Report on the Questionnaires on Occupational Exposure in Interventional Cardiology

Executive Summary

As part of the Information System on Occupational Exposure in Medicine, Industry and Research (ISEMIR) project, the Working Group on occupational exposures and radiation protection of staff in interventional cardiology (WGIC) was formed in 2009 to undertake 3 years of activity focussed on improving the implementation of occupational radiation protection in interventional cardiology (IC).

In its first 6 months the WGIC performed a survey to gain insight into occupational radiation protection in IC around the world. Three different questionnaires were sent to: individual interventional cardiologists, chief interventional cardiologists in an IC facility, and national or state radiation protection regulatory bodies. The two cardiologist questionnaires were designed to be quick to answer, with questions on the use of personal dosimeters and protection equipment, training in radiation protection, and knowledge of doses. The regulatory body questionnaire addressed occupational exposure data for IC personnel, as well as requirements for radiation protection training. Questionnaires were distributed by the International Atomic Energy Agency (IAEA) to the regulatory bodies, and by the WGIC members to individual and chief cardiologists, primarily through the members' professional associations, including attendance at conferences or workshops and through professional connections.

Responses were received from 45 chief interventional cardiologists of IC facilities, from 24 countries; and from 201 individual interventional cardiologists from 32 countries. There were 81 responses from the regulatory bodies (from 57 countries), representing jurisdictions covering about one-quarter of the world's population. Because of the nature of the distribution of the interventional cardiologist questionnaires, it is recognised that the results cannot purport to be truly representative of the worldwide practice of IC and all results must be interpreted with this caution. Further, some of the questions involved a cardiologist assessing his/her own habits or performance, and hence are subject to distortions of perception versus reality, thus placing a further caveat on those results.

Results of the two interventional cardiologists' questionnaires included:

- There was an average of about two IC laboratories per IC facility, with almost 900 procedures performed per laboratory per year;
- There was an average of 11 monitored professionals per laboratory; 4 were physicians (38%), 4 were nurses (37%) and 3 were other professionals (25%);
- A typical interventional cardiologist performs an average of about 400 procedures per year, most likely in more than one IC facility; and approximately 90% of interventional cardiologists perform fewer than 600 procedures a year;
- 76% of interventional cardiologists stated that they always used their personal dosimeter, and 45% stated that they always used two dosimeters;
- 97% of interventional cardiologists stated that they always wear a protective apron, and 43% stated that they always wear protective eyewear;
- 78% of interventional cardiologists stated that they always use a ceiling screen, and 77% stated that they always use a table screen;
- 64% of interventional cardiologists stated that they know their own personal doses, 43% that they know their patients' doses, and 38% that they know both;

- 83% of interventional cardiologists stated that they had undergone radiation protection training, and 52% that they had received certification for this;
- Having had radiation protection training and certification had a positive effect on the wearing of dosimeters, and the use of protective clothing and tools.

It is likely that the interventional cardiologists who participated in the surveys were "better than average" – they were either attending a conference or had contact with the medical physics profession. This factor, together with a likely bias in reporting their own radiation protection behaviour, would suggest that the results are probably more indicative of the upper end of current good radiation protection habits in IC.

Results of the regulatory body questionnaire included:
- About 60% of regulatory bodies stated that they specify the number and position of dosimeters for the monitoring of staff in IC;
- About 50% of regulatory bodies stated that they require personnel to have radiation protection training in order to be able to perform IC procedures;
- Less than 40% of the responding regulatory bodies were able to provide useful occupational dose data for personnel working in IC;
- For those regulatory bodies reporting data for IC physicians as a group, in 2008 the mean country median effective dose was 0.73±0.62 mSv per year, and the mean country 3rd quartile effective dose was 1.09±0.69 mSv per year.

The reported annual median dose values in IC were lower than would have been expected based on validated data from facility-specific studies, indicating that compliance with continuous individual monitoring is often not being achieved in IC. Underestimation of total doses in IC is further exacerbated by interventional cardiologists working in more than one IC facility, with these dose records not always being appropriately summed.

The three questionnaires of the survey have provided insight into the current status of occupational radiation protection in IC facilities around the world, but noting the above caveats about the representativeness of the participating interventional cardiologists and the likely optimistic bias in their self-evaluations.

Even so, the results of the two interventional cardiologists' questionnaires indicate that there is room for significant improvement in the practice of occupational radiation protection in IC throughout the world. Individual monitoring dosimeters are not being worn all the time, protective clothing and tools are not being used all the time, knowledge of personal and patient doses is still limited, and radiation protection training and certification of IC personnel are yet to be universal. The last point is particularly important as the survey results provided further evidence that radiation protection training improves the practice of radiation protection in IC.

Obtaining reliable data on occupational exposures in IC from radiation protection regulatory bodies proved to be difficult. Many regulatory bodies have limited access to such data and, even if they do have access, the data are often not detailed enough to provide the required information for particular roles and functions within the IC facility. A further complicating factor, as noted above, is that recorded doses may underestimate the true occupational exposure. Alternative strategies for the collection of IC occupational dose data will need to be utilised if a worldwide database of this information is to be established under the ISEMIR project.