per hr, a constant 75 miles per hr and for a standard urban cycle. However, in order to make a valid comparison of several models, a prospective purchaser needs a single figure that represents realistic driving conditions. Therefore many motoring publications calculate an average fuel consumption based on a weighted mean of the individual figures. It does not matter if the weights assumed do not exactly reflect an individual's driving pattern, the average fuel consumption is still a useful figure for comparing the *relative* efficiency of several models. It may also be used to give an idea of the running costs for an average driver, based on say 12,000 miles per yr. For a more accurate prediction of an individual user's *absolute* running costs, this can be scaled up or down to take into account whether the driver's annual mileage is more or less than average.

Returning to nuclear medicine, to say that it is inappropriate to quote effective dose equivalents for nuclear medicine investigations is just as unhelpful as it would be to say that it is inappropriate for motoring publications to quote an average fuel consumption figure for different cars. Effective dose equivalents allow the *relative* risk of several procedures to be compared prior to "purchase." The fact that the weighting factors might not have been quite right for this individual patient is a small error compared with uncertainties in the assumptions of the biodistribution which cannot be known accurately until after the test. If the *absolute* risk to an individual is important then the average figure for the risk per mSv can be adjusted to take account of whether the patient is older or younger than average.

We would urge the MIRD Committee to think again about their advice. They have led the way so admirably through the jungle of patient dosimetry in the past that it would be a pity for them to turn back now, just as we are emerging into a clearing where results can be understood by colleagues in other disciplines.

REFERENCES

1. Poston JW. Application of the effective dose equivalent to nuclear medicine patients. *J Nucl Med* 1993;34:714–716.
2. Shields RA, Lawson RS. Effective dose equivalent. *Nucl Med Commun* 1987;8:851–855.

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Application of the Effective Dose Equivalent to Nuclear Medicine Patients

TO THE EDITOR: A statement from the Medical Internal Radiation Dose (MIRD) Committee was recently published in *The Journal of Nuclear Medicine* (*1*), which concludes "... it is inappropriate to use the effective dose equivalent for individual patients undergoing nuclear medicine procedures," and recommends that dose calculations for such patients, "continue to be made in terms of radiation absorbed dose (in units of grays or rads)." We feel that we must disagree with both these conclusions.

It is certainly the case that the concept of the effective dose equivalent was developed by the ICRP (*2*) specifically for the purpose of providing comparative estimates of occupational radiation exposure, whether that exposure occurs in a uniform or nonuniform manner.

Nevertheless, in the publication *Protection of the Patient in Nuclear Medicine*, the ICRP itself comments on the usefulness of the effective dose equivalent (*3*). Paragraph 107 of this publication makes several salient points: "When radiopharmaceuticals are administered, individual organs may receive very different doses. In order to facilitate a comparison between different types of radiological investigations, the effective dose equivalent is a convenient measure." The same paragraph acknowledges the limitations of single-tissue weighting factors and the potential variation that may accrue from a patient population as opposed to an occupational one or from differing age and sex distributions. It is undoubtedly correct to say, as ICRP themselves acknowledge in the same paragraph; "... the effective dose equivalent can only be an approximate indicator of the risk to either the individual worker or the individual patient."

Nevertheless, the effective dose equivalent is the best method that we have had at our disposal for some time for estimating the relative risk to nuclear medicine patients from exposure, and the best way of comparing different nuclear medicine techniques with each other and with other radiological procedures.

There are several instances where different radiopharmaceuticals are used to image the same organ yet produce widely differing radiation dose distributions. The use of organ doses alone in such circumstances may make dose assessment and comparison difficult or even potentially misleading.

We would concur with ICRP, again quoting paragraph 107 (*3*): "the effective dose equivalent can be used in comparisons of the radiation exposure to a patient from different procedures used in diagnostic nuclear medicine and in research." We feel that not only can the effective dose equivalent be used in these circumstances, but that it is the most appropriate measure to use.

The effective dose equivalent is hardly a recent concept—its endorsement for use in nuclear medicine was published some 6 yr ago. Furthermore, the Committee makes no mention of *ICRP Publication 52* in their statement, nor do they mention the extensive data on the effective dose equivalent of nuclear medicine procedures in *ICRP Publication 53*. In *ICRP Publication 60* the concept has been refined and renamed "effective dose." This publication has now revised tissue-weighting factors to include total radiation detriment, and should prove a significant improvement in this dose assessment.

REFERENCES

1. Poston JW/MIRD Committee. Application of the effective dose equivalent to nuclear medicine patients. *J Nucl Med* 1993;34:714–716.
2. International Commission on Radiological Protection. Recommendations of the ICRP, ICRP publication 26. *Annals of ICRP, volume 1, number 3.* Oxford: Pergamon Press; 1977.
3. International Commission on Radiological Protection. Protection of the patient in nuclear medicine, ICRP Publication 52. *Annals of the ICRP, volume 17, number 4.* Oxford: Pergamon Press; 1987.
4. International Commission on Radiological Protection. Recommendations of the ICRP, ICRP Publication 60. *Annals of the ICRP, volume 21, number 1-3.* Oxford: Pergamon Press; 1991.

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