SUPPLEMENTAL INFORMATION. Parameters for PHITS simulation.

EGS5 (*1*) mode of PHITS (*2*) version 2.88 was used for transport of positrons, photons, and electrons originating from ^{86}Y. A 3 keV energy cutoff was utilized for all particles, after which remaining energy was deposited locally. The PHITS-EGS5 method for treatment of multiple scattering was implemented, which considers starting scattering strength at all new material boundary traversals. Explicit treatment of K- and L-edge Auger electrons and fluorescent photons, Rayleigh scattering, electron impact ionization was considered. The incoherent scattering function for Compton scattering was utilized. Angular distributions of photoelectrons, pair electrons and bremsstrahlung were determined by sampling.

Source particle generation for each phantom organ was conducted using the PHITS multi-source option, which here implemented rectangular parallelepiped (RPP) sources encompassing each organ. Initial guesses within the RPP organ-bounding volume were restricted by overlaps with the region (cell) corresponding to the tetrahedral elements comprising the organ. Following a successful initial guess, particle type (electron, positron, or photon) was sampled based on weighted intensities defined by the ICRP 107 database, and was given an initial energy sampled from the same database (continuous spectrum or monoenergetic spectrum for positrons or photons/Auger/IC electrons, respectively). The source intensities were defined by the whole-organ residence times obtained from PET image segmentation and VOI analysis described in the manuscript. For visualization, absorbed dose was tallied in using xyz-mesh type with isotropic spacing of 0.5 mm. For organ-level mean dose estimation, absorbed dose was tallied using the region mesh function. 5 million total source particles were simulated, resulting in less than 5% relative error in mean organ absorbed doses.

1. Hirayama H, Namito Y, Bielajew AF, Wilderman SJ, Nelson WR. The EGS5 code system. High Energy Accelerator Research Organization; 2005.

2. Sato T, Niita K, Matsuda N, et al. Overview of particle and heavy ion transport code system PHITS. *Annals of Nuclear Energy*. 2015; 82:110-115.