

### Mandate

The Task Group would develop an ICRP Publication on radiological protection in PET and PET/CT, giving recommendations on occupational, patient, and public radiation protection. The following topics would be covered:

- PET/CT principles (applications, technology and protocol).
- Facility design (focusing on elements related to radiation protection).
- Approaches to PET/CT justification with special attention to the purpose of the CT scan.
- Measures for protection of staff: considering protection measures that should be in place and application of automated systems for drawing up and injecting radiopharmaceuticals.
- Development of more coherent strategies for personal dose monitoring.
- Radiation protection of the patient (including justification and optimisation of PET imaging and the CT scan, and special situations: pregnant, paediatric and breastfeeding patients).
- Radiation protection of the public (patient release).
- Dose management and quality assurance program.

The target audience would be nuclear medicine, radiologists and other clinicians, medical physicists, technical staff, radiation protection officers, regulatory authorities, and equipment manufacturers. This Task Group will develop an ICRP Publication on radiological protection in PET and PET/CT, as well as prepare educational materials on the topic.

**Task Group 117 organised a Workshop on Radiation Protection in PET and PET/CT on 18 September 2023, and a draft of the final report is out for consultation until 29 December 2023.**

### Sections of the Document

1. Introduction
2. PET and PET/CT Principles
3. PET/CT Facility Design
4. Imaging Equipment Life Cycle
5. Justification and Optimisation of PET, PET/CT and PET/MRI
6. Optimisation Related to the Medical Exposure of Patients, Carers/Comforters, and Research Volunteers
7. Radiological Protection for the Public
8. Optimisation for Staff
9. Dose Management and Quality Assurance Program
10. Education and Training in Radiological Protection

### Main Points

- Planning of positron emission tomography (PET) facilities is crucial for the radiological protection of the patient, staff, and public. Proper shielding and maximum automation of the radiopharmaceutical handling should be employed and the rooms within a PET department should be arranged to facilitate

patient movement, while minimising the exposure of staff members and other patients.

- The justification of PET, PET/CT and PET/MR should involve consideration of the characteristics of the imaging technologies, and take account of the PET radiopharmaceutical and choice of protocol to achieve the objective of the CT examination and special consideration given to paediatric patients. Imaging protocols should be optimised for the clinical task, and national diagnostic reference levels (DRLs) should be established for PET and CT components.
- Occupational doses in PET are frequently close to one third of the dose limit, and skin doses to the fingers from manipulating PET radiopharmaceuticals can exceed the annual dose limit if proper protection measures are not followed. Adoption of appropriate shielding devices is important, but the individual techniques and optimisation of working practices are crucial (see Figure 1).

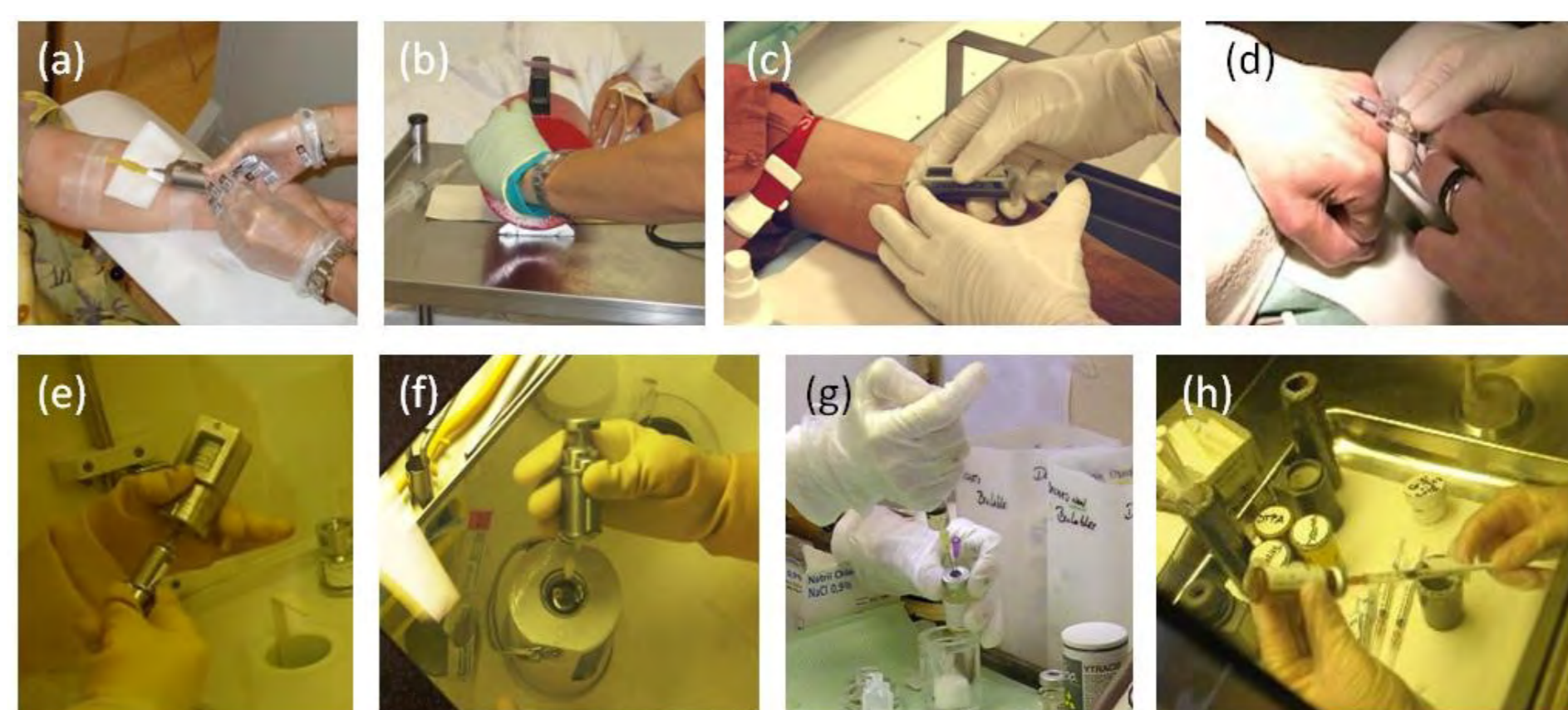


Fig 1. Examples of good administration (a) (b) and preparation (e) (f) practices, and examples for bad administration (c) (d) and preparation (g) (h) practices (Vanhavere et al., 2012).

- Whole-body monitoring should be carried out based on monthly measurements, and  $H_p(10)$  measurement from a dosimeter worn on the upper body will also provide an approximate indication of dose to the eye lens. Monitoring extremity doses with fingertip or ring dosimeters is recommended, with correction factors to estimate the maximum dose over the two hands (see Figure 2).

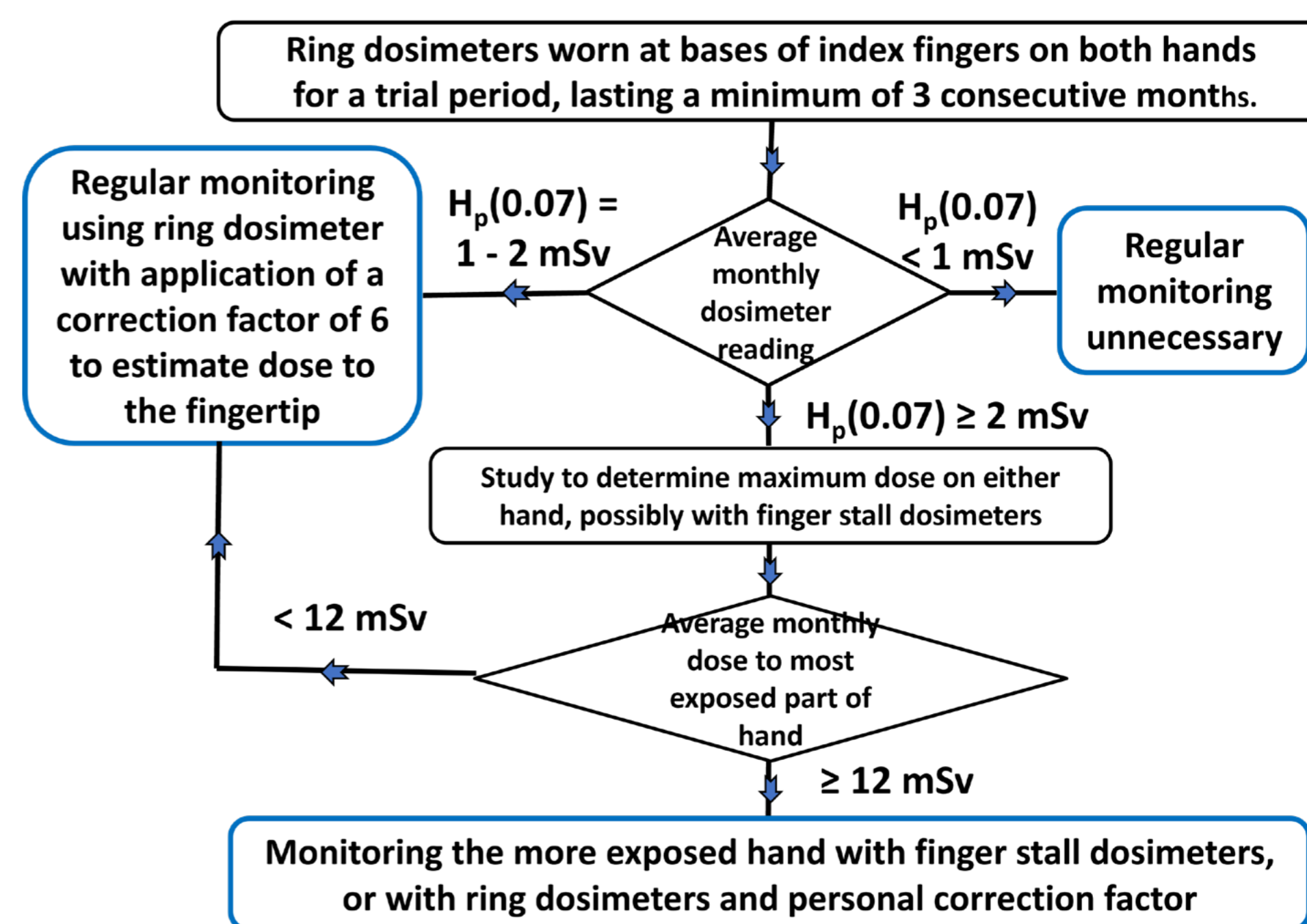


Fig 2. Flowchart setting out decisions about extremity monitoring options based on a trial period with staff wearing ring dosimeters.

- Appropriate standards should address radiation protection in a PET facility for patients, staff and public. Each member of the medical imaging team has a crucial and defined role and must obtain proficiency in radiological protection through formal education, training and continuous professional development.