



Occupational Radiation Dose

Interventional Radiology

Reducing radiation dose within the interventional lab has been the primary goal of the angiography industry for over 30 years. The concern for patient dose are well-studied with the “linear-no-threshold” model for risk generally accepted, meaning there is no safe level of radiation for the patient. However, what is often overlooked is the risk of radiation exposure to interventional staff, exposed to scatter radiation every day over potentially a 40-year career.

In 2013, a study by Roguin et al raised concerns regarding radiation exposure-induced malignancies in interventionalists. It documents an increased incidence of malignancies in interventionalists and a disproportionate number of tumours on the left side of the brain, the region of the head known to be more exposed to radiation and least protected by traditional shielding¹.

Without changing workflow or method of procedure, Queen Elizabeth Hospital in Adelaide have demonstrated an 84% reduction in radiation dose by using SpotROI.

It is an alarming finding that proves that radiation exposure is not only an important consideration for patients, but also for interventional staff.

Vano et al (2013) investigated ocular radiation doses and the prevalence of lens opacities in a group of interventional professionals and found posterior subcapsular lens changes characteristic of ionising radiation exposure in 50% of interventionalists, and 41% of nurses and technicians².

A review of the literature also demonstrates that scatter radiation is not only absorbed by the operator but also nursing and radiography staff. This shows that, despite recent changes in practice, lead screen, aprons and everyone's best efforts, there is still a significant occupation risk.

Innovative dose reduction technology and improvements in image quality play an important role in reducing patient dose during interventional procedures. However, it is important to note that any reduction in patient dose is also a reduction in operator dose.

A study by The St George Hospital found that use of advanced Dose Reduction Technology (DTS) resulted in a 46% reduction in peak skin dose³. DTS is a patient-centric model that live records the patient's skin dose according to c-arm angle, field of view, tube current and imaging mode to give the most accurate demonstration of dose received during an examination. Researchers at St George confirmed that ongoing real-time dose feedback is a critical factor in the successful modification of operator behaviour to reduce radiation dose.

The unique collimation filters of SpotROI allow the operator to reduce dose to surrounding anatomy while simultaneously ensuring full image quality in the area that matters most. This allows the interventionalist to monitor the position of the guide wire and the surrounding anatomy, though not at full dose.

Dose reduction techniques should not come at the cost of examination time, workflow or ergonomics.

Flexible Lateral Isocentre (FLIC) allows the lateral arm of a biplane system to be height adjusted independently, enabling patient anatomy to be kept at isocentre. In a study by Borota and Patz (2017), the use of FLIC led to a 25% reduction in dose, whilst improving ergonomics and range of table heights and increasing angulation ability on the frontal arm⁴.

Interventional departments have a responsibility to take every effort to reduce radiation dose to patients and to minimise the occupational dose received by staff. While there is no safe amount of radiation to receive in the lab, by reducing the dose to the patient using Canon Medical's industry-leading dose-reduction technologies, staff can take control of the occupational safety of the lab.

Canon Medical, for over 25 years, have facilitated a steady decline in radiation dose with the launch of pioneering products that expand our commitment to reducing patient and staff dose. The new Alphenix family of interventional systems provide comprehensive dose management solutions including DTS, SpotROI and FLIC to prioritise the safety of our customers and their patients.

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References

¹ Roguin A., Goldstein J., Bar O., et al. Brain and neck tumors among physicians performing interventional procedures. *Am J Cardiol* 2013; 111:1368–1372.

² Vano E., Kleiman N J., Duran A., et al. Radiation-associated Lens Opacities in Catheterization Personnel: Results of a Survey and Direct Assessment. *J Vasc Interv Radiol* 2013; 24: 197–204.

³ Wilson S, Prasan AM, Viridi A, et al. Real-time colour pictorial radiation monitoring during coronary angiography: effect on patient peak skin and total dose during coronary angiography. *EuroIntervention* 2016;12: 939–47.

⁴ Borota L, Jangland L, Aslund PE, et al. Spot fluoroscopy: a novel innovative approach to reduce radiation dose in neurointerventional procedures. *Acta Radiol*. 2017;58(5):600–608.