International Commission on Radiological Protection draft report for consultation: Diagnostic Reference Levels in Medical Imaging

IPEM Radiation Protection Special Interest Group, Diagnostic Radiology Special Interest Group and Nuclear Medicine Special Interest Group comments on the report

General Comments:

- First impressions of this document are that it is a very welcome and useful addition providing greater clarity
- Overall it is a good document that is easy to read and follow. A few comments highlight the writing style as good. The document appears to cover most areas
- From a nuclear medicine point of view, this is a well-written document. The most specific change is in a weight based dosing. This is often done in cardiology and in PET but not normally for other areas. If it were introduced it would make things a bit more complex. The splitting of CT and NM DRLs is a sensible arrangement but discussion with departments about the role of CT in the scan be performed, and overall care of the patient should be examined. While a diagnostic CT may not be needed for the NM scan being performed, and low dose procedure such attenuation correction and localisation be adopted, could it be used to replace a diagnostic CT later and therefore reduce the exposure to the patient and giving additional information to the NM scan. A holistic approach should be adopted.

Specific Comments:

Page 11 lines 31, 34, 37: At times it is not clear what DRL value is being referred to; national, regional, local?

Page 23 line 39 and elsewhere: This is an unfortunate example of a technology step-change that might require separate DRLs. Noise properties and hence patient dose can be changed to a similar or greater degree by selecting a different reconstruction kernel or slice thickness. A better example would be CR and DR specific DRLs.

The commission recommends weight ranges for paediatric DRLs, which are at odds with those proposed by the EC PiDRL project. Weight is not particularly relevant for head examinations. In this very difficult area it is crucial to have a consistent approach. The commission are urged to approach the PiDRL committee and reach a consensus.

At various points in the document DRLs are described as being useful for optimisation. A more accurate description is that DRLs are useful for benchmarking, which is the first step in optimisation. Beyond this point, in-depth knowledge of x-ray equipment performance, radiographic technique and examination protocol are more important.

Page 26 line 27: The median value of the national distribution of the dose quantity is proposed as a trigger for image quality evaluation. Would it be more robust scientifically to propose the 25% percentile, as there will always be a spread in acceptable practice which extends both above and below the median? The centres with local DRLs outside the interquartile range would then be required to review practice with regard to dose or image quality.

Page 32 Section 2 line 30: States as a summary that there should be standardisation of weight, however, Page 40 paragraph 86 allows for the fact that large samples negate the requirement for weight standardisation. The summary line should read that there should be standardisation of weight, unless large samples are used.

Page 33 line 17: Typo “considerations for paediatric **examiantions** are dealt with in Chapter 6, but general principles”.

Page 33 line 29: Would it be better to say “bad practice” as opposed to “bad medicine” at the end of the line?

Page 34 line 21: It is not clear whether room median dose quantities should be combined for all the rooms at a health facility to obtain a median dose quantity for the facility, or whether dose quantities at a facility should be pooled together without regard for the rooms in which the examination takes place.

Page 36 table 2.1: This suggests mobile radiography is a lower priority than other general radiography. There are many patients who have multiple mobile radiographs when they are more poorly and when clinical condition is changing so are likely to require more imaging. Perhaps something similar to the dental approach suggested of measuring output with the clinical exposure factors used is an option?

Page 40 paragraph 86: This suggests that for large samples the upper and lower 5% are removed to eliminate outliers. This is an acceptable approach but unless there is evidence that this is the most efficient method it may be more appropriate to state something like “In order to eliminate outliers and data with gross errors from analysis, some form of exclusion method should be considered, for example, removal of the highest and lowest 5%”. It is noted that this is covered on Page 45 paragraph 102.

Page 49 line 26: This statement deserves greater prominence and perhaps should be included with the bullet points in bold text at the beginning of the chapter or the whole document.

Page 51 line 26: Are there not more documents that provide such guidance other than the EC ones? What about those used in mammography?

Page 52 line 6: What about DDIs for direct digital radiography?

Page 58 line 1: Table 3.1 - it may be worth adding that Ba enemas are increasingly being replaced with CT colonoscopy.

Page 67 line 32 Typo: “variability in **patints** and in the lesions being treated. Patient variability refers to variability in”.

Page 78 line 40 Typo: There probably should not be a comma after “Bedside”.

Page 79 line 10: Typo: “They utilise direct or indirect conversion of **x rays** into electrical signals.”

Page 101 line 16: Add “protection **or image quality** can be reviewed and optimised if necessary”.

Page 103 Figure 7.1: Suggest that even in the instance where median dose is <DRL value a review still takes place. This is good optimisation. For example, IPEM Report 88 suggests that if median dose is more than 10% lower, the median value is suggested to become the new local DRL. The review can incorporate a review of image quality to highlight those areas where dose levels have come down too much.

Page 103 Figure 7.1 and paragraph 276 Page 105: Similar to above, there needs to be some latitude for when median doses are > DRLs. Again IPEM 88 suggests 10%. Paragraph 276 does suggest allowing for an error of the median value but this could be clearer or more specific.

Page 108 line 32 and Page 109 line 6: In these sections inappropriate digital image processing could also be included.

Page 114 lines 32-36: Should mention in this paragraph also be made that when operators are training in interventional procedures there will be a tendency to have higher doses until they perfect their techniques?

Page 118 line 20: Paragraph 5 is very confusing the way it is written and could do with being clearer in the point it is trying to convey.

Ends