Notification to the Statutory Authorities

IRMER(2017)

Ionising Radiation (Medical Exposure) Regulations (IRMER 2017) [1] require that incidents involving significant accidental or unintended exposure (SAUE) of an individual due to an equipment fault or procedural error are reported to Scottish Ministers (SM). In addition, any incidents that result in an individual receiving a dose which is deemed clinically significant (CSAUE) must also be reported to the Scottish Ministers. Such incidents must be reported via the HIS portal at https://hisportal.scot.nhs.uk/ Notifications must only be made by those persons identified in EP15.

SAUE: Guidance on the report content and notification criteria are contained in the document "Significant Accidental Unintended Exposure: Criteria for making a notification" [2]

CSAUE: Guidance on the criteria for determining if an accidental or unintended exposure is clinically significant has been published in the document "IR(ME)R Implications for clinical practice in diagnostic imaging, interventional radiology and diagnostic nuclear medicine" [3].

If it is suspected that a SAUE or CSAUE has occurred, a preliminary investigation must be carried out as soon as possible, and a notification made to the Scottish Ministers **within 2 weeks** of discovering the incident through the on-line portal. A detailed investigation must then be carried out, with the investigation report being submitted to the Scottish Ministers **within 12 weeks** of discovery of the incident.

Further information can be found on the HIS website at

http://www.healthcareimprovementscotland.org/our_work/inspecting_and_regulating_care/ionising_radiation_regulation.aspx

IRR(2017)

Ionising Radiations Regulations (IRR 2017) [4] require that incidents involving an overexposure of a member of staff or member of the public be reported to the Health and Safety Executive (HSE). The dose limits for these groups of staff are set out in IRR 2017 Schedule 3 Dose Limits.

https://www.legislation.gov.uk/uksi/2017/1075/schedule/3/made

In addition, IRR17 sets out levels at which loss, release or spill of a radioactive material should be reported to HSE. These can be found in Schedule 7 of IRR(2017)

https://www.legislation.gov.uk/uksi/2017/1075/schedule/7/made

Where there is such a loss the Scottish environmental protection agency (SEPA) and Police Scotland should also be informed.

Where the cause of an incident has been equipment failure (whether IRMER or IRR) the issue may also be reported to IRIC Incident reporting and investigation centre – this can be done via the Health facilities Scotland website at

http://www.hfs.scot.nhs.uk/services/incident-reporting-and-investigation-centre-iric-1/how-to-report-an-adverse-incident/.

Patient radiation doses and risks associated with diagnostic exposures

General terms that can be used to describe risk are given in Table 1 [5], with an estimation of the effective dose for the most common examinations/procedures given in Table 2 [6], [7], [8]. NB: These are effective doses for standard examinations of typical sized patients - the effective dose received by the patient will be estimated by an MPE on a patient-by-patient basis, using relevant exposure factors and dose quantities. Table 2 also gives the effective dose in terms of the equivalent period of background radiation to put the radiation risk into perspective [8].

Table 1: Terminology for describing radiation risks to adult patients [5]

Examples of Medical exposures	Effective Dose (mSv)	Risk Descriptor
Radiographs of chest, limbs, head, neck and teeth; Nuclear medicine ^{14}C breath test	< 0.1	Negligible
Radiographs abdomen and pelvis; Nuclear medicine lung ventilation scans.	0.1 – 1	Minimal
Barium swallow, single CT scans of head or body; coronary angiography and angioplasty; most Nuclear medicine imaging procedures, e.g. bone scan.	1 – 10	Very low
Higher dose or multiple interventional radiology or cardiology procedures; Double CT scans for contrast enhancement, Nuclear medicine ^{201}Tl myocardial imaging.	10 – 100	Low
Multiple CT scans, multiple high dose interventional radiology, or high dose cardiology procedures on larger patients.	>100	Consult MPE

Table 2: Approximate effective doses and equivalent period of background radiation from specific sources of radiation [6], [7], [8] , [9]

	Source of exposure	Effective dose (mSv)	Equivalent period of average background radiation in UK*
Radiology	Extremities	<0.01	<2 days
	Dental	<0.01	<2 days
	Chest	0.014	2 days
	Skull	0.07	2 weeks
	Hip	0.3	7 weeks
	Lumbar spine	0.6	3 months
	Abdomen	0.7	4 months
	Pelvis	0.9	5 months
CT	Head	1.4	8 months
	CTPA	3.3	1.5 years
	KUB	5.5	2.5 years
	Chest	6.6	3 years
	Abdo/pelvis	6.7	3 years
	CAP	10	4.5 years
Fluoroscopy	HSG	0.42	10 weeks
	Pacemaker	1.1	6 months
	Barium swallow	1.5	8 months
	ERCP	2.5	14 months
	Angioplasty	4.4	2 years
	Embolisation (aneurysm)	20	9 years
Nuclear Medicine	Thyroid scan (Tc-99m)	1.0	5 months
	Lung perfusion (Tc-99m),	2.2	1 year
	Bone scan (Tc-99m)	2.9	16 months
	Renogram Dynamic (Tc-99m)	0.7	4 months
	Myocardial perfusion (Tl-201)	11	5 years
	PET – FDG (F-18)	7.6	3.5 years
Other	100g Brazil nuts/flight to London	0.01	2 days
	Transatlantic flight	0.08	2 weeks
	Flight to Australia	0.2	5 weeks
	UK annual average Radon dose	1.3	7 months
	UK average natural background radiation	2.2	1 year
	Average annual radon dose to people in Cornwall	6.9	3.1 years
	Annual exposure limit for radiation employees	20	9.1 years

*everybody is exposed to natural background radiation on a daily basis. This comes from ground and building materials, cosmic rays, food and drink, and radon gas. The average natural background radiation in the UK is 2.2 mSv [9].

References

[1] Ionising Radiation (Medical Exposure) Regulations, *(SI 2017 No 1322),* UK:HMSO, 2017.

[2] The Health Departments, IRMER 2017 Significant Accidental and Unintended Exposure, Guidance for Employers and Duty holders, published June 2019.

[3] IR(ME)R: Implications for clinical practice in diagnostic imaging, interventional radiology and diagnostic nuclear medicine London; The Royal College of Radiologists, 2020

[4] Ionising Radiations Regulation, *SI 2017 No 1075,* London: HMSO, 2017.

[5]. C J Martin et al 2017 J. Radiol. Prot. 37 883

[6] Public Health England, Guidance - Ionising Radiation: dose comparisons, published 18th March 2011, available at: https://www.gov.uk/government/publications/ionising-radiation-dose-comparisons/ionising-radiation-dose-comparisons

[7] Public Health England, Patient dose information: guidance, published 4th September 2008, available at: https://www.gov.uk/government/publications/medical-radiation-patient-doses/patient-dose-information-guidance

[8] D Hart, BF Wall, MC Hillier and PC Shrimpton, Report HPA-CRCE-012, Frequency and collective dose for medical and dental X-ray examinations in the UK, 2008.

[9] S J Watson et al, Report HPA-RPD-001 Ionising Radiation Exposure of the UK Population: 2005 Review.