

## Editorial

### SHIELDING OF PATIENTS, FOOLISH OR REASONABLE?

Radiographers worldwide are challenged to rethink the best practice of shielding in view of a recent paper by Marsh and Solisky.<sup>[1]</sup> These authors are of the opinion that with the latest digital equipment, due to the utilising of automatic exposure control, patients will receive a higher dose with the shielding. They cite a comment made almost 30 years ago claiming that in terms of shielding, only foolish voices are heard. More reasonable voices should be heard to change the course of training programmes and regulation because there is no benefit in shielding to contribute to the health of a patient. They conclude that it is more reasonable to avoid the shielding of patients whenever possible. A 2014 publication<sup>[2]</sup> reports on a review of gonad shielding during paediatric radiography. The 130 evaluated images revealed that gonad shielding was often omitted and incorrectly used. These results signposted that gonad shielding was not effective and efficient for female patients, especially when incorrect use of lead shielding results in repeat exposures. The authors concluded that gonad shielding should thus be abandoned for female patients.

At the recent 2019 European Congress of Radiologists, held in Vienna, the presence and voice in favour of more stringent optimisation of radiation protection was heard by representatives from the World Health Organisation (WHO), the International Atomic Energy Agency (IAEA), Eurosafe, and the International Society of Radiographers and Radiologic Technologists (ISRRT). Many sessions were dedicated to radiation protection; presentations covered the valuable use of lead shielding.

A recent OPTIMAX publication<sup>[3]</sup> contains an analysis of breast and gonad lead shielding effectiveness in abdominal antero-posterior (AP) radiography. The phantom study determined the impact of lead-shielding on radiation dose to breast and gonads located peripheral to the primary beam during AP abdominal X-ray examinations. The phantoms used ranged from one year old to adult male in four sizes. Radiation dose was statistically significant reduced. The dose to the breast was reduced by 46-93% in all age groups. The dose to the gonad of the male phantom was reduced by 13-50%; shielding to male patients was thus recommended.

Some voices argue that internal scatter cannot be restricted. This is not new. One should be cognisant of the current regulations of the International Commission of Radiation protection (ICRP) to make sure about what answers are on the table already. The ICRP is currently the guide in terms of regulation and research pertaining to radiation protection of ionising radiation. We should thus be reminded that the current status quo is to make informed decisions about the future of shielding in terms of the ICRP Publication 121 (ICRP 2013).<sup>[4]</sup> The publication may be accessed at <http://www.icrp.org/publication.asp?id=icrp%20publication%20121>. The ICRP report reiterates the notion that one size does not fit all.

Considering the above it seems that different examinations should be merited individually. Many factors must be considered in the same breath as shielding. Collimation, source image distance, immobilisation, and automatic exposure control, are integrated to contribute to patient dose. Technical factors such as automatic exposure control (AEC) sensors, commonly used in adults, are often problematic in children if the body part is smaller than the trio of AEC sensors. In some cases, AEC may be used on children if only the center sensor is activated and the child's body part is positioned to completely cover the entire single sensor. However, for smaller children the imaged area of anatomy may be smaller than the single central sensor. Thus, manual techniques may be most appropriate for small children.

Collimation to only the area of interest is the first step to contain the beam even before shielding is applied. There are many examples of excessive inclusion of the abdomen of a neonate in cases where the request was only for a chest radiograph. To complicate matters even further, radiographers are often guilty of digital collimation (post-process cropping) instead of beam collimation.

Tight beam collimation, to the area of interest, is advocated by the *Image Gently* campaign.<sup>[5]</sup> It also advocates shadow shielding to mask of the humeri during mobile neonate imaging of the chest. Also to be considered is the use of Baker cones.<sup>[6]</sup>

This is not just a straightforward matter of yes or no. If it was, we could have been rightly considered button pushers. Even before the X-ray beam is activated, a radiographer is supposed to measure the area of interest to link to an updated exposure chart dedicated for that specific unit. Shielding during fluoroscopy outside the collimated beam considers the scattered radiation from the entrance side of the beam. This however does not mean this shielding stands on its own. It is interrelated with the source image distance, filtration, and orientation of the of C-arm.

This conundrum does not only require reflection from the operators, but also training institutions and regulators. There should be clear guidelines for examinations and patient specific protocols.

There is much talk lately about the digital twin of a patient that is a replica so that with artificial intelligence medical care will be hand-glove fitted for each individual. Since we are not robots we have the benefit to reflect on ethical factors influencing our decisions in terms of not using shielding because it is simply unavailable, or costly, or the action of protection is merely not done due to laziness.

Before we make foolish and hasty decisions we must relook optimisation and convince ourselves that it is well researched and not abandoned for all. Is it reasonable to claim without a doubt that shielding risk outweighs the benefit? It is hoped that this topic will be well ventilated at the congress in Cape Town in August 2019. Discussions could include whether shielding of patients is unnecessary

and destined to lose its place in the all familiar trio of distance, time, and shielding.

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## REFERENCES

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