**Introduction**

Interventional radiological procedures are increasingly used for the diagnosis and the treatment in clinical practice (Jankowski, Chrzciciel, Olszowski, & Cygan, 2002). They have many advantages such as improving the diagnostic quality of examinations and replacing surgery for the treatment. The interventional radiological procedures are safer, less traumatic and less complications following the interventional treatment. Patients can also recover sooner from interventional procedures. Numerous health benefits are shown from medical uses of interventional radiological procedures and the risks associated with diagnostic and treatment are relatively low. Therefore, they are widely adopted by medical professionals in China (Liu, et al. 2000; Yu, et al. 2005). Interventional radiological procedures become essential tools for improving human health. Patients in China are willing to accept their health care professionals' recommendations for receiving interventional radiological procedures. However, interventional radiological procedures have disadvantages in clinical practice. They can lead to very high radiation doses due to exposure in both patients and medical professionals. According to the United Nations Scientific Committee, the effects of radiation from the diagnostic medical applications of radiation account for about 95% of the exposure to radiation from human-made sources and about 12% of total exposure (International Atomic Energy Agency, 1991).

**Subjects and Methods**

The present study included 438 medical professionals from 60 hospitals in Shandong Province, China. Out of 438 medical professionals, there were 185 interventional radiologists and surgeons, 152 radiographic technicians, and 101 nurses who participated in interventional radiology in radiology, X-ray, and CT. All of the participants received radiation dose measurements.

**Methods**

The TLD model used in the United States and thermoluminescent dosimeters (TLDs) made in China were used in this study. The measurement range of TLD was within 0.1 mrd and 10 mrd. All 438 participants were a badge dosimeter, out of which 158 participants were a ring dosimeter. All the radiation doses were measured to estimate the radiation exposure to the chest and hands of medical professionals, respectively. A badge dosimeter included three units which medical professionals were in front of their chest area. If medical professionals were aware, the TLD was placed in the collar on the left. A ring dosimeter was worn on the finger of medical professionals. All the medical professionals were TLDs and ring dosimeters for three months. All the measurements were conducted in the Department of Radiological Protection and Safety, Shandong Center for Disease Control and Prevention, Jinan, Shandong, China. The TLDs were mailed to each hospital before conducting the measurements.

**Results**

The dose distribution in 438 medical professionals showed that 39% of medical professionals received the average annual radiation dose with the image of 6-10 mrd and 26% of them received the average annual radiation dose at the range of 2.5-6 mrd. For the detailed results, see Figure 1.

**Discussion**

Interventional radiological procedures are performed by interventional radiologists. The present study results showed that the effective dose and dose distribution in the chest and hands of medical professionals were the highest for the interventional radiologists, then radiological technicians, and finally nurses. This study result is consistent with the results in existing studies (Stranden, Wolfmark, & Sekar, 2008). The reasons for this are that interventional radiologists and surgeons are close to the X-ray tube and receive exposure to looking and scanning radiation when performing interventional procedures. It is recommended that interventional radiologists and surgeons should shorten the operation time and avoid placing hands in radiation areas when performing interventional procedures. Exposure to high doses may be associated with inadequate equipment, lack of skills in operating and back support of equipment.

Therefore, radiation protection of interventional medical professionals in China is a challenge issue. It is difficult to deal with because interventional radiological procedures have to be performed near a patient’s bed. At present, many hospitals in China use a simple additive hanging screen or using lead screen close to the bed to provide some protection, but it is not an ideal protection measures for most circumstances. In addition, exposure to high doses may be related to the position of interventional radiologists while performing interventional procedures. Another situation is that interventional radiologists and surgeons are exposed to high radiation from different directions when they perform interventional cardiac logical procedures. It is suggested that providing shielding facilities should be encouraged to protect medical professionals from radiation exposure in clinical settings.

**Conclusions**

Interventional radiological procedures are widely used for medical diagnosis and the treatment in China. However, much attention to radiation protection of medical professionals must be paid when interventional radiological procedures are performed. The use of appropriate shielding facilities, limiting exposure time of the interventional radiological procedures, and monitoring radiation exposure doses routinely are recommended.

**References**


http://www-pub.iaea.org/infocus/pdfs/pb1113_s3b1111_s1c7.pdf 


