer Centre and Institute of Oncology, Warsaw, Poland. He invites ambassador of Bangladesh to Poland his excellency Mr. Mahfuzur Rahman to visit the medical physics department and treatment facilities of the hospital.

Ambassador and his wife visit this hospital on 10th August 2016. Prof. Pawel Kukolowicz and Mr. Akhtaruzzaman received them. At the beginning of the meeting Prof. Kukolowicz briefly describe the foundation of the hospital and contribution of Dr. Maria Sklodowska-Curie and latter, the ambassador was shown the small museum equipped with medical physics tools those were used in early days for cancer treatment. Finally, they visit the radiotherapy facilities which equipped with 8 linear accelerators, 3 brachytherapy machines, 2 CT-simulators and necessary diagnostic equipment (CT, MRI).

Ambassador of Bangladesh to Poland visits Maria S. Curie Memorial Cancer Centre

National Training for Radiation Oncology: August 2016

National Training for Radiation Oncology

A National Training program on "Cervical Cancer & Genitourinary Malignancies" was held from 7th-11th August 201 at Institute of Nuclear Medicine and Allied Sciences (INMAS), Dhaka Medical College Campus by technical support of International Atomic Energy Agency (IAEA). Prof. Dr. S K Shrivastava, Head, Radiation Oncology, Tata Memorial Hospital, India and Dr. Tharmar Ganesh, Chief Medical Physicist; Fortis Memorial Research Institute, India were conducted the training program. Participants both in oncology and medical physicist from different institute were successfully attended the training program. This five days training comprises the lectures, discussion sessions and hands on training in Delta Hospital Limited and United Hospital Limited. The trainees learned many things about brachytherapy insertions, contouring and planning etc. Finally, the training certificates were given to the participants.

Visit of MIST Delegation to Germany: June 2016

Recently in Bangladesh a few universities are opening the study of Biomedical Engineering. One of these is MIST (Military Institute of Science and Technology). BMPS, MPBME and other societies and organization are working together to develop the current situation of these professionals in Bangladesh. On the basis of this a MoU has been established between MPBME, GB and department of Biomedical Engineering, MIST. For professional and academic development a group of MIST Faculty headed by Dean Colonel Abu Zafor Mohammad Salahuddin, Faculty of Nuclear Science & Biomedical Engineering, MIST visit from 16-24th June 2016 in Germany. The visiting members of MIST were Colonel Md. Hasan Uz Zaman, Lt Colonel Md. Jahangir Hossain, Major Dr. Md. Altab Hossain, Nuclear Science & Engineering Department, MIST, Major Dr. Md. Ashrafuzzaman, Biomedical Engineering Department, MIST. During this period the delegations, MIST had participated DEGRO Conference 2016 (German Radio-oncology Society Conference) from 16 -18 June in Mannheim and visited Anhalt University of Engineering, Germany from 23-24th June 2016. A extensive program has been arranged by the Dean, Anhalt University of Engineering, Germany, where the delegations also met the Vice chancellor of the University.

MIST Delegation, Honorary member BMPS with VC , Anhalt University of Engineering, Germany

Special Session on Medical Physics Education in Developing Countries in DEGRO : June 2016,

The 22 Annual Meeting of German Association of Radio-Oncology (DEGRO) was held from 16 to 19 June 2016, Mannheim, Germany. In this congress, a special session entitled 'Radiation Therapy and Medical Physics in Developing Countries' was held on 17th June followed by a round table discussion. The founder of medical physics in Bangladesh and the chairperson of the Task Group of German Society of Medical Physicists (DGMP) was present in this session. On behalf of Bangladesh Mr. Md Akhtaruzzaman, Vice-President of Bangladesh Medical Physics Society (BMPS) present "Improvement of education and profession of medical physics in Bangladesh- a DAAD project". Dr. Clement Edusa presents 'Introduction of Sweden-Ghana Cancer Center' for Ghana. In the round table discussion participants share their experiences and views about the current situation and future development of medical physics education in the developing countries.

Special session in DEGRO

BMPS Members were Attended to Japan Radiology Congress (JRC) 2016: April 2016

Oral Presentation, JRC: Ms Naima Jannat

From April 14th-17th 2016, two members of BMPS (Mr. Moklesur Rahman and Naima Jannat) participated to the Japan Radiology Congress (JRC). On that time they presented their oral presentation on Deep Inspiration Breath Hold Techniques with Homemade LPT system for left breast cancer comparison between 3DCRT and IMRT and poster presentation on Displacement effect of

cylindrical ionization chambers with high energy photon beams and joined in the scientific sessions. They also met with Mr. Hidetoshi Saitoh, President, JSMP at Tokyo Mero politan University.

Industrial visit of Dhaka Women's Polytechnic institute's Students at Department of MPBME, GB: April, 2016

On 11th April 2016, a seminar was organized by Dept. of MPBME and BMPS for the students, Women's Polytechnic Institute. As Medical Physics is still a new subject in our country. Many few people know the role, importance education in Medical Physics. Considering this BMPS and MPBME has a mission to circulate the education in medical physics in different levels of public specially the students. In the seminar the activities of medical physicists and their role in health care is explained to the students. The seminar was presided by Prof. Dr. Hasin Anupama Azhari, chairman of MPBME, GB. The seminar was coordinated by Dr. Kumaresh Chandra Paul.

Industrial visit of Dhaka Women's Polytechnic Institute

Meeting with BMPA: March 2016

On 30 March, BMPS members made a courtesy visit to President, BMPA Prof. Dr. Sadik Malik in his hospital. Upon several discussions between members of BMPA and BMPS, a date was fixed to hold a meeting of the EC between two societies. On 28th September, BMPS honorary member, and all EC members meet in a hotel with BMPA President and General Secretary, general members. The main focus of the meeting was each Societies should work together for the betterment of Medical Physics in Bangladesh. It is emphasized that our adjuvant work will be very much effective to go a long way in the field of medical physics and to establish qualified medical physicist in Bangladesh.

First (1st) meeting with BMPA

Second (2nd) Meeting with BMPA

International Conference on Computer, Communication Chemical, Material and Electronic Engineering (IC4 & ME2 2016),Rajshahi University : March 2016

Professor Dr. Golam Abu Zakaria, Honorary Member had been invited as invited speaker in an International Conference on Computer, Communication, Chemical, Material and Electronic Engineering (IC4 & ME2 2016) organized by Faculty of Engineering, University of Rajshahi from 24-25 March 2016. Also BMPS President Dr Kumaresh Chandra Paul and Joint Secretary Md Abu Kauser also presented their lectures on the Medical Physics.

Conference in Rajshahi University

Seminar on "Role of Medical Physicist in Cancer Treatment" at NICRH: March, 2016

Seminar at NICRH

On 22nd March 2016, a seminar was held entitled on "Role of Medical Physicist in Cancer Treatment" in National Institute of Cancer Research and Hospital (NICRH). The seminar was organized by Dept. of Medical Physics & Biomedical Engineering (MPBME), Gono Bishwabidyalay, Savar, Dhaka; National Institute of Cancer Research and Hospital (NICRH), Mohakhali, Dhaka and Bangladesh Medical Physics Society (BMPS).

Prof. Dr. Moarrof Hossen, Director, NICRH, was delivered his Speech as a chief guest. He pointed out that, many medical physicists will be needed in different public and private hospital in near future. He advised the students to enrich their knowledge practically. Prof. Sheikh Golam Mostafa Head, Dept. Of Radiation Oncology; NICRH, was present the seminar as a chairman.

Prof. Dr. Golam Abu Zakaria Chairman and Chief Medical Physicist, Gummersbach Hospital, Academic Teaching Hospital of the University of Cologne, Germany was present there as a main speaker. He discussed about the role and responsibilities of medical physicists. He also mentioned the different problems and perspectives of medical physicists in his speech. Finally he discussed among the participants about the different issues of absolute dosimetry.

Then participants attended the practical training programme on absorb dose to water measurement and they demonstrated the whole radiotherapy department.

Seminar on "Present Status of Medical Physics in Bangladesh": March, 2016

Seminar at Atomic Energy commission

A seminar on medical physics was held on 16th March 2016 at Atomic Energy commission auditorium, Shahbag, Dhaka. A good number of participants among researchers, faculties, scientific officers, medical physicists, and students were present the seminar.

Prof. Dr. Golam Abu Zakaria, Chairman and Chief Medical Physicist, Gummersbach Hospital, Academic Teaching Hospital of the University of Cologne, Germany was delivered his speech main speaker. He mainly focused the importance, role, responsibilities and present status of medical physics in Bangladesh. He showed a very good statistics about necessity of medical physicist in radiotherapy as well as diagnostic imaging in Bangladesh comparing Germany. Besides that he asks for all the participants to come forward to work about medical physics in public sector.

Dr. Monjur Ahasan, Project Director, Institute of Medical Physics Project (INMP), BAEC, discussed different perspectives of his projects and he expects that, this project will play a vital role in cancer treatment.

Meeting at AEC with BPS, Dhaka: March, 2016

Meeting at AEC

On 16th March 2016, at 2:00 pm BMPS executive members met with Dr. Dilip Kumar Saha, treasurer of Bangladesh Physical Society (BPS) at BAEC, Dhaka. The purpose of this visit was to maintain a cooperative relationship with different societies and to take necessary steps to facilitate the development of medical physics on behalf of BPS. Founder of medical physics education in Bangladesh, founder president, joint secretary, treasurer of BMPS emphasized the role of BMPS in multifariousness activities such as public awareness, education, professing and manpower development in their discussion.

Public Awareness Program in AERE School and College: June 2016

For BMPS members regularly visit different schools, High schools, colleges, universities to introduce the this new subject Medical Physics. In this connection a group of member, BMPS had visited AERE school and college and discussed with the teachers the prospect, importance of this subject. It was also urged to them to inform the students.

Discussion between Teachers & BMPS Members on Medical Physics Subject

Workshop on TPS & Dosimetry in Dept. of MPBME, GB: March, 2016

Workshop in Dept. of MPBME, GB

The three days workshop from 13th-15th March 2016 was arranged by the Dept. of MPBME and BMPS at Gono University campus on TPS & Dosimetry. Prof. Dr. Golam Abu Zakaria (Visiting Professor) was carried out the workshop. MPBME faculty members, students, members from Institute of Nuclear Medical Physics Project (INMP), Bangladesh Atomic Energy Commission, took part the three days workshop. The speakers discussed different sections of TPS and dosimetry are broadly and interactively with the participants.

Seminar on Medical Physics: February, 2016

On 15thFebruary 2016 a seminar was organized jointly by Bangladesh Medical Physics Society (BMPS) and Department of MPBME, GB. All the topics was on Medical physics The speakers were Mr. Abdus Sattar Khalid, (Topic: Brief Introduction on Medical Physics) Medical Physicist, United Kingdom; Md. Nazrul Islam (Topic: Sharing of Medical Training in Medical Physics under DAAD Scholarship in Germany)Medical Physicist, Shaheed Ziaur Rahman Medical College Hospital, Bogra; and Mr. Masud Parvej (Topic: Exchange of Knowledge and Experience of training on Medical Physics) on Physicist, Institute of Nuclear medicine and Allied Sciences, Bangladesh Atomic Energy Commission.

Meeting at Klinikum Darmstadt GmbH, Germany for Collaboration: January, 2016

Meeting at Klinikum Darmstadt GmbH, Germany

On 15 October 2010 Honourary Member, BMPS and Professor, University of Colognae Germany established a Memorandum of Understanding (MoU) For Development of skilled Radiotherapist between National Institute of Cancer Research & Hospital, Dhaka, Bangladesh and Klinikum Darmstadt GmbH, Germany

As this cooperation is not still propagated , on the consequence of this on 31st January 2016, Prof. Dr. Golam Abu Zakaria again visited the Klinikum Darmstadt and urges the Head of Radiotherapy department and Chief medical Physicist to amendment of some process in the agreement to start the training program through the collaboration

Participation in DGMP, Germany: January, 2016

Participation in DGMP

On 29th January 2016, a seminar titled Sitzung des Arbeit skreises K16 "Medizinische Physik in den Entwicklungsländern (International Cooperation in Medical Physics and Radiation Therapy)was held in Seminar room 2, house 42, level 1 organized by working group K16 of the German Association of Medical Physics (DGMP). An introduction of PAGEL program had been discussed by Dr. Frank Hensley on A funding program of the German academic exchange service (DAAD) Then Medical Physics Status reports of different countries like Indonesia, Germany, Colombia, Nigeria,Bangladesh has been presented by DwiSihono, Dipl.-Ing. Volker Steil ,Dr. Flavia Molina, Dr. Obioma Nwankwo, Dr. Hasin Anupama Azhari, repectively. the seminar was presided by Prof. Dr. Golam Abu Zakaria.

BMPS Quarterly Meeting: 2016

In every three months a quarterly meeting is held with BMPS general members. In the meeting suggestions are made from the general members. According to the suggestions of the members BMPS try to accomplish the activities of Medical Physics (MP) development. BMPS thinks it is vital to exchange the views ideas between EC and GM members. This year BMPS quarterly meeting was held in February, June and September 2016 with the presence of good number of BMPS members.

BMPS Quaterly meeting

Annual General Meeting (AGM) of BMPS

All categories of BMPS members were present in the AGM. The President, joint secretary, treasurer have discussed the activities and related issues of the last one year. The honorary member and founder member have expressed the future activities and their implementation in AGM. Some new proposal from EC are unanimously accepted by general members.

Annual General Meeting of BMPS-2016

Awards and Honors

Elekta Travel Award 2016

Mr. Mokhlesur Rahman, M.Sc. student of the dept. of Medical Physics & Biomedical Engineering (MPBME), Gono University and Member of Bangladesh Medical Physics Society (BMPS) has been selected as the recipient of the Elekta Travel Award for 2016 by the Asia-Pacific Special Interest Group of the Australasian College of Physical Scientists and Engineers in Medicine. This award entitles the travel costs (including visa), accommodation and conference registration to attend the conference on ''Engineering and Physical Sciences in Medicine'' in Sydney, Australia from 6th – 10th November 2016.

AFOMP Award-2016

Three BMPS members (Dr. Kumaresh Chandra Paul, President; Md. Anwarul Islam, Vice-President and Ms. Nupur Karmaker, Treasurer) has been selected for travel award from Asia-Oceania Federation of Organizations for Medical Physics (AFOMP) to participant in the International Conference On Medical Physics (ICMP-2016), 9-12 December, Thailand. They have offered 500 USD award for each person.

Poster Awards ACBSROBMPS-2016

In ACBSROBMPS-2016 poster session, Judges selected three best scientific posters among total sixteen posters for the awards. The first, second and third poster awards are sponsored by Varian Medical System, Bangladesh Medical Physics Society (BMPS) and Bangladesh Society of Radiation Oncologists (BSRO) respectively.

First Award:
Design and construction of Linear Variable Differential Transformer (LVDT); Fazlul Haque Rana; Dept. of Medical Physics & Biomedical Engineering (MPBME), Gono University.

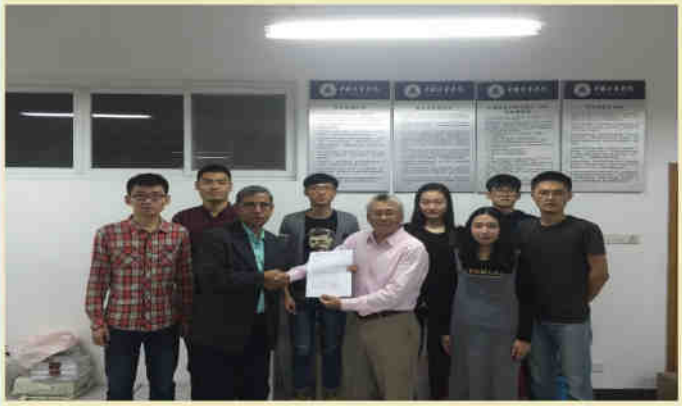
Second Award:
Deep Inspiration Breath Hold Techniques with Homemade LPT system for left breast cancer comparison between 3DCRT and IMRT; Mokhlesur Rahman; M.Sc. Student, MPBME, Gono University.

Third Award:
Deep Inspiration Breath Hold Techniques with Homemade LPT system for left breast cancer using 3DCRT; Md. Hafizur Rahman; MPBME; Gono University.

Best Poster Awards Winner (from right 1st, 2nd and 3rd)

Distinguished Professor , China Jiliang University

The honorary member, BMPS Prof. Dr. Golam Abu Zakaria has been honored by the Jiliang University as distinguished professor. It is the follow up visit from 23 rd October to 3rd November 2016 second time in this university and Zhejiang Cancer hospital, China for the cooperation with MPBME, GB and BMPS. Prof Zakaria will advise for the academic development of the department of BME, Jiliang University.



Distinguished Professor

BMPS is the First Affiliate Member Organization of IOMP

Bangladesh Medical Physics Society (BMPS) is the main professional body and scientific organization and it is the voice of medical physicists practicing in Bangladesh. BMPS has already been taken initiatives to create medical physics positions as well as to recruit medical physicists in the public hospitals. In addition, BMPS trying to focus the importance of medical physics education and medical physicist by organizing national and international conferences, workshops, etc. As a consequence of very promoting activities, BMPS became the affiliate member of AFOMP in 2014 and in 2016, IOMP it also became the first affiliate member of IOMP.

Asia and Pacific region, OWSD

Recently the founder president, BMPS has been selected executive regional member, of Asia and Pacific region, OWSD (The Organization for Women in Science for the Developing World). It was founded in 1987 and is the first international forum to unite eminent women scientists from the developing and developed worlds with the objective of strengthening their role in the development process and promoting their representation in scientific and technological leadership. It is an independent, non-profit and non-governmental body based at the offices of TWAS, in Trieste, Italy.

Upcoming Events

18-20th November 2016
37th Annual conference of Association of Medical Physicist of India.
Hotel Marriott & Convention center, Hyderabad.
www.ampi.org.in

9-12 December 2016.
International conference on Medical physics 2016, 16th AOCMP & 14th SEACOMP
Bangkok. *Thailand*
Mini-Symposia & IOMP school
https://icmp2016.org

26-27 January 2017
International Conference on Computer, Communication, Chemical, Material and Electronic Engineering (IC^4ME^2-2017)
Rajshahi, Dhaka, Bangladesh
www.dept.ru.ac.bd/ic4me2-2017

6-7 February 2017
Linac Calibration and Small Field Dosimetry course .
Wisconsin USA.
https://uwmrrc.wisc.edu

22-23 February 2017
Workshop on Medical Physics
Dhaka , Bangladesh
www.bmps-bd.org

24 February 2017
Volumetric Modulated ARC therapy (VMAT) QA.
Atlanta, GA, USA

27th March – 7April 2017.
School of Medical Physics for Radiation Therapy: Dosimetry and Treatment Planning for Basic and Advanced Application (smr 3110).
Strada Costiera, Trieste (Italy).
Room: Kastler Lecture Hall (AGH) .
www.indico.ictp.it

13-16April 2017.
The 113th scientific meeting of the Japar Society Medical Physics.
Pacifico Yokohama. Japan.
www.jsmp.org

20th April 2017
Seminar on Medical Physics Bangladesh Medical Physics Society,
Dhaka , Bangladesh
www.bmps-bd.org

8-12 May 2017.
Joint ICTP- IAEA workshop on the implementation of Image Guided Radiotherapy (IGRT) (smr3114)
https://www.ictp.it

22-23 May 2017
6th Annual Conference of Bangladesh Medical Physics Society,
Dhaka , Bangladesh
www.bmps-bd.org

20-23 June 2017
International Conference of Advances in Radiation Oncology (ICARO-2)
Vieana, Austria.
https://rpop.iaea.org

3-5 November 2017
3rd International Conference on Medical Physics in Radiation Oncology and Imagir (ICMPROI) -2017
Dhaka , Bangladesh

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