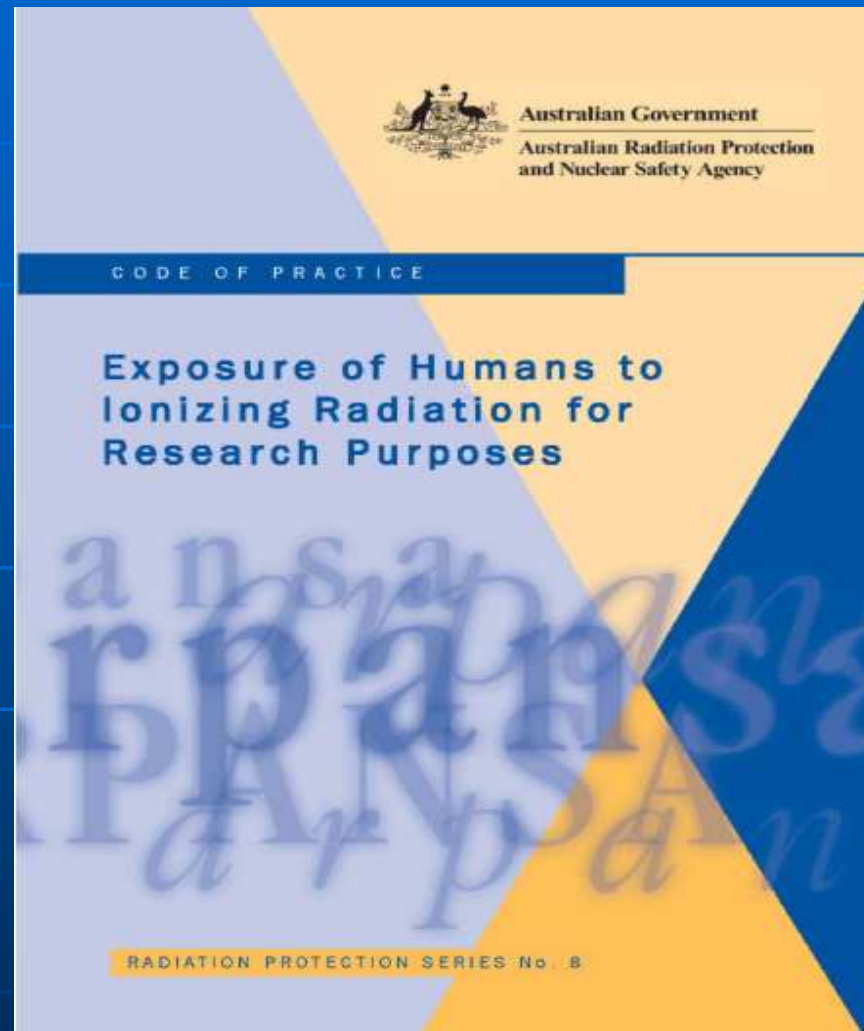


Overview of RPS 8



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Introduction

The code establishes the specific requirements to be adopted by State and Territory jurisdictions

Specifies that research projects involving exposure of humans to ionising radiation must:

- be reviewed by Human Research Ethics Committee (HREC)
- not be undertaken or funded unless and until approval has been granted
- include radiation dose calculations and risk information provided by approved medical physicist
- obtain consent from participants who have been provided with adequate knowledge about the research

Purpose of Code

- Designed to ensure that researchers provide appropriate information that allows consent to be properly considered by participants and approval considered by the HREC
- Requires researchers to have dose calculations and associated risk information checked by an independent medical physicist
- In the case of radiation doses in excess of certain dose constraints, verification by a second medical physicist must also be obtained
- Applies to research involving humans who are exposed to radiation which is additional to that received as part of their normal clinical management

Roles and Responsibilities

Code defines these for:

- Researcher who proposes the project
- Medical Physicist who verifies the radiation dose and risk involved
- HREC which is an independent advisory body
- 'Responsible Person' at site of imaging procedures

Responsibility of Researcher

Prepare Research Application which must include:

- reasons for radiation exposure
- radiation dose and risk assessment
- statement confirming that imaging site is actively involved in a relevant quality assurance program
- precautions to be taken to keep radiation exposure to a minimum
- written information to be given to research participants relating to dose and risks
- actual doses received in novel applications of radiation

Responsibility of Medical Physicist

- Assess and verify total effective dose, organ doses and radiation risk
- Obtain verification of dose assessment by second medical physicist when dose constraints are exceeded
- Prepare a written report documenting radiation dose and risk assessment (if applicable)

Responsibility of HREC

Consider benefits and risks associated with radiation exposure with attention to:

- estimates of expected radiation doses and associated risks
- opinion of independent medical physicist where the dose constraints are exceeded
- manner in which radiation doses and risks are provided to participants (in PICF)
- justification for radiation exposure particularly if dose constraints exceeded
- measures to be taken to assess radiation doses received from novel uses of radiation

Role of 'Responsible Person'

- Observance of the Code and its implementation
- Compliance with regulatory requirements for radioactive materials and radiation apparatus at facility (DHS Radiation Safety Standards)

Radiation Dose Constraints

- Radiation doses to participants must be kept to minimum level practicable
- Total effective doses and organ doses to adults and children should conform with dose constraints in following table

Dose Constraints

Table 1. Dose Constraints for Participants in Research^a

Participant Category		Dose Constraint ^b
Adults		
total effective dose	– in any year	5 mSv ^c
	– over 5 years	10 mSv
total effective dose in adult with life expectancy less than five years	– in any year	50 mSv
equivalent dose to skin averaged over 1 cm ²	– in any year	200 mSv ^d
equivalent dose to any other organ or tissue	– in any year	100 mSv ^e
Children and fetuses		
Total effective dose to age 18 years,		5 mSv
– Subject to:		
	• Effective dose from conception to birth; and	0.1 mSv
	• Effective dose in any year from birth to 18 years.	0.5 mSv
Total equivalent dose to age 18 years to any organ or tissue		100 mSv

Categories of Risk

Table 3. Categories of risk, corresponding levels of dose and corresponding levels of benefit to society

Level of Risk	Risk Category	Effective Dose Range (adults) (mSv)	Level of Societal Benefit Expected
Minimal	Category I ($\sim 10^{-5}$ or less)	< 0.2	Minor
Very Low	Category IIa ($\sim 10^{-5}$ to 10^{-4})	≥ 0.2 and < 2	Intermediate
Low	Category IIb ($\sim 10^{-4}$ to 10^{-3})	≥ 2 and ≤ 20	Moderate
Moderate	Category III ($\sim 10^{-3}$ or more)	$> 20^a$	Substantial

Examples of Projects

Three basic scenarios:

- 1. Healthy Volunteers

Research involving healthy volunteers and/or patients where radiation exposure may be part of eligibility criteria

- 2. Oncology Trials

Research with diagnostic/therapeutic agents and procedures, including Phase I, II, III and IV clinical trials where radiation exposure is used to assess treatment

- 3. New Imaging Techniques

Research of novel procedures on selected groups of research participants where a new imaging technique is being trialled

1. Healthy Volunteers

- Risk levels are intended to be applied when low levels of radiation are given to healthy subjects with long life expectancies
- Risk needs to be balanced against the possible benefit to society
- Example – project where radiation exposure is part of eligibility criteria e.g. chest radiograph to exclude disease
- The medical physicist may use published data of effective dose and organ doses for routine radiographic and nuclear medicine procedures taking into account the age and gender of the research participants as appropriate
- Radiation procedures clearly additional to 'standard clinical care'

Published Effective Dose

Table 5. Relative effective dose and their equivalent period of exposure to natural background radiation.

Investigation	Effective dose (mSv)	Equivalent no. of chest X-rays	Equivalent period of natural radiation
Radiography			
Extremities (eg knee)	0.01	5	1.5 days
Chest	0.02	1	3 days
Skull	0.1	5	2 weeks
Cervical spine	0.1	5	2 weeks
Dorsal spine	1.0	50	6 months
Lumbar spine	2.4	120	14 months
Hip	0.3	15	2 months
Pelvis	1.0	50	6 months
Abdomen	1.5	75	9 months
Biliary tract	1.3	65	7 months
Barium studies:			
Oesophagus	2.0	100	1 year
Stomach	5.0	250	2.5 years
Small bowel	6.0	300	3 years
Large bowel	9.0	450	4.5 years
Intravenous urogram	4.6	230	2.5 years
CT examinations			
Brain	2.0	100	1 year
Cervical spine	3.0	150	18 months
Thoracic spine	6.0	300	3 years
Chest	8.0	400	4 years
Abdomen	8.0	400	4 years
Lumbar spine	3.5	175	1.8 years
Pelvis	7.0	350	3.5 years
Nuclear medicine examinations			
^{99m}Tc studies			
Bone imaging	3.6	180	1.8 years
Cerebral perfusion	4.5	225	2.3 years
Lung perfusion	1.0	50	6 months
Myocardial perfusion	5.0	250	2.5 years
Thyroid imaging	1.0	50	6 months
DTPA renogram	1.6	80	10 months
DMSA renal	0.4	20	8 weeks
Hepatobiliary	2.3	115	14 months
Liver colloid	0.7	35	4 months
Gastric emptying	0.3	15	2 months
HMPAO leucocytes	2.8	140	17 months
Other radionuclides			
²⁰¹ Tl-myocardial	18.0	900	9 years
¹²³ I-thyroid	4.4	220	2.2 years
¹²³ I-MIBG	5.6	280	2.8 years
¹¹¹ In-leucocyte	9.6	480	4.8 years
¹¹¹ In-bowel transit	2.0	100	1 year

2. Oncology Trials

- Projects in which patients (life expectancy <5 years) have advanced or refractory disease and radiation (typically CT scans) is used to monitor response to treatment and/or progression/relapse
- Currently there is considerable variation in the interpretation of what constitutes 'standard clinical care' for these cases, both between and within given centres
- Problematic especially when two or more centres are evaluating the same project
- Traditionally, 'standard clinical care' has been considered as CT scans of the chest/abdomen/pelvis (and possibly radionuclide bone scans) at say 12-weekly intervals
- Becoming more common for projects to require scans at 8 and even at 6-weekly intervals if it is important to gain an early indication of the effectiveness or otherwise of a new treatment regime

Dilemma

- In reality, the possible risk of procedures deemed to be additional to standard care becomes irrelevant in a group of patients, many of whom will not survive the length of the proposed study anyway
- Impossible to make a realistic estimate of radiation dose, since the number of follow-up scans depends on how well participants respond to treatment
- Paradoxically the more scans they have the better since they are still alive
- Any estimate of risk of developing another cancer in 20 or 30 years time should be multiplied by probability of participants surviving their first cancer and living that long
- RPS 8 states: *"As the long-term risks from radiation exposure are minimal in patients who have a very short life expectancy, these statements of risk are inappropriate and are not required for research studies involving such patients"*

3. New Imaging Techniques

- Here the radiation itself, or the timing/frequency of its use, is of an experimental nature i.e. is integral to the research and not incidental to it
- Example – project evaluating use of new multi-detector CT as alternative to current procedure such as fluoroscopy, ultrasound, or endoscopy
- Dose calculations must be performed using the technique factors specific to the site at which the research will be performed
- Radiation procedures clearly additional to 'standard clinical care'