

The American Board of Radiology: MOC

Therapeutic Radiologic Physics SDEP

- [Example 1: Education](#)
- [Example 2: Education](#)
- [Example 3: Clinical](#)

Example 1: Education

- Title: Develop a Lecture on CT/PET in Radiation Oncology for Medical Residents

- Category: Education

- Date Initiated:

- Date Completed:

- **A. Significance:**

Physicists are responsible for radiation physics training of medical students, residents, and allied health personnel. In this case, a specific lecture on the use of CT/PET in radiation oncology will be developed as an educational tool.

- **B. Approach:**

A one-hour lecture will be prepared, utilizing appropriate task group reports and reference data, to be delivered to medical residents in radiation oncology. It will be developed at the appropriate level using appropriate references. A PowerPoint presentation will be made to cover my objectives for the self-education project:

- Familiarize myself with PET/CT
 - Discuss the basics of PET, CT and PET/CT scanners
 - Discuss the purpose of PET/CT in oncology
 - Address limitations
- Observe the clinical use of PET/CT
- Conduct an experiment for measuring the resolution in a PET scanner
 - Build a phantom for measuring the resolution of hot sources on a cold background
 - Use ^{18}F FDG to measure the resolution of the GE Advance Pet Scanner in the department

- **C. Evaluation of Achievement:**

1. PROSPECTIVE STATEMENT (provided at the date SDEP is initiated):

Upon completion of the project, a PowerPoint lecture will be created for radiation oncology residents on CT/PET use in radiation oncology. The lecture will be delivered to the residents in the department, and their evaluations will be compiled to assess the success of the project.

2. FINAL STATEMENT (provided at the date SDEP is completed):

The project has resulted in creation of an educational lecture on PET/CT. A slide presentation is available for use by members of the department. Specific learning objectives have been documented. Following the presentation, evaluation by the residents showed a favorable response to fulfilling the learning objectives and furthering their understanding of PET/CT technology and its clinical utility.

■ **D. Impact on Practice/Outcome Statement:**

1. PROSPECTIVE STATEMENT (provided at the date SDEP is initiated):

Medical imaging is an essential tool in radiation therapy. Computed tomography (CT) and positron emission tomography (PET) are image modalities that have been used in diagnosis and staging of diseases and in monitoring the effects of therapy. The high-resolution anatomical imaging ability of CT and the accurate localization of functional abnormalities with PET provide valuable information for patient management. The biological information from a PET/CT image can aid oncologists in assessing tumor hypoxia and potential doubling time.

2. FINAL STATEMENT (provided at the date SDEP is completed):

The implementation of the SDEP on CT/PET has benefited the institution in achieving a full understanding of the consequences of implementing the modality. It has aided in understanding the advantages of multimodality imaging application in radiation oncology. It provides detailed step-by-step process implementation tools.



Example 2: Education

■ Title: HDR Treatments and Treatment Planning

■ Category: Education

■ Date Initiated:

■ Date Completed:

■ **A. Significance:**

High-dose-rate brachytherapy (20 cGy/min and higher) is used for the treatment of cancer in radiotherapy clinics nationwide. Since the advent of the remote afterloader, HDR has gained popularity over LDR because it is an outpatient procedure requiring a much abbreviated hospital stay as compared to LDR. As a medical physicist, a comprehensive understanding of this treatment modality is absolutely essential. Although I am a board-certified medical dosimetrist, I have little to no experience with brachytherapy; therefore, I see this as the most significant weakness in my development as a clinical medical physicist. The goals of this project are to obtain a working knowledge of the Nucletron system and PLATO planning software, as well as to familiarize myself with the delivery process and required QA and safety checks.

■ B. Approach:

To familiarize myself with Nucletron's PLATO planning system, I must run a large number of treatment plans, as one plan will not be enough to gain any sort of proficiency with the system. I will concentrate my efforts on tandem and ovoid treatments, but will venture into breast treatments if possible. For the tandem and ovoid cases, I will acquire films of patients who have been treated in the past and will attempt to recreate their original plans. I can check my accuracy by comparing my plan to the actual treatment. I will attempt to follow a similar procedure for the breast patients but will use CT scans of previously treated patients.

The second component of this project is to learn about the actual procedure. I have chosen to follow one breast patient from the beginning of simulation to the end of the first treatment. I will begin by observing the placement of the catheters; I will then watch the medical physicist run the treatment plan and attend the first treatment. At the time of treatment, I hope to get some hands-on experience by running the Nucletron console, performing the relevant paperwork, and physically attaching transfer tubes under the direct supervision of a certified medical physicist.

I intend to complement the above project with outside research on the topic to increase my understanding of HDR brachytherapy practice and procedures.

■ C. Evaluation of Achievement:

1. PROSPECTIVE STATEMENT (provided at the date SDEP is initiated):

Upon completion of the project, a report will be presented summarizing all procedures observed and completed. All printouts of plans run can be printed if necessary. One example will be included as part of the report. The workup will include a critical comparison of the methods, detailing assumptions made in each and outlining various aspects and considerations per discussion points raised in the literature as well as personal observations. A final analysis of the plans will be made with an experienced physicist/dosimetrist and radiation oncologist.

2. FINAL STATEMENT (provided at the date SDEP is completed):

The summary report prepared has documented the above activities related to the HDR treatment planning, date of its completion, and data for all relevant findings. Specific steps of the processes related to planning, delivery, and verification are identified.

■ D. Impact on Practice/Outcome Statement:

1. PROSPECTIVE STATEMENT (provided at the date SDEP is initiated):

At the completion of this SDEP, I will have the benefit of acquiring HDR planning and delivery skill. It will allow me to offer additional physics support to my institution and broaden the scope of my expertise. However, the documentation and record keeping required for the various options must be fully understood and evaluated as to realities of implementation and efficacy to confirm the protocol most appropriate for use.

2. FINAL STATEMENT (provided at the date SDEP is completed):

As a result of completing this self-directed project, I achieved my original goal of gaining a working knowledge of HDR. Going into the project, I had little to no knowledge of what was involved with HDR

treatment. After completing all of the above procedures, I have a much better understanding of this treatment technique and will have less to learn when I encounter it again later in my career.



Example 3: Clinical

■ Title: Using the TG-51 Protocol for Calibration Dosimetry

■ Category: Clinical Practice

■ Date Initiated:

■ Date Completed:

■ **A. Significance:**

During the last decade radiation therapy high-energy accelerator beams have been calibrated following the TG-21 recommended protocol. AAPM's TG-51 protocol for clinical reference dosimetry of high-energy photon and electron beams is an improved and significantly revised protocol. It is strongly recommended by the Radiologic Physics Center and the Therapy Committee of the AAPM. The objective of this SDEP is to fully understand and implement all aspects of the TG-51 protocol.

■ **B. Approach:**

A step-by-step guide to calibration of a linac's photon and electron beams using the TG-51 protocol will be written. The guide could be used by a medical physicist who is not yet familiar with this protocol to gain experience. A calibrated ion chamber, a water tank phantom, a calibrated electrometer, a lead foil for filtering electron contamination from a photon beam of 10 MV or greater, and temperature and pressure-measuring devices are also required. Emphasis will be placed on explaining the definitions and the advantage in simplicity of using dose-based calibration, as opposed to the exposure-based calibration and cavity theory relationships used in the TG-21 protocol.

The formalism and dosimetry procedures recommended for TG-51 are based on the use of an ionization chamber calibrated in terms of absorbed dose to water in an Accredited Dosimetry Calibration Laboratory (ADCL) using a reference ^{60}Co gamma ray beam. This is different from the recommendations given in the AAPM TG-21 protocol, which are based on an exposure calibration factor of an ionization chamber in a ^{60}Co beam.

Step-by-step information will be provided on the following topics:

- Measurement of percent depth-ionization and depth-dose curves for photon and electron beams using cylindrical and plane-parallel ionization chambers.
- Determination of the beam quality conversion factor k_Q for photon beams and the electron beam quality conversion factor k'_{R50} for electron beams.
- Measurement of various correction factors to the charge reading.
- Determination of dose at the depth of dose-maximum from measurements made at the reference depth for both photon and electron beams.
- Measurements needed to compare the recommendations of the TG-51 protocol with those of the TG-21 protocol.
- Clarification of potential sources of confusion in the clinical implementation of TG-51.

■ **C. Evaluation of Achievement:**

1. PROSPECTIVE STATEMENT (provided at the date SDEP is initiated):

Upon completion of the project, a guide will be prepared and posted on a university website for use by any person who wants to learn about TG-51.

2. FINAL STATEMENT (provided at the date SDEP is completed):

A report concerning TG-51 has been prepared that documents the above activities, date of completion, and data for all relevant findings. That report is available on the web to serve as a teaching guide.

■ **D. Impact on Practice/Outcome Statement:**

1. PROSPECTIVE STATEMENT (provided at the date SDEP is initiated):

Completion of the guide to TG-51 will require a thorough understanding of the protocol and will provide a useful resource for any medical physicist who wants to become familiar with TG-51.

2. FINAL STATEMENT (provided at the date SDEP is completed):

The implementation of the TG-51 protocol has benefited the institution in achieving a full understanding of the consequences of implementing the new protocol. It has aided in complying with the recommendations of the Radiologic Physics Center and, consequently, in achieving better standardization of the dosimetry. The comparative evaluation of patients entered in national clinical trials through study groups such as RTOG is also placed on better scientific foundations.