Voice of BMPS

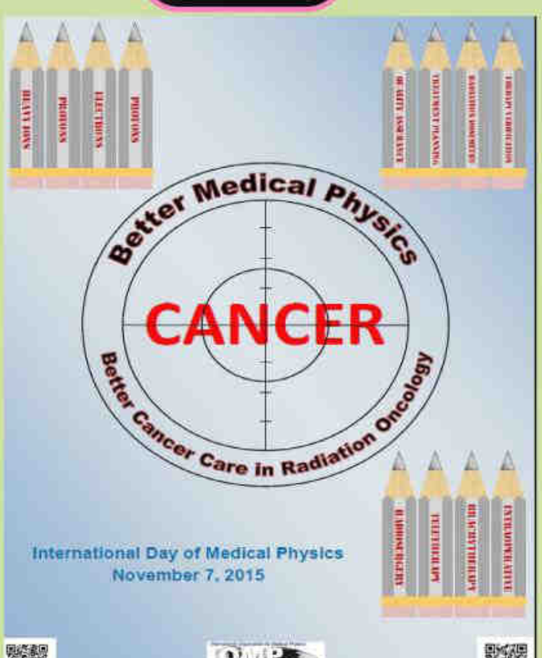
An official Yealy e-Newsletter of BMPS, Issue 3, November 2015

Bangladesh Medical Physics Society

Internation Day of Medical Physics (IDMP)

7th November, 2015

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



4th Annual Conference Bangladesh Medical Physics Society-2015, Dhaka, Bangladesh.

Cultural Activities: Members of Bangladesh Medical Physics Society (BMPS)

Designed by Sajan

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Editorial

Welcome to the issue no. 3rd, BMPS's official e-news letter, the "Voice of BMPS", on the occasion of International Day of Medical Physics (IDMP) on 7th November, 2015 Bangladesh Medical Physics Society (BMPS) is going to publish the IOMP declared 7th November International Day of Medical Physics (IDMP) as it is the birthday of the great Polish-French scientist Maria Sklodowska Curie, whose pioneering work on radiation physics is fundamental for our profession. The theme of IDMP 2015 is 'Better Medical Physics = Better Cancer Care in Radiation Oncology'.

At present in Bangladesh the awareness, of Medical Physics are increasing gradually. Some hospitals recruiting MP in their Radiotherapy department wherever in Government hospitals situation is vice versa. BMPS is trying relentlessly to make them aware as well as to create their positions. Also to raise awareness of our profession, different steps are taken through media for general public.

This issue contains scientific articles on quality control, dosimetry, articles on education, news, events and so on. We are happy to observe that even the students of Medical Physics and Biomedical Engineering are also contributing their activities in this newsletter.

As an editor the responsibilities will continue to be the advancement of the success of the newsletter by establishing editorial policies that highlight the role of medical physics as an integral part of our society. The newsletter will continue to be a vehicle for promoting fluent communication among all members of national and international organization.

I hope that you will enjoy reading this issue. Voice of BMPS values your contribution and I look forward to your continuous support in the coming issue.

With warmest thanks,

Anupama

Dr. Hasin Anupama Azhari


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An Alternative Method to Obtain the Dose Absorbed in Water from the Dose in Air in the Cavity of an Ionization Chamber for High Energy Photons

G. H. Hartmann

In the dosimetry of high energy photons with ionization chambers we always face the task to convert the measured quantity of dose absorbed in the air cavity of an ionization chamber into the desired quantity of absorbed dose in water. Our current understanding of the conversion method is based on the well known Bragg-Gray formalism. The following article is describing an example of how the capability of Monte Carlo calculation to deliver fluence spectra may slightly change our understanding of this conversion method.

Introduction

Recently, a paper was published that suggested a slightly new formulation of the Bragg-Gray formalism which is required to convert the dose absorbed in air measured in the cavity of an ionization chamber (hence called dose in air, D_a) into the absorbed dose to water at the point of measurement, D_w (H. Bouchard: A theoretical re-examination of Spencer–Attix cavity theory. Phys. Med. Biol. 57, 2012, 3333–3358). The method described in this article was triggered by this paper. It will be shown, that the conversion from D_a to D_w does not need the two well known Bragg-Gray conditions if the fluence of secondary particles is used for that. The method is therefore based on the knowledge of the spectrum of secondary charged particles (electrons and positrons) which can indeed be obtained by Monte Carlo (MC) calculations. It is also an example of how the MC method can influence the interpretation of the conversion formalism from D_w to D_a .

Examples and values for the case of Co60 radiation and two types of cylindrical ionization chambers, the Farmer type chamber 30013 and the chamber 31010, both from PTW, will be given.

1. **Derivation of the conversion formula**

1.1 The ratio of D_w to D_a

We start with ratio f of Dw to Da. In case that this ratio is known, the absorbed dose to water at the point of measurement simply would be:

$$D_w = f.D_a \tag{1}$$

Strictly speaking, D_a ist the dose absorbed in air measured in the cavity of an ionization chamber which is positioned in a water phantom such that its reference point is located at the measuring depth z. Without the ionization chamber, D_w is the absorbed dose to water at the measuring depth z under exactly the same irradiation conditions.

D_w as well as D_a can be partly expressed based on the fluence of the secondary charged particles. For that considering both types of charged particles (electrons and positrons) as well as photons is required. The following schematization taken from the paper of H. Bouchard, is defined.

(i) For electrons and positrons, the following approximations are made.

Discrete inelastic collisions with electrons only occur if the kinetic energy of the primary particle is greater than or equal to the energy Δ. During electron–electron or positron–electron collisions, δ-rays are transported only if their kinetic energy is greater than or equal to Δ. Note that secondary charged particles are allowed to have a kinetic energy below. Their energy is subsequently absorbed locally.

- Bremsstrahlung radiation is not be produced by charged particles with kinetic energy below Δ.
- Charged particles set in motion from photon interactions and resulting with a kinetic energy below Δ are not transported.
- Charged particles ending up with kinetic energy below Δ are absorbed locally. For positrons, a positron-electron annihilation event occurs once the kinetic energy is deposited locally.

(ii) For photons, the following approximations are made.

- Photon interactions do not occur if the photon energy is smaller than Δ (the same energy level as used for the charged particles) . Note that during Compton events, scattered photons with energy below Δ are allowed as they are subsequently absorbed locally.
- During bremsstrahlung production, photons are not be transported if their energy is below Δ .
- Photons with energy below Δ are absorbed locally.

Note that this schematization was also applied during the particle transport calculations with the MC method.
With this schematization we can express the total dose by two components: one component, by far the largest component, is due to the energy loss of the charged secondary charged particles and which is described by the collision stopping power, and a second part which is due to photon and Compton interactions and which is not taken into account by the transport of resulting charged secondaries. The first component, denoted as D_ww^±, can be expressed using the fluence differential in energy of the charged secondary charged particles as shown in equation (2):.

$$D_{ww}^{\pm} = \int_{\Delta}^{E_{max}} \varphi_{e^-,w}^{\Delta}(E) \cdot \left(\frac{L_{\Delta}^{-}}{\rho}\right)_w dE + \int_{\Delta}^{E_{max}} \varphi_{e^+,w}^{\Delta}(E) \cdot \left(\frac{L_{\Delta}^{+}}{\rho}\right)_w dE + TE(\Delta) \quad (2)$$

The meaning of the symbols is as follows:

$\varphi_{e^-,w}^{\Delta}(E)$	fluence differential in energy of electrons of all generations; the symbol Δ in $\varphi_{e^-,w}^{\Delta}$ indicates. that the energy level Δ has been also used to calculated the fluence.
$\varphi_{e^+,w}^{\Delta}(E)$	fluence differential in energy of positrons of all generations;
$\left(\frac{L_{\Delta}^{-}}{\rho}\right)_w$	restricted mass collision stopping power of electrons in water
$\left(\frac{L_{\Delta}^{+}}{\rho}\right)_w$	restricted mass collision stopping power of positrons in water
$TE(\Delta)$ =	the so-called track-end term with Δ

The second component is due to photon and Compton interactions taking into account the binding energy involved in that processes. It will be denoted as D_w^?.
Hence the total dose absorbed in water can be expressed according equation (3):

$$D_w = D_{ww}^{\pm} + D_w^{\gamma} = D_{ww}^{\pm}(1 + D_w^{\gamma}/D_{ww}^{\pm}) \quad (3)$$

The dose absorbed in the air cavity of the chamber is expressed in the same way: :

$$D_a = D_{aa}^{\pm} + D_a^{\gamma} = D_{aa}^{\pm}(1 + D_a^{\gamma}/D_{aa}^{\pm}) \quad (4)$$

The ratio of D_w to D_a is then given as:

$$\frac{D_w}{D_a} = \frac{D_{ww}^{\pm} + D_w^{\gamma}}{D_{aa}^{\pm} + D_a^{\gamma}} = \left(\frac{D_{ww}^{\pm}}{D_{aa}^{\pm}}\right) \cdot \left(\frac{1 + D_w^{\gamma}/D_{ww}^{\pm}}{1 + D_a^{\gamma}/D_{aa}^{\pm}}\right) \quad (5)$$

1.2 Re-formulation of equation (5)

The next step consists of the introduction of a hypothetical dose parameter into equation (5). This dose parameter, denoted as D_wa^±, can be interpreted as due to the energy loss of the charged secondary charged particles in air, however having the exactly same fluence as the secondary charged particles in water at measuring conditions. This dose parameter can be calculated analog to equation (2):

$$D_{wa}^{\pm} = \int_{\Delta}^{E_{max}} \varphi_{e^-,w}^{\Delta}(E) \cdot \left(\frac{L_{\Delta}^{-}}{\rho}\right)_a dE + \int_{\Delta}^{E_{max}} \varphi_{e^+,w}^{\Delta}(E) \cdot \left(\frac{L_{\Delta}^{+}}{\rho}\right)_a dE + TE(\Delta) \quad (6)$$

Note that this dose parameter is not really an existing quantity. Nevertheless, it can be calculated based on the fluence of the charged particles.
Introducing this hypothetical quantity into equation (5), the dose ratio can be re-formulated as:

$$f = \frac{D_w}{D_a} = \frac{D_w \cdot D_{WA}^{\pm}}{D_{WA}^{\pm} \cdot D_a} = \left(\frac{D_{ww}^{\pm}}{D_{wa}^{\pm}}\right) \cdot \left(\frac{D_{wa}^{\pm}}{D_{aa}^{\pm}}\right) \cdot \left(\frac{1 + D_w^{\gamma}/D_{ww}^{\pm}}{1 + D_a^{\gamma}/D_{aa}^{\pm}}\right) \quad (7)$$

An interpretation of equation (7) using the expressions "stopping power ratio" and "perturbation factor"

The first term of the right side of equation (7) describes the influence of exchanging the medium water by the medium air related to the energy loss of the charged secondaries released in water. It can be interpreted as the "Stopping Power Ratio" analog to the Bragg-Gray formalism. Note that this term explicitly takes into account the stopping power of electrons as well as that of positrons. It is exactly the quantity which is obtained with the MC code SPRnrc.
Next the second and third term are considered at first commonly as a product. When comparing equation (7) with the Bragg-Gray formalism of the ratio of Dw to Da the the form

$$\frac{D_w}{D_a} = s_{w,a}^{SA} \cdot p \quad (8)$$

where s_(w,a)^SA is the Spencer-Attix stopping power ratio water to air and p is a so-called perturbation factor, one may interpret the product again as a the perturbation factor:

$$p = \left(\frac{D_{wa}^{\pm}}{D_a^{\pm}}\right) \cdot \left(\frac{1 + D_w^{\gamma}/D_w^{\pm}}{1 + D_a^{\gamma}/D_a^{\pm}}\right) \quad (9)$$

However, note that the word "perturbation factor" is a misleading expression since no perturbation was introduced in the derivation of equation (7).

More physically meaningful is the interpretation of the second term only to describe the influence of exchanging the fluence in water in that of the air cavity with respect to the collision stopping power in air. This influence is in fact very small since the fluence in water and the fluence in air do not differ very much. As an example, figure 1 shows the ratio of fluence differential in energy between the two media water and air for Co60 gamma radiation. The fluence in air is that obtained for PTW 30013 Farmer chamber. Note that the fluence in water is always larger than that in air.

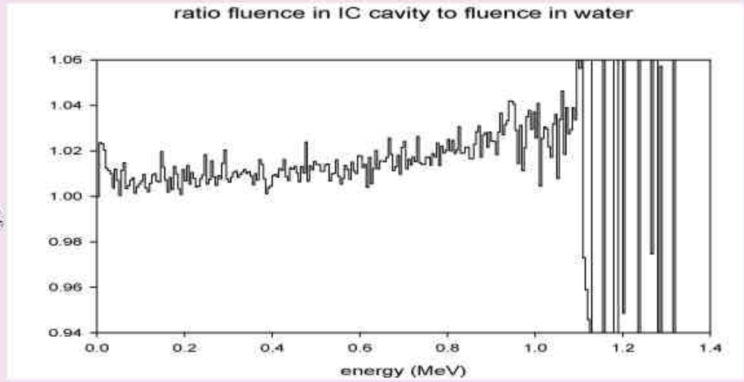

Fig. 1: Ratio of the secondary electron fluence between water and chamber air cavity in the measuring depth of 5 cm

The third term finally, ((1+(D_w^?)/(D_w^±))/(1+(D_a^?)/(D_a^±))) describes the influence which is due to the exchange of water by air with respect to the binding energy involved in photon and Compton interactions.

2 Values of ratio-quantities obtained by Monte Carlo Calculations

The following results have been obtained through MC calculations. The program used consists of a modified DOSXYZnrc code from the EGSnrc system in which the required routines to get the fluence in water as well as in the cavity of an ionization chamber have been integrated. The geometric parameter as well as the relevant transport parameter are listed in Table 1. Co60 gamma radiation has been simulated by a point source having a photon spectrum according to the MORA spectrum. Dose in air data has been obtained by simulation the PTW 30013 and the PTW 31010 chambers.

Tab. 1: Geometrical parameter and transport parameter used for the MC Simulation

Parameter	Wert
SSD	95 cm
Measuring depth	5 cm
Field size at measuring depth	10 cm x 10 cm
Scoring volume in water	1 cm x 1 cm x 0.1 cm
Global ECUT	0.521
Global PCUT	0.01
Global SMAX	5
ESTEPE	0.25
XIMAX	0.5
Boundary crossing algorithm	Exact
Skin depth for BCA	3
Electron-step algorithm	PRESTA-II
Spin effects	On
Brems angular sampling	Simple
Brems cross sections	BH
Bound Compton scattering	On
Pair angular sampling	Simple
Photoelectron angular sampling	Off
Rayleigh scattering	On
Atomic relaxations	On

The fluence of electrons and positrons as obtained from the MV calculation are shown in Fig. 2

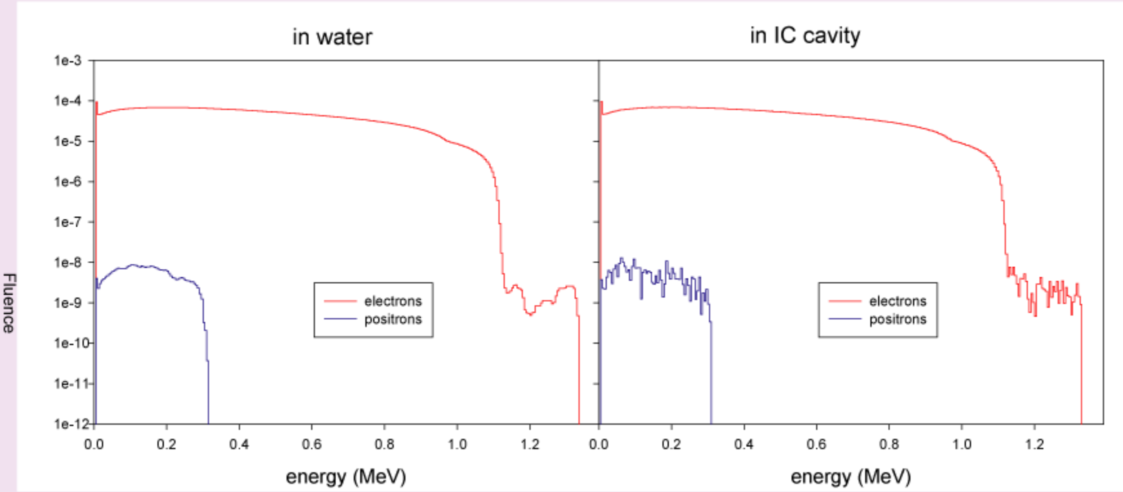

Fig. 2: Spectra of secondary charged particles at the measuring depth of 5 cm in a Co60 radiation field

All dosimetric quantities resultant from equations (2-7) are listed in Tab. 2-4.

Tab. 2: Dose quantites in water in Gy/history

Dose quantity		calculated based on fluence & rel. SD in %
$D^{\pm}_{ww}$:	integral of fluence in water, STP in water	4.0898e-12 (0.06)
$1 + D^{\Gamma}_{w} TD^{\pm}_{ww}$		1.00048 (0.0001)
Total dose: $D^{\pm}_{w}(1 + D^{\Gamma}_{w} TD^{\pm}_{w})$		4.09172E-12 (0.06)
control:		
total dose directly from MC:		4.0924e-12 (0.06)

Tab. 3: The hypothetical dose quantity in water/air in Gy/history

Dose quantity		calculated based on fluence & rel. SD in %
$D^{\pm}_{wa}$:	integral of fluence in water, STP in air	3.6077e-12 (0.06)

Tab. 4: Dose quantites in the air cavity of the ionization chamber in Gy/history

Dose quantity		calculated based on fluence & rel. SD in %	
		PTW 30013	PTW 31010
$D^{\pm}_{aa}$:	integral of fluence in air, STP in air	3.6523e-12 (0.06)	3.6620e-12 (0.06)
$1 + D^{\Gamma}_{a} TD^{\pm}_{aa}$		1.0005676 (0.0001)	1.0005673 (0.0001)
Total dose: $D^{\pm}_{a}(1 + D^{\Gamma}_{a} TD^{\pm}_{aa})$		3.65437E-12 (0.06)	3.66408E-12 (0.06)
Control:			
total dose directly from MC:		3.6550e-12 (0.06)	3.6647e-12 (0.06)
ratio $D_{w} TD_{a}$		1.120 (0.08)	1.117 (0.08)

Using the results from Tab. (2-4), we can obtain numbers for the three factors in equation (7) shown below.

Tab. 5: Numerical values the three factors in equation (7)

Factor	calculated based on fluence & rel. SD in %	
	PTW 30013	PTW 31010
$(D^{\pm}_{\bar{w}}/D^{\pm}_{\bar{w}a})$	1.1336 (<0.0001)	1.1336 (<0.0001)
$(D^{\pm}_{\bar{w}a}/D^{\pm}_{\bar{a}})$	0.9878 (0.08)	0.9852 (0.08)
$\left(\frac{1 + D^{\mp}_{w}/D^{\pm}_{\bar{w}}}{1 + D^{\mp}_{a}/D^{\pm}_{\bar{a}}}\right)$	0.99991 (<0.0001)	0.99991 (<0.0001)

Conclusion

Stricly using the fluence spectra of secondary electrons and positrons for the conversion method from Da to Dw we can obtain

$$D_w = D_a \cdot f = D_a \cdot \left[\left(\frac{D^{\pm}_{\bar{w}w}}{D^{\pm}_{\bar{w}a}}\right) \cdot \left(\frac{D^{\pm}_{\bar{w}a}}{D^{\pm}_{\bar{a}a}}\right) \cdot \left(\frac{1+D^{\mp}_{w}/D^{\pm}_{\bar{w}w}}{1+D^{\mp}_{a}/D^{\pm}_{\bar{a}a}}\right)\right] \qquad (10)$$

whereas in the Bragg-Gray formalism we have

$$D_w = D_a \cdot f = D_a \cdot \left[s^{SA}_{w,a} \cdot p\right] \qquad (11)$$

When calculating numerical values for each of these factors in both equations based on MC calculations we obtain identical values. Of course, this cannot not be surprising since in all calculations the same MC transport algorithms and physical data have been employed. Nevertheless, the interpretation of eqation (10) somewhat differs from the Bragg-Gray formalism of equation (11). We do not speak of a perturbation factor or even a product of single perturbation factors due to a series of influences such as the chamber wall, the central electrode etc. Instead of, we simply state that the conversion can be attributed to the exchange of medium from air to water and to a small change of the fluence spectra.

Experimental determination of the shift of effective point of measurement for cylindrical chamber in high energy electron beams

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1. Introduction

Measurement of dose in water phantom in megavoltage photon and electron beams needs the use of air filled ionization chambers in external beam radiotherapy. To do so one has to consider the replacing volume of water by the chamber as it is not water equivalent. The determination of the quantity of absorbed dose to water from the detector signal is based on the cavity theory [1]. The detector signal is generally subjected to various perturbation effects. Due to this replacing water, perturbation correction factors are being considered in dosimetry. One of these perturbation factors is displacement correction, which comes from displacement of the surrounding material water by the detector. This factor is possible to take into account either by placing the effective point of measurement (EPOM) at the reference depth [2] or, alternatively, by using a displacement perturbation factor Pdis. The positioning of the EPOM with respect to the central axis of the chamber is called the shift of EPOM for the high energy photon and electron beams [3]. In electron beams a constant shift of 0.5r (r is inner radius of the chamber) is currently recommended in the protocols.

EPOM was first introduced by Skagg LS [4] for the determination of depth dose curve in electron beam. Today EPOM concept is being applied for absorbed dose determination with ionization chambers in electron dosimetry [5]. The German protocol DIN 6800-2 applies the EPOM for all of dose measurements [6]. Recently several publications have demonstrated the relation of perturbation with the water depth [7, 8].
Currently, a few experimental data are available on the chamber size dependent displacement effect in electron beam dosimetry [9,10]. The purpose of the study was to experimental determination of the shift of the EPOM of cylindrical types ionization chambers compare to the % depth ionization curve of well establish Roos chamber. It was also aim to find out the dependence of depth and the chamber radii on displacement factor.

2. Materials and Methodology

2.1 Materials: Linear accelerator of Electra Versa HD, Blue Phantom of Iba, the Roos chamber (34001, PTW), electrometer, Unidose, six specially prepared Farmer type cylindrical chambers with inner radius ranging from 1 to 6 mm (considering R1, R2…R6), (30013.1.911, 30013.1.921, 30013, 30013.1.941, 30013.1.951 and 30013.1.961, PTW, Freiburg, Germany) and a Semi-flex (inner radius of 2.75 mm) ionization chamber (31013, PTW) have been used in the study. The wall thickness electrode (aluminium, diameter 1.1 mm), material and length are identical of the 3.0 mm Farmer chamber for all these six chambers. Only the radius was different which was shown in the figure1. A spirit leveler was used for checking the phantom axis was correctly positioned.

Figure 1: Chambers with six different diameters

2.2 Measurement set up and procedure:

Measurements were performed along the beam central axis in motorized Iba blue phantom with the vertical electron beams. The measurement source to surface distance (SSD) was 100 cm and the field size was 10 cm × 10 cm. The central axis of Farmer chambers were set on the water surface following the mirror symmetry of image matching. International Atomic Energy Agency (IAEA) TRS-398 protocol was followed for measurement the depth ionization. Normalization was done to maximum ionization and percentage depth ionization curves were drawn. The shift of EPOM was determined in 6, 8, 10, 12 and 15 MeV electron beams comparing with the depth ionization curves of well established Roos chamber setting at 1.5 mm above the water surface of the phantom. Microsoft Office Excel and Sigma Plots 10 were used for analyzing the results. By using the "Quick Transforms" key, the displacements were calculated. The measurement of uncertainty was 0.01 mm. The best match was considered for the measurement of shift between the curves. As the curves showed the difference of displacement along the curve after the dmax Therefore, the shift at maximum ionization was considered.

For measurement the farmer chambers were fixed with an in-house developed mounting (shown in the figure-2), which allows exchanging of Farmer chambers while maintaining the position of the chamber axis on the surface following the mirror symmetry. The measurement was started from the bottom of the water and step by step method was selected for the measurement. Every time 999 MU (monitor unit) was set for the radiation exposure and was stopped after getting the curve. For chamber setting 1 mm (R1, the smallest) cylindrical chamber was adjusted first on the surface and for other it was exchange with the bigger radii without changing the position, so that there was positional error of the chamber.

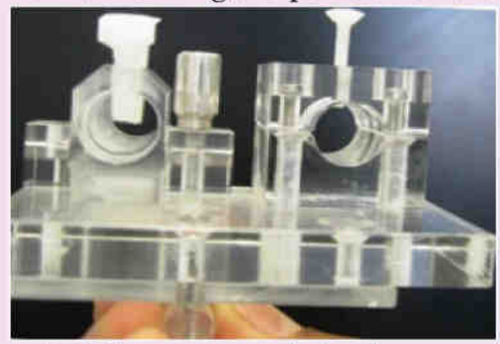

Figure-2: In-house prepared chamber mounting

3.1 Results:

The experimental depth % ionization curves were shown in the graph in the figure-3 below.

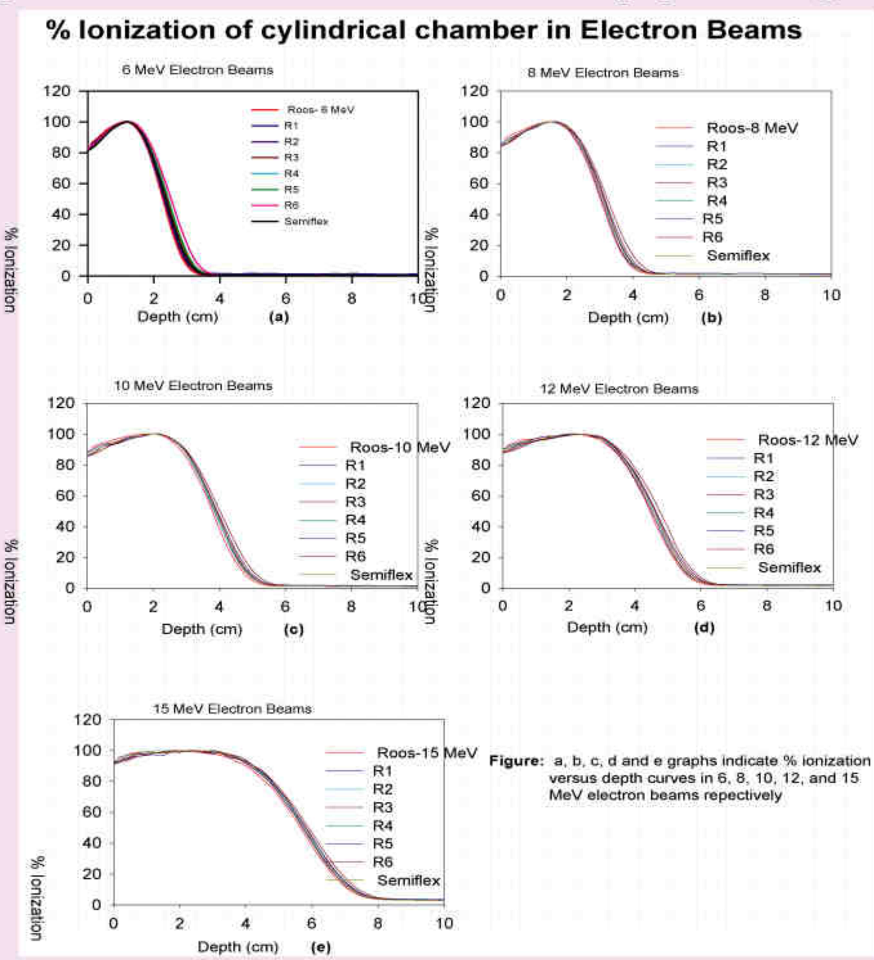

Figure 3: Curves (a), (b), (c), (d) and (e) shows the experimental depth % ionization curves in 6, 8, 10, 12 and 15 MeV electron beams.

3.2 Discussion:

In the experiment only % ionization was considered for the measurement of the displacement effect. Beam quality and the measurement of ionization at reference depth with all six chambers need to be considered for measuring the effect of chamber geometry on the displacement effect. The experimental results above 10 MeV showed fairly good to the protocol. Monte Carlo simulation with the same electron spectrum of measurement can be an alternative to conclude more precisely.

4. Conclusion:

The obtained displacement effect appears to be dependent on the depth of water. Therefore, no exact value of displacement effect was possible to suggest but average displacement values were calculated in all considering energies, which was a range from 0.22 rcyl to 0.47 rcyl at dose maximum of the curves for cylindrical chambers. The chamber positioning and measuring uncertainty was 0.1 mm and 0.01 respectively. Displacement effect was not good agreement with a single value of the protocols. Moreover, the displacement effect observed energy and chamber volume dependent. For all considering energies, the obtained average values were lower than that of the recommended value and for 12 and 15 MeV, it was in fairly good agreement with the recommended value given in the protocol. Therefore, a modified formula was proposed for the determination of EPOM.

5. Acknowledgement

It was gratefully acknowledged the PTW Freiburg for designing and building the non standard Farmer chamber with radii of 1, 2, 3, 4, 5 and 6 mm. The support of the Department of Radiation Oncology, University Clinic Mannheim of Heidelberg University was acknowledged to offer their facilities and also acknowledged financial assistance by DAAD for the study. It was acknowledged the Department of Medical Physics and Biomedical Engineering, Gono Bishwabidyalay for selecting the author as Ph.D researcher under the collaboration with PAGEL project of Germany.

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Quality Assurance for Brachytherapy

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The task of quality assurance (QA) for radiation therapy is to establish a technical system which ensures the correct and safe delivery of the medically desired dose to the correct site in the patient. For brachytherapy QA this means that the correct radiation source must be placed at exactly the correct position in the patient for exactly the correct time. This must happen with great precision because a small misplacement of the source can lead to a large difference in delivered dose. Generally in brachytherapy, small errors in application can lead to large dose errors due to the steep dose gradients in this therapy but also due to the large doses per fraction. To achieve the required precision, brachytherapy QA must therefore encompass the complete system with all its components: the source itself, the applicators, transfer tubes, the afterloading machine with all its functions and safety features, the planning system and data including applicator reconstruction, dose calculation and data transfer. In the following, a number of tests are described which are necessary to ensure correct positioning and timing of the radiation source. These tests should be periodically performed, many of them within daily QA checks.

QA of the brachytherapy source:
After installation of a new source, prior to the first patient treatment, the reference air kerma rate of the source must be verified by a qualified medical physicist (QMP). Verification is usually performed with a calibrated well-type ionization chamber. The procedure for such a verification is described in chapter 7 of the International Atomic Energy (IAEA) report IAEA Tecdoc 1274. Usually, the verification yields differences smaller than 1-2% between the measurement and the air kerma rate stated in the source certificate. If larger differences are found, the reason should be identified and corrected before use of the source. Manufacturer calibrations are usually reliable and differences are often due to incorrect measuring procedures, the use of incorrect corrections or conversion factors or defects in the measuring instrumentation. Therefore the detection of differences in source verification is always a warning signal that one should review one's own instrumentation and methods.

When a new source is installed in the afterloading machine one should additionally ensure correct source outdrive as described in the next paragraph. If the source does not travel to exactly the correct position (within 1mm), one should ask the service person to adjust this.

QA of the afterloading machine:
The daily QA procedure should contain a check of correct source outdrive, i.e. that the source travels to exactly the programmed distance from its starting position in the afterloading machine. Some manufacturers include a video system with which the source outdrive to a selected or a standard position can be verified. An alternative mechanical tool is a source position check ruler as provided by some manufactures and shown in fig 1. The ruler is a tool with a transparent source channel and a scale which indicates the source outdrive in mm. The ruler is attached to a standard transfer tube and the source is moved to a preselected outdrive length. Inside the transparent source channel of the ruler, the source moves (pushes) a small plastic marker. After retraction of the source, the marker remains at the final position of the source tip. The scale on the ruler shows the position of the marker which should correspond to the selected source outdrive. Additionally, in some rulers the source position can be documented on a scaled radiochromic film.

Figure 1. Example for the check of source outdrive with a source position check ruler and check of multiple channels by exposure of film with a geometric pattern of source positions (left insert).

The radiograph on the left side of the figure shows how the correct placement of the source in multiple channels can be quickly verified by programming a geometrical pattern of source positions.

Additional to source positioning, all safety features and functional interlocks should be checked on every day of operation. Safety features include the emergency stops, door interlocks and the indicator and warning signals and lights. The functional interlocks that should be checked include the prevention of source outdrive if no transfer tube is attached or if it is not correctly locked to the machine. Source outdrive should be refused if no applicator is attached to the transfer tube and treatment should be refused or interrupted in case of an obstruction in the transfer tube or applicator.

The timer which controls the dwell times should be checked by independently measuring the dwell time of the source at a user-selected position and time with a stop watch and comparing the programmed and measured time.

The travel time of the source from its starting position to the first programmed dwell position should be constant at every day of use. Differing transfer times may indicate some defect in the transport system. One should therefore record a typical transfer time and check its constancy on every day of use. This can be done e.g. with a stop watch or by observing the timer on the treatment console.
On every day of operation, the source activity indicated by the operating system of the afterloader should be compared with the correct value from a decay table to ensure that the system is correctly adjusting for source decay.
These checks can be performed on every day of operation in about 15 minutes using a pre-programmed operating program.

QA of Applicators:
In the commissioning of a new applicator the actual source positions inside the applicator for a selected source outdrive must be verified. The actual positions relative to the applicator (usually the distance to the applicator tip) must be identical to the positions assumed by the planning system. Usually it is sufficient to verify the first position (the one at the longest possible outdrive) since other positions are determined relative to this position by the system. This can be done by film measurement as shown in fig. 2: the applicator is fixed to a sheet of film (radiographic or radiochromic) with tape. The applicator tip is marked on the film with a pin prick. Then the source is moved to the first few positions and dwells for a time short enough to produce only a small, distinguishable blackening. The distance of the pin prick to the center of the blackening should be equal to the distance from the applicator tip to the first position as indicated in the image or the co-ordinates of a treatment plan. To be more exact, e.g. for thick-walled plastic applicators, the wall thickness of the applicator (which can be inquired from the manufacturer) is subtracted. Fig. 2 shows a verification film for several sizes of ring and tandem applicators. An applicator is shown as example in the figure.

If x-ray markers are used, a check should be made to ensure that the positions indicated by the markers coincide with planned positions and outdrive lengths. The radiograph insert shows the X-ray markers inside a Fletcher type applicator. Measurements to determine the correct dwell positions and correct marker positions should be made before the first use of the applicator in a patient.
Before every use of the applicator, it should be visually inspected for changes and damages.

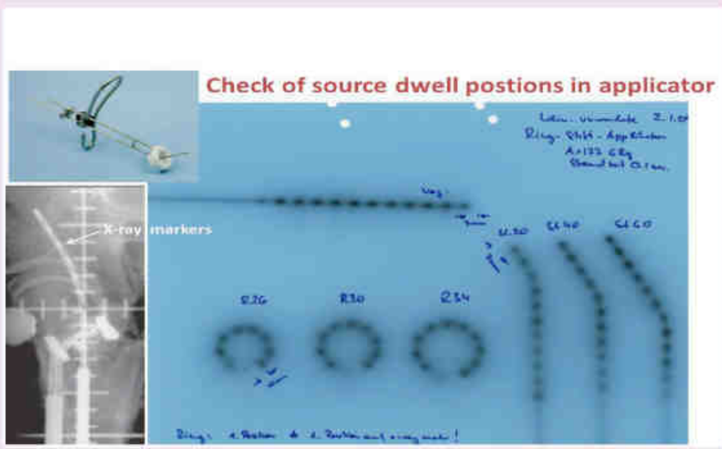

Figure 2. Verification film for several sizes of ring and tandem applicators. An applicator is shown as example in the top left of the figure. If x-ray markers are used, a check should be made to ensure that the positions indicated by the markers coincide with planned positions and outdrive lengths. The radiograph insert on the left shows the X-ray markers inside a Fletcher type applicator.

QA of transfer tubes:
All transport tubes should be checked for correct length and functionality of their coupling mechanisms before their first use and then at least annually. Before any application, the used tubes should be inspected for damage.

QA of planning system:
Apart from the large body of tests during commissioning which are described in IAEA report TRS 430, one should routinely perform a number of special QA tests for a brachytherapy planning system: after each change of software one should verify that the sytsem uses the correct set of TG43 data for the source type used in the department. TG43 data can be found on the internet at the web sites of the Carleton Data Base http://www.physics.carleton.ca/clrp/seed_database and in the GEC-ESTRO Data Base (located at the University of Valencia, Spain): http://www.uv.es/braphyqs/ .
Additionally one should check that the system uses the correct air kerma rate constant Δ for the used source type and the correct decay half-life: t1/2 . This data can be obtained from the manufacturer of the planning system.
For each patient plan, an independent manual calculation or a calculation with an independent planning system should be made for a few important dose points. Manual calculations can be made using the geometrical data (distance of the dose point to the source positions) and dwell times from the planning system together with the TG43 data of the source.
Correct transfer of the data from the planning system to the treatment machine and correct connection of the applicator to the channels of the afterloader should be checked before each application. Additionally, correct adjustment of the dwell times to the source decay between time of planning and time of application should be verified before each treatment.
This report describes only a selected number of essential QA procedures for brachytherapy. A more comprehensive overview is described in the report of AAPM TG 56, given in the references.

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4th Annual Conference of Bangladesh Medical Physics Society (ACBMPS-2015)

Md. Safayet Zaman

Bangladesh Medical Physics Society (BMPS) is a non-profit, non-trade registered organization primarily engaged in professional, educational and research activities, public awareness throughout Bangladesh. The society has been working to take the application of physics in medicine to a level for a better health care and treatment support in the field of medical physics and biomedical engineering especially concerning radiation oncology, imaging and nuclear medicine sector in Bangladesh since its foundation in 2009. It.

BMPS regularly arranges seminar, workshop, training program, annual conference and international conference (every 3 years) etc. On 7th July 2015, BMPS has organized its the 4th Annual Conference (ACBMPS-2015) at Institute of Nuclear Medicine and Allied Sciences (INMAS) of Dhaka Medical College Campus in Dhaka.

The co-organizers are i. Department of Medical Physics and Biomedical Engineering (MPBME), Gono Bishwabidyalay (University) ii. Institute of Nuclear Medical Physics Project (INMP), Bangladesh Atomic Energy Commission, Ministry of Science and Technology iii. Institute of Nuclear Medicine and Allied Sciences (INMAS) and iv. Department of Radiotherapy, Dhaka Medical College Hospital (DMCH).

Mr Kumaresh Chandra Paul, Senior Lecturer of Department of MPBME, Gono Bishwabidyalay (University) and President of BMPS and Mr Safayet Zaman, Medical Physicist of Department of Radiotherapy, Dhaka Medical College Hospital were the Organizing Chairperson and Organizing Secretary of this conference respectively.

More than 300 participants (Fig. 1 & 2) including medical physicists, biomedical engineers, scientists, oncologists, young researchers from different hospitals, universities, industries and the Bangladesh Atomic Energy Commission (BAEC) attended the conference and exchanged their knowledge, experience and ideas.

Fig. 1 Participants, ACBMPS-2015

Fig. 2 Some Distinguished Guests, ACBMPS-2015

ACBMPS-2015 was comprised of key note speech, invited lectures, oral, poster and vendor presentations which have covered a wide range of issues related to Dosimetry, External Beam Therapy, Brachytherapy, Treatment Planning, Diagnostic Imaging, Nuclear Medicine, Quality Assurance, Radiobiology, Radiation Oncology, Radiation Safety, Biomedical Engineering and also on Education. Forty-six (46) papers were presented in five (5) different scientific sessions. All scientific sessions are comprises of invites and oral talks. The Inaugural Ceremony was followed by the first scientific session. After break Poster presentation was followed by two parallel sessions. At the closing, award ceremony was followed by the AGM of BMPS.

In the inaugural ceremony (Fig. 3) of ACBMPS-2015 Engr. Md. Monirul Islam, Chairman of the Bangladesh Atomic Energy Commission, Ministry of Science and Technology was present to grace the occasion as the Chief Guest. Prof. Dr. Moarraf Hossen, Director, National Institute of Cancer Research and Hospital was present as the Special Guest. Mr. Volker Steil was present as the Guest of Honor. Prof. Dr. Golam Abu Zakaria was present to in the occasion as the Keynote Speaker. His topic was "Radiation Protection Rules, Regulations and Quality Control for X-Ray machines". The session was presided over by Prof. Dr. Md. Sanowar Hossain, Director, Institute of Nuclear Medicine and Allied Sciences (INMAS) of Bangladesh Atomic Energy Commission. Also the co-organizers also delivered their speeches. The speakers emphasize the importance of medical physics profession in health care in their speeches.

There were twenty-one (21) posters are presented in a gallery. BMPS has awarded the winners of the first, second and third posters which were judged by the committee for the poster session. The First, Second and Third posters were "Assessment of arsenics is patient in Bangladesh by the determination of arsenic concentration in scalp hair using EDXRF: A five years case study" by M. Safiur Rahman from Bangladesh Atomic Energy Commission, Dhaka, Bangladesh, and "Design and Development of Dose Rate Meter" by MPBME, Md. Mamun or Rashid from Gono Bishwabidyalay, Savar, Dhaka, Bangladesh, "Application of European Commission Reference Dose Level in Pediatric CT Examination in Dhaka City" by Rehana Zinat from MPBME, Gono Bishwabidyalay, Savar, Dhaka, Bangladesh respectively.

Fig. 3 Inaugural Session ACBMPS-2015

Fig: 4a Award giving ceremony

Fig: 4b Award giving ceremony

Fig. 5 Female Participants, ACBMPS-2015

In the closing ceremony, the opinion, pros and cons of the ACBMPS 2015 was thoroughly discussed by the foreign guests, ex-president of Bangladesh Physical Society (Prof. Ali Asgar), the founder president of BMPS (Dr. H. A. Azhari). In the award ceremony award is given to winner of first (Fig. 4a), second (Fig. 4b) and third poster presenters. Then the President and the Secretary of BMPS delivered closing speeches. A photo session of female medical physicists was taken. BMPS is very happy to see how female medical physicists (Fig. 5) are increasing progressively in Bangladesh. At the end of the day, AGM of BMPS was held and a new executive committee has been formed for the next two years.

Experience of a student: Through Collaboration between MPBME, Bangladesh and University of Heidelberg, Germany

Abu Kausar

M.Sc Student, University of Heidelberg, Joint Secretary, Bangladesh Medical Physics Society (BMPS)

International Cooperation enhances the opportunities for the people to improve their knowledge as well as to develop the quality of an institute. Collaboration between Gono University and Heidelberg University, Germany is such a grand extent to share knowledge, develop the quality in all purposes, to judge the learning style and so on. This program will continue for 4 years (2014-2017) to develop the medical physics in Bangladesh.

It is my immense pleasure that I am one of the members who got the chance to be a part of this program as a master student of Medical Physics in Heidelberg University. This program aided me how to learn different things, broaden thinking, study different subjects and develop ownself. This program also taught me many things about different cultures, manners, attitude and team work.

Fig: M.Sc. students with Prof. G.A. Zakaria & Dr. Hasin Anupama Azhari in Medical Faculty of Mannheim.

Fig: M.Sc. students with Hospital trainee, Ph.D. Researcher and people of the DAAD project in Mannheim.

Medical Physics study (M.Sc.) in Heidelberg University is a one year program which consists of 70 credits that includes theory classes, practicals, workshops in different sections and computer programming. According to European Credit Transfer and Accumulation System (ECTS) a student needs a total of 300 ECTS for obtaining a M.Sc. degree from Heidelberg University. In Germany B.Sc. course consists of 230 credits.

I hope and believe that, this program will be very effective in all perspective of medical physics in Bangladesh and every person acquaring knowledge from the project will put valuable effort from their respective positions.

Essence of Importing Technology in Diagnosis and Treatment of Cancer

Mokhlesur Rahman

B.Sc. Student, Dept. of Medical Physics and Biomedical Engineering, GB

Bangladesh Medical Physics (BMPS) organizes annually the International Day of Medical Physics (IDMP) on November 7, an important date in the history of medical physics. On that day in 1867, Marie Sklodowska-Curie known for her pioneering research on radioactivity, was born in Poland. We celebrate the 3rd IDMP on November 7, 2015. The theme of IDMP 2015 is 'Better Medical Physics = Better Cancer Care in Radiation Oncology.

The success of any development effort of a country depends on its ability to absorb the outcomes of modern technology. This is true for all facets of economic and social activities. Generally developing countries lack such capacity. Often this lacking is due to inadequate infrastructure, human capital, finance, commitment of leaders and their willingness to do so. It is an undeniable fact that for setting a country into a path of development, it should focus on development of science and technology. Experiences of the developed countries show that they were once a fertile land for technologies. Most of them are yet working hard to develop new technologies. Only those countries which have invested heavily in science and technologies are progressing leaps and bounds. They have been benefitted by their home made and imported technologies. Technology is the application of knowledge to practical purpose which ultimately innovates the way of performing task assuring a better outcome in what we do. As a developing country, it might not be possible for Bangladesh to invest heavily on development of science and technology; however it shall prepare itself to build capacity to absorb the recent outcomes of scientific development. Since last century we have been using different machines in disease diagnosis and treatment. These machines are the outcomes of dedicated research and investments. Similarly ionizing radiations have been used for diagnosis and treatment of diseases. To improve the precision of diagnosis and treatment, the producers of such machines are using the recent and exotic research findings. This has made the use of such machine is expensive. Regarding Cancer diagnosis and treatment, in recent years, there has been a huge development in the techniques of imaging and therapy. In imaging conventional X-Rays, Mammography, Angiography, Ultra-sonogram (USG) have been used for quite long. Magnetic Resonance Imaging (MRI), Computed Tomography (CT), SPECT, PET Scans machines are proving themselves as reliable machines for disease diagnosis. Similarly radiotherapy has come a long way from the days when the treatment was started with X-ray tubes, Van de Graff generators and betatrons and cobalt-60 teletharapy units. Today we are using moderns LINACS and modern Brachytherapy machines. As special techniques in radiotherapy Stereotactic irradiation, Total Body Irradiation(TBI), Total Skin Electron Irradiation(TSEI), Intra Operative radiotherapy(IORT), Endo rectal Irradiation, Conformal Radiotherapy and Intensity Modulated Radiotherapy (IMRT), Image Guided Radiation Therapy (IGRT), Respiratory Gated Radiation Therapy(IGRT), PET/CT fused images, proton therapy and higher nuclide therapy at our avail although the use of most of them by a common patient has been limited by cost and shortage of manpower who has skills on using them. In addition, there are many equipments, chemicals and accessories used in medicines. The price of these machines is generally high for the obvious reasons that they are the result of huge investment and dedicated efforts. But a mankind cannot stay away from being benefitted from such grace of human efforts. Many developing countries lack such services for the limitation of their resource. Nevertheless Governments of these countries should not make an excuse for high price to import such technologies (True beam, Rapid Arc,) to their country. They should find the ways to import these technologies to their country and hence start building a necessary infrastructure including skills and manpower (Medical physicist, Biomedical Engineer and related workers) to do that. This will help every citizen to do cancer diagnosis and treatment and minimize the treatment cost at home than going abroad. This will help a country to assure the right of every citizen for health.

Participation in DGMP, Marburg, Germany: 9-12 September, 2015

Prof. G. A. Zakaria, Honorary member, BMPS and Md. Anwarul Islam, Vice President, BMPS participated Jahrestagung der Deutschen Gesellschaft fur Medizinische Physik, DGMP from 9-12 September, 2015, Marburg, Germany. Prof. G. A. Zakaria was invited as a session chair for Dosimetry and Poster session.

Participation in DGMP-2015

Seminar on Regulatory Aspects and Quality Control in Diagnostic Imaging and Radiotherapy Facilities: 9th July 2015

On 9th July 2015, a workshop was organized by Bangladesh Medical Physics Society (BMPS) and Bangladesh Atomic Energy Regulatory Authority (BAERA). The title of the workshop was "Regulatory Aspects and Quality Control in Diagnostic Imaging and Radiotherapy Facilities". The main aim of the workshop was to practice Quality Assurance (QA) & Quality Control (QC) in Bangladesh for accuracy of the treatment of cancer as well as for diagnosis. The workshop was presided by the Chairman, BAERA, Prof. Dr. Naiyyum Choudhury. The Chief Guest-Prof. Dr. Mesbahuddin Ahmad, President of the Bangladesh Academy of Sciences (BAS) and the special guests and speakers were Prof. Dr. G. A. Zakaria, Mr. Volker Steil, Dr. Flavia Molina from Germany. The program was coordinated by Dr. Hasin Anupama Azhari, Chairman of MPBME, Gono Bishwabidyalay and Dr. Mofazzal Haider Head of Radiation Control division, BAERA on behalf of BMPS and BAERA.

Participants in the Workshop In BAERA

In scientific session speakers emphasized the procedure of quality control in radiotherapy, diagnostic imaging, nuclear medicine centers in their presentations. "The recent status of Medical Physics in Bangladesh" and "Regulatory framework for medical radiation facilities in Bangladesh" were presented by Dr. Hasin Anupama Azhari and Dr. Mofazzal Haider respectively.

Visit to Ambassador of Germany in Bangladesh by BMPS members: 6th July 2015

Germany played a pioneer role in introducing and development of Medical Physics in Bangladesh through establishment of Department of Medical Physics and Biomedical Engineering (MPBME) in Gono University. Recently on 6th July, 2015, Dr Hasin Anupama Azhari, the founder President of Bangladesh Medical Physics Society (BMPS) and Chairman of MPBME, Prof. Dr. Golam Abu Zakaria, coordinator of German Collaboration and Professor of Medical Physics in Germany and other German Professors (Mr. Volker steil and Dr. Flavia Molina) visited Dr. Thomas Prinz in Embassy, Honorable Ambassador of Germany in Dhaka, Bangladesh. He was informed about the overall activities, development, hinders, pros and cons of medical physics subject both in academic and clinical aspects in details.

BMPS members' visit to Honorable Ambassador of Germany in Bangladesh

Participation in World Congress on Medical Physics and Biomedical Engineering, Toronto, Canada: June, 2015

Since 1979, the World Congress (WC) on Medical Physics and Biomedical Engineering has been bringing together a growing number of professionals involved in basic research & development, industry and medical applications and attracts both biomedical engineers and physicists from around the globe. It used to held in every three years.

The recent congress took place in Toronto from 7 to 12 June 2015. WC 2015 was hosted by IUPESM, IOMP, IFMBE, CMBES and COMP which are the world's best leading associations. The IUPESM World Congress (WC) in 2015 had arranged a symposium focusing on "Building Medical Physics Capacity in Developing Countries".

IOMP invited Dr. Hasin Anupama Azhari from Bangladesh to contribute her valuable knowledge and experience based on this symposium title. Dr. Azhari is the Dean of the faculty of Physical and Mathematical Sciences and also the Chairman of the Medical Physics and Biomedical Engineering Department (MPBME). She is the founder president of Bangladesh Medical Physics Society (BMPS).

BMPS founder President Dr. Hasin Anupama Azhari in World Congress

The present situation of medical physics and its growing demand was briefly explained in her presentation.

Training Program on Gastro Intestinal Cancers: April 2015

A National Training Program was held from 26th April to 30th April 2015 on Gastro Intestinal Cancers in Radiation Oncology Department of National Institute Cancer Research and Hospital (NICRH). One of the BMPS members Mr. Shaheen Miah, Medical Physicist, NICRH attended the training program.

Brachytherapy Training in India: February 2015

The oldest medical institute Dhaka Medical College Hospital (DMCH), Dhaka, Bangladesh has recently installed a new Co-60 HDR Brachytherapy (BT) Unit, Eckert & Ziegler Bebig Multisource to treat a vast number of cancer patients at low cost in a developing country like Bangladesh. To run the new department efficiently a foreign training was

Indian and Bangladeshi Oncologists and Medical Physicists

Training on Treatment Planning

arranged for two oncologists and one medical physicist (Safayet Zaman, Treasurer, BMPS) at R. G. Kar Medical College & Hospital, Kolkata, India from 9-14th February, 2015. A Hands on training for both oncologists and physicists were given on interstitial and and intracavitary brachytherapy by a group of well-experienced oncologists and medical physicists for one week.

BMPS Meeting with Chairman of IOMP Education and Training Committee: February 2015

Prof. John Damilakis, Chairman of the IOMP Education and Training Committee and President, EFOMP visited Bangladesh to attend International Conference on Physics in Medicine and Clinical Neuroelectrophysiology (PMCN2015) in February 2015. During that period he met BMPS members on 17th February, 2015. At that meeting a detailed discussion was held regarding development and present situation of Medical Physics in Bangladesh followed by a dinner. Dr. Hasin Anupama Azhari (Vice-President. Md. Anwarul Islam (Vice-President), Md. Akhtaruzzaman (General Secretary), Md. Mahmudul Hasan (Joint Secretary), K. M. Masud Rana (Treasurer), Kazi Towmim Afrin (Executive Member) have attended the meeting. As a Chairman of the IOMP Education and Training Committee BMPS asked his continuous support for development of Medical Physics in Bangladesh.

Meeting with Prof. John Damilakis

IAEA supported workshop on Medical Physics at Radiation Oncology department, United Hospital Limited, Dhaka, Bangladesh: November 2014

Under the auspices of IAEA and Medical Physics Unit of Radiation Oncology department, United Hospital Limited, a four day workshop was organized on implementation of the International Code of Practice for external beam radiotherapy dosimetry based on standards of absorbed dose to water, IAEA TRS-398 from 18 to 21 Nov 2014. Prof M. A. Hai, President Oncology Club Bangladesh, Engr. M. Ali Zulquarnain, Chairman (In-charge), Bangladesh Atomic Energy Commission, Dhaka, Bangladesh, Prof. Dr. Santanu Chaudhuri, Consultant Oncologist, United Hospital Ltd. were present at the inaugural session.

Participants of the Workshop

Dr. M. Saiful Huq, Professor and Director of Medical Physics Division, UPMC Cancer Centre, Pittsburgh, Pennsylvania, USA was the trainer for the workshop. A total of twenty four participants including 13 radiation therapy physicists and 8 nuclear medicine physicists working in different government and nongovernment hospitals of Bangladesh and 3 M.Sc students of Gono Bishwabidyalay attended the workshop. Among them 10 participants were BMPS members. The workshop includes brief discussion on dosimetric principles and absolute dosimetry for high energy photons and electrons using IAEA TRS-398 protocol separately followed by practical sessions. An informal evaluation cum feedback session and certificate giving ceremony was held at the end of the workshop.

IAEA National Training Program on Radiation Oncology: November 2014

Md. Anwarul Islam, Vice President of Bangladesh Medical Physics Society & Medical Physicist, Square Hospitals Ltd had participated in the IAEA training program entitled "The IAEA National training program on Radiation Oncology".The training was conducted by Dr. Shyam Kishore Shrivastava, Dr. S. Hukku and Dr. Rajesh A. Kinhikar.

BMPS Vice President in IAEA National Training Program on Radiation Oncology

Training Course on Intensity modulated radiation Therapy for Head and Neck cancers and Brain Tumors: November 2015

A National Training Course on Intensity modulated radiation Therapy for head and neck cancers and brain tumors will be held from 30th November to 4th December 2015, Mumbai, India. One of BMPS members Mr. Shaheen Miah, Medical Physicist has been selected from NICRH to attend the program.

Quarterly Meeting: BMPS

Besides executive meeting of BMPS, in every three months a meeting is held with BMPS general members. In the meeting suggestions are made from the general members. According to the suggessions of the members BMPS try to accomplish the activities of Medical Physics (MP) development. BMPS thinks it is vital to exchange the views and ideas between GM and EC members.

Quarterly Meeting of BMPS

Progressive Development In Medical Physics and Biomedical Engineering Education

International: German Collaboration

On 22nd May 2012, a cooperation contract was signed between Mannheim Medical Center of the Ruprecht-Karls-University Germany and the Department of Medical Physics and Biomedical Engineering (MPBME), Gono-Bishwabidyalay (GB), Dhaka, Bangladesh (BD). On the basis of the co-operation in the year 2014 and 2015 the following personals visited Germany for M.Sc. degree from Heidelberg University, Ph.D Practical works, hands on training program, workshop, seminar.

Students for M.Sc. Degree from Germany : Three (3) students already visited Germany for M.Sc. degree in Medical Physics from Heidelberg University. **2014:** *Mr. Abu Kauser* and *Nupur Karmaker*; **2015:** *Md. Naznul Alim*

Ph.D Practical Work: 2014: *Kumaresh Chandra Paul*, **2015:** Anwarul Islam

Training of Hospital Physicists: 2014: *Md. Masud Rana* (National Institute of Cancer Research and Hospital), Md. Faruq Hossain (United Hospital) **2015:** *Md. Nazrul Islam* (Shaheed Ziaur Rahman Medical College and Hospital); *Md. Masud Parvej* (Bangladesh Atomic Energy Agency).

Teachers visit from Germany in BD: 2014: *Prof. Dr. G. A. Zakaria* **2015:** *Mr. Volker Steil, Dr. Flavia Molina, Prof. Dr. G. A. Zakaria*

Teachers visit from Bangladesh in Germany: *Dr. Hasin Anupama Azhari, Kumaresh Chandra Paul*

One week workshop in Germany: 2015: *Suresh Poudel, Mr. Delowar Hossain.*

2014: Visited Students Ph.D and M.Sc; Hospital Physicists in Germany Through Collaboration

2015: Visited Students PhD and M.Sc; Hospital Physicists in Germany Through Collaboration

International: Indian Collaboration

For pursuing B.Sc. project in 8th Semester of Honours course or after B.Sc. (Hons) course some selected students were also sent to Saroj Gupta Cancer Center and Research Institute, Thakurpukur, Kolkata, and North Bengal Oncology Center, Siliguri since 2011. The main aim of this programe is to qualify them theoretically and clinically. The students of MPBME undergone clinical training in radiotherapy, nuclear medicine and Imaging department. Till now 15 students participated and achieved training certificate from India and 3 Indian teachers also visited MPBME, Gono Bishwabidylay.

2015: Training of MPBME students in India

2014: Training of MPBME students in India

National: Internship and Training

After passing the B.Sc and M.Sc course from MPBME, GB, students are placed in different hospitals for internship program for three months. At present Students are being trained in United Hospital, Dhaka Medical College hospital, Ahsania Mission Cancer and General Hospital (AMCGH) and National Institute Cancer Research and Hospital (NICRH).

MPBME students training in NICRH

BMPS Annual General Meeting (AGM)

At the end of ACBMPS 2015, Annual General Meeting (AGM) was held with all members of BMPS. A new executive committee has been formed for the year 2015- 2017. The new members are as follows:

NAME AND PARTICULARS	POSITION
Kumaresh Chandra Paul	President
Mohammad Anwarul Islam	Vice-President
Md Akhtaruzzaman	Vice-President
Safayet Zaman	Secretary
Md. Abu Kauser	Joint-Secretary
Nupur Karmaker	Treasurer
Dr. Hasin Anupama Azhari Prof. Dr. Golam Abu Zakaria Md. Mahmudul Hasan Kazi Towmim Afrin Supti Md Mostafizur Rahman Md Atiquzzaman	Executive Members

BMPS Executive Members: 2015-2017

Awards and Honors

ICTP Associate Member

Dr. Hasin Anupama Azhari is selected as an associate member for the 2nd time by Abdus Salam ICTP Associateship Scheme . During her tenure she will be doing research in medical physics, cooperation with ICTP, organize conference, workshop and seminar. Dr. Azhari is the Dean of the faculty of Physical and Mathematical Sciences and also the Chairman of the Medical Physics and Biomedical Engineering Department, Gono Bishwabidyalay.

Honorary Member of Bangladesh Cancer Society (BCS)

On 27th December 2011, Bangladesh Cancer Society (BCS) nominated Professor Dr. Golam Abu Zakaria, Chief Medical Physicist and Chairman Gummarsbach University Teaching Hospital, Cologne, Germany as an Honorable Member of the Society for his outstanding contribution in Medical Physics and Oncology in Bangladesh and abroad. He is also the Chairman of the project called Medical Physics in the Developing Countries and initiator of seminars for introducing Medical Physics in Bangladesh.

BANGLADESH CANCER SOCIETY
CERTIFICATE

Dhaka, the 27th of December 2011

Bangladesh Cancer Society (BCS) is delighted to nominate Professor Dr. Golam Abu Zakaria as an Honorable Member of the Society for his outstanding contribution in Medical Physics and Oncology in Bangladesh and abroad.

(Prof. Dr. Mollah Obayedullah Baki)
President
Bangladesh Cancer Society

(Prof. Dr. Sheikh Golam Mostafa)
Secretary General
Bangladesh Cancer Society

Certificate from BCS to Professor G. A. Zakaria

Award : IOMP

International Organization for Medical Physics (IOMP) invited Dr Hasin Anupama Azhari, Founder President, Bangladesh Medical Physics Society to take part in the World Medical Physics Congress on Medical Physics and Biomedical Engineering (7-12 June 2015, Toronto, Canada). They have offered award for all the expenses related to attend the Congress.

Award Ceremony ACBMPS-2015

In the award ceremony of ACBMPS 2015, poster prizes were given to the best three poster presenters. The judges of the evaluation committee were Mr. V. Steil, Mannheim Medical Centre, Germany; Dr. Monjur Ahasan, Bangladesh Atomic Energy Commission (BAEC); Prof. Dr. G. A. Zakaria, University of Cologne, Germany; Dr Flavia Molina, Mannheim Medical Centre, Germany; and Prof. Dr. M. Ali Asgar, Bangladesh Physical Society (BPS). The name of the winners and their presentation titles are as follows:

1st Prize: Assessment of Arsenicosis Patient in Bangladesh by the Determination of Arsenic Concentration in Scalp Hair Using EDXRF: A Five Years Case Study; M. Safiur Rahman, Bangladesh Atomic Energy Commission.

2nd Prize: Design and Development of Dose Rate Meter; Md. Mamun Or Rashid, BSc student, MPBME GB.

3rd prize: Application of European Commission Reference Dose Level in Pediatric CT Examination in Dhaka City; Mst. Zinat Rehana, BSc student, MPBME GB.

First Prize Winner

Second Prize Winner

Department of Medical Physics & Biomedical Engineering

[Only Department in Bangladesh: Collaboration with Germany & India]

In 2000 a full-fledged "Department of Medical Physics & Biomedical Engineering" was founded at Gono Bishwabidyalay, Savar, Dhaka, Bangladesh with M.Sc course of international standard. From 2005, B.Sc (Hons) course in Medical Physics and in Biomedical Engineering was launched.

Courses Offered

UGC Approved

B.Sc (Hons) in Medical Physics & Biomedical Engineering	4 years (8 Semesters)
M.Sc in Medical Physics & Biomedical Engineering	2 years (4 Semesters)

Medical Physics and Biomedical Engineering

Medical Physics is the application of physics to medicine. It generally concerns physics as applied to medical imaging and radiotherapy, although a medical physicist may also work in many other areas of healthcare.

Biomedical engineering is an interdisciplinary field of advanced knowledge of engineering and science to solve medical and healthcare related problems.

This unique field encompasses

Bio-instrumentation, Radiotherapy Treatment Planning, Radiation Dosimetry, Bio-materials, Radiotherapy Devices, Nuclear Medicine, Bio-Mechanics, Radiation Protection, Medical Imaging, Radiation Oncology Physics, Brachytherapy, Cellular and Tissue Engineering, Laser medicine, Intensity Modulated Radiation Therapy (IMRT), Sophisticated Imaging Device: Magnetic Resonance Imaging (MRI), Computed Tomography (CT), Positron Emission Tomography (PET).

Job Scope : Medical Physics and Biomedical Engineering

- Radiotherapy Department in all public and private Hospitals
- Diagnostics Centers
- Bangladesh Atomic Energy Commission (BAEC)
- Medical Companies for Maintenance, Operation, Managment and Development of Equipment
- University or Research Institute
- Also in foreign countries.
- Laser therapy for skin treatment.

Practical Class in Hospital

Special Features

- Well equipped laboratories for Physics, Electronics, Medical Physics and Biomedical Engineering.
- Collaboration with the German Cancer Research Centre (DKFZ), Heidelberg University, Germany.
- Collaboration with Saroj Gupta Cancer Centre & Research Institute, Thakurpukur, Kolkata, India.
- Collaboration process is going on with the School of Bioscience & Engineering, Jadovpur University, Kolkata, India.
- Collaboration with Anhalt University of Applied Sciences, Germany
- Scope of higher education (M.Sc. & Ph. D) and training under DAAD Scholarship at Mannheim Medical Centre, Heidelberg University Germany
- Thesis and project supervised by renowned Professors from German Universities.
- Updated books relevant to the subject and laboratory instruments are supplied from Germany
- Courses are taken by Guest Professors from Heidelberg University, University of Cologne, Germany.
- Facilities of practical training in the Government and non Government hospitals in Bangladesh (NICRH, DMCH, etc.)

Eligibility for admission

B.Sc (Hons) in Medical Physics and Biomedical Engineering :
GPA 2.5 in S.S.C & H.S.C with Math & Physics or Diploma on Electrical/ Electronics/Mechanical/Electromedical Engineering from Polytechnic Institute, minimum 2nd class or equivalent.

M.Sc in Medical Physics and Biomedical Engineering :
B.Sc (Hons) in Medical Physics & Biomedical Engineering, B. Sc (Hons)/ M.Sc degree in Physics/Applied Physics/Biochemistry/Biology/ Chemistry/Mathematics/MBBS/B.Sc in engineering, minimum 2nd class or equivalent.

Students passed from the department are currently working in Dhaka Medical College Hospital (DMCH), National Institute of Cancer Research and Hospital (NICRH), Square Hospital, United Hospital, Bangabandhu Sheikh Mujib Medical University (BSMMU), Khwaja Yunus Ali Medical College & Hospital, Ahsania Mission Cancer & General Hospital, Multinational company and also in Gono Bishwabidyalay.

Department of Medical Physics & Biomedical Engineering

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GONO BISHWABIDYALAY

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www.bmps-bd.org

ICMPROI-2017

3rd International Conference on Medical Physics in Radiation Oncology and Imaging

21 - 23 October 2017

DHAKA, BANGLADESH

Organized by

Bangladesh Medical Physics Society (BMPS)

Endorsed by

Asia-Oceania Federation of Organizations for Medical Physics (AFOMP)

CONTACT

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+88 01730 449 610

Upcoming Events

January 19, 2016
TG 278 Combined Residency and Research Training in Medical Physics Meeting AAPM HQ
1620 Prince Street
Alexandria, VA 22314
703-302-8300, United States of America.
http://www.aapm.org/meetings/2016TG278Meeting.asp

Feb 15 – 19, 2016
ICTR-PHE: Int'l Conference on Translational Research in Radio-Oncology and Physics for Health.
Geneva, Switzerland
https://ictr-phe16.web.cern.ch/

February 20-21, 2016
Annual Conference of Association of Medical Physicists of India (Northern Chapter)
Institute of Medical Sciences, Banaras Hindu University
Varanasi (UP)-221005, India.
http://www.ampi.org.in

22-23 February 2016
Workshop on Medical Physics
Dhaka, Bangladesh
www.bmps-bd.org

Mar 2 – 6, 2016
European Congress of Radiology
Vienna, Austria
http://www.myesr.org/cms/website.php?id=/en/ESR_ECR_news.htm

April 14-17, 2016
The 111th Scientific Meeting of the Japan Society of Medical Physics.
Pacific Yokohama, Japan.
http://www.jsmp.org/conf/111_en/

20 April 2015
Seminar on Medical Physics
Bangladesh medical Physics Society, Dhaka, Bangladesh
www.bmps-bd.org

9-13 May 2016
The 14th Congress of the International Radiation Protection Association
Cape Town, South Africa.
http://www.irpa2016capetown.org.za/

July 21 - 22, 2016
ICMPBE 2016 : 18th International Conference on Medical Physics and Biomedical Engineering.
Zurich, Switzerland
https://www.waset.org/conference/2016/07/zurich/ICMPBE/call-for-papers

Sep 7 – 10, 2016
47th Annual Meeting of the German Society of Medical Physics (DGMP)
Würzburg, Germany
www.dgmp-kongress.de

September 8 - 9, 2016
ICMPBE 2016 : 18th International Conference on Medical Physics and Biomedical Engineering
Singapore, SG
http://www.waset.org/conference/2016/09/singapore/ICMPBE

25-28 September 2016
ASTRO 58 th Annual Meeting
415 Summer Street
Boston, MA 02210, USA
www.astro.org

2017: 21-23 October 2017
3rd International Conference on Medical Physics in Radiation Oncology and Imaging" (ICMPROI 2017), AFOMP

22-23 November
5th Annual Conference of Bangladesh Medical Physics society (ACBMPS-2016)
Dhaka, Bangladesh.
www.bmps-bd.org