

Site planning for PET involves separating radiation sources, primarily patients, from the remainder of the radiology department and general hospital facilities. It is important to detach the PET area from ordinary nuclear medicine to reduce variable background radiation in the cameras. Movement of positron sources should also be done distant from the camera zone. Separation is more important in the fluorodeoxyglucose (FDG) studies because of the one-hour quiet period required of the injected patient prior to imaging. Thus, an adjacent area must be designated for patient holding. A protocol nurse is usually required for PET due to the use of oral muscle-relaxant drugs (e.g. ativan) for the FDG study. Since the injected patient may react to relaxants and/or FDG, surveillance is maintained during the holding procedure. This is best done with a closed circuit TV system that produces an image at the PET scanner console or nurse's station. Radiation safety for PET entails maximizing distance and shielding while minimizing contact time. It may be useful if an outside wall is used as one or more sides of the PET zone. Likewise, placing PET on the lowest floor of the hospital can reduce exposure to other staff. The resting individual will have on the order of 10 mCi of F-18 on board at the beginning of their procedure. Using the gamma dose rate constant of $5.7 \text{ R cm}^2/\text{h/mCi}$, implies exposure rates of approximately 6 mR/h or less at one meter. Decay of F-18 with a half-life of 110 minutes and internal absorption can reduce this value significantly during the 2 h stay in the PET zone. Dosimeters should be placed at several locations within the PET facility and adjacent areas to monitor monthly exposures. It is also prudent to employ rolling shields that can be placed at the foot and side(s) of the holding bed. Such devices usually contain 2.5cm of lead (up to 5.0 cm) and thus substantially reduce exposures of the staff since the HVL of Pb at 511 keV is on the order of 4 mm. An additional shield can be positioned between the scanner couch and technologist. Many institutions already have such shields due to their historical use with Cs-137 implant therapy.

Educational Objectives:

1. Knowing the various functional areas in a PET facility
2. Optimizing distance, shielding and time to minimize personnel and visitor dose due to PET.
3. Knowing expected exposure rates at one meter from small F-18 sources.