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On behalf of PRET (Principles of Radiation protection within Endovascular Team) group

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Objective: Determine the **key competencies in radiation protection** which every endovascular team member should **possess and apply routinely**, through multispecialty clinical-content expert consensus.

Methods: A multispecialty Delphi consensus study involving European vascular surgeons, interventional radiologists and interventional cardiologists / angiologists experienced in endovascular procedures. Initial statements were drafted, in three categories: **29 knowledge skills, 25 technical skills and 19 attitudes**. Experts were able to suggest additional statements between rounds.

Results: Forty-one out of sixty-five (63.1%) invited experts agreed to participate, and 36 experts completed both rounds (87.8%). Experts suggested **9 additional statements** after the first Delphi round.

Knowledge skills

Statements seen as key competency: **30/33 (90.9%)**.



✓ Top 3 statements

	Mean	SD	Median	Consensus (%)
Specific risks for the healthcare workers.	4.92	0.28	5	100
The management of pregnant staff, threshold doses & period of highest risk.	4.81	0.40	5	100
The cause and importance of scatter radiation.	4.78	0.59	5	97.2

✗ No consensus

	Mean	SD	Median	Consensus (%)
The mechanism of X-ray production.	3.67	1.07	4	61.1
The electromagnetic spectrum & the position of x-rays.	3.56	1.16	4	63.9
The difference between flat panel detectors and old school image intensifiers.	3.83	0.85	4	77.8

Technical skills

Statements seen as key competency: **23/37 (82.1%)**.



✓ Top 3 statements

	Mean	SD	Median	Consensus (%)
Increase distance from radiation source when performing DSA runs.	4.94	0.23	5	100
Avoid putting hand within the fluoroscopy field.	4.94	0.23	5	100
Maximize their distance from radiation source whenever possible.	4.89	0.32	5	100

✗ No consensus

	Mean	SD	Median	Consensus (%)
The C-arm movements & settings should only be controlled by people who are scrubbed in. §	4.11	1.26	5	72.2
Use a live-feedback personal dosimeter (e.g. dose-aware).	3.94	1.09	4	69.4
Vary fluoroscopy angles to limit patient Peak skin dose.	3.83	0.91	4	72.2

Attitudes

Statements seen as key competency: **20/25 (80%)**.



✓ Top 3 statements

	Mean	SD	Median	Consensus (%)
Use a lead apron and thyroid collar.	4.97	0.17	5	100
Only use X-rays when all team members are adequately protected.	4.92	0.37	5	97.2
Confirm adequate protection of other team members before using X-rays.	4.86	0.54	5	97.2

✗ No consensus

	Mean	SD	Median	Consensus (%)
Register the administered radiation doses in the patients file.	4.11	0.95	4	72.2
Consider the risk / benefits for each procedure (justification principle).	4.03	1.16	4	75
Inform patients of the radiation related risks.	3.42	1.20	4	52.8
Use leaded leg protection.	3.39	0.90	3	33.3
Use radio-protective gloves.	2.69	1.12	3	16.7

Conclusion: This multispecialty expert panel reached consensus about the key competencies in radiation protection. These results may serve to **create practical and targeted training courses**, enhancing radiation safety for patients and healthcare workers.

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