

Online Appendix 1

Study questionnaire

Please encircle the most appropriate option unless otherwise indicated

- (1) What is your current level of training?
- Professor
 - Orthopaedic consultant
 - Senior registrar (More than 2 years of training)
 - Junior registrar (First 2 years of training)
 - Medical officer
- (2) From your total amount of surgeries performed, how often do you use fluoroscopic imaging?
- All operations
 - More than 75%
 - Between 50% and 75%
 - Between 25% and 50%
 - Less than 25%
- (3) Do you believe that fluoroscopic imaging is necessary in order to more effectively execute orthopaedic procedures?
- Yes
 - No
- (4) Which sources of education on occupational radiation safety have you accessed? (encircle all that apply)
- Radiation protection course
 - Lecture by someone with training in radiation safety
 - Discussion with colleagues
 - Medical school (undergraduate)
 - Internet
 - None
 - Other (please describe)
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- (5) Do you feel that you have received adequate training on radiation safety?
- Yes
 - No
- (6) Are you aware of the ALARA principle used in radiation protection?
- Yes
 - No
- If yes, what does the acronym ALARA stand for?
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- (7) The Inverse Square Law states that:
- Radiation dose is doubled for every twofold increase in radiation intensity.
 - *Radiation intensity is reduced with the square of the distance from the radiation source.
 - The square of the radiation exposure time is directly proportional to the radiation dose received.
 - None of the above.
- (8) What is the annual occupational dose limit for radiation workers in South Africa?
- *20 mSv
 - 50 mSv
 - 120 mSv
 - 150 mSv
- (9) Do you believe that you are at risk of developing deterministic or stochastic effects of radiation? (*please see definitions at the end of the questionnaire*)
- Yes
 - No

(10) Which of the following methods can you implement to reduce radiation exposure to the orthopaedic surgeon in the theatre? Please mark all relevant options.

- a) *By using the X-ray beam collimator.
- b) *By reducing dose to the patient.
- c) By using the fluoroscopic magnification mode for a smaller field of view.
- d) By using the anti-scatter grid whenever available.
- e) By changing the C-arm position in order to be closer to the x-ray tube than the image intensifier (II).
- f) By reducing kV while increasing mA settings on the fluoroscopy unit.
- g) *By using highly attenuating shielding devices.
- h) By using continuous fluoroscopy as opposed to pulsed-wave fluoroscopy.
- g) By increasing distance from the image intensifier.

(11) Do you use a personal dosimeter? If yes, please indicate how regularly you check the dosage on it?

- a) Yes
- b) No

(12) After a procedure, do you check how much time you spent screening?

- a) Always
- b) Sometimes
- c) Never

(13) This question pertains to the use of the radiation protection devices listed below:

Radiation protection device	Most appropriate option
Lead aprons	
Thyroid shields	
Lead glasses	
Lead gloves	
Lead table skirts	
Lead shields suspended from ceiling	
Mobile shields	
Other: (please elaborate)	

Choose the letter corresponding to the most appropriate option and write it next to each radiation protection device in the space provided in the tabular column above.

- a) I always make use of this device.
- b) I sometimes make use of this device.
- c) I do not use this device as it is unavailable.
- d) I do not use this device as it is uncomfortable.
- e) I do not use this device as it is impractical.
- f) I do not use this device as it is too expensive.
- g) I usually forget to use this device.
- h) I did not know this device was an option.
- i) I do not care about this device.

(14) Do you think orthopaedic surgeons should be classified as radiation workers?

- a) Yes
- b) No

Thank you for taking time to complete this questionnaire!

Definitions

Deterministic: Deterministic effects refer to the biological effects of ionising radiation that is dose dependent. An increase in radiation dose will result in an increase in the severity of the deterministic effect. There is however a threshold below which the effect will not occur. Examples include dermal erythema, epilation, cataracts, and sterility.

Stochastic: Stochastic effects refer to the biological effects of ionising radiation that is not dose dependent. An increase in radiation dose will result in an increase in the likelihood of a stochastic effect; however, the severity will remain the same. Examples include cancers and hereditary effects.

mSV: MilliSievert. The standard international unit for the expression of equivalent doses (deterministic effects) and effective doses (stochastic effects).

Collimation: A process during which the blades of the collimator are adjusted to change the size of the X-ray beam, and thus also the size of the field of view.

Image intensifier: A device that forms part of the fluoroscopy unit. It is used to create a brighter version of the image by using a photoelectric screen.

Note: This is Online Appendix 1 of Van Papendorp LWA, Suleman FE, Hanekom H. The knowledge, awareness and practices of radiation safety amongst orthopaedic surgeons. S Afr J Rad. 2020;24(1), a1806. <https://doi.org/10.4102/sajr.v24i1.1806>