Effective radiation doses and associated risks
General X-ray (EOS and stitching)

The Royal **Children's** Hospital Melbourne

Medical Imaging

This poster describes typical effective doses from common paediatric studies performed at the RCH, the associated lifetime risk of cancer incidence and level of risk. The effective doses are also expressed in terms of 'background equivalent radiation time' (BERT) and the number of hours of international flight time. The terminology used, including BERT and international flight time, will assist you in conveying the associated lifetime risk of cancer incidence and level of risk to health professionals, patients and carers in ways that are easy to understand.

All medical procedures involving ionising radiation exposure must be justified and approved.

All examinations should be conducted so that the dose to the patient is the lowest necessary to achieve the clinical aim.

General X-ray (EOS and stitching)

The effective dose estimates for weight ranges are based on the RCH General X-ray exposure chart for stitching and EOS. Estimates quoted are the maximum values. For example, the effective dose for a long legs AP using the EOS standard dose protocol is approximately 0.03 mSv and the risk of cancer incidence is better than one in 119,000 which is considered to be a minimal level of risk. The effective dose from this long legs AP exam is the same as from the natural background radiation that the patient would receive in about 7.3 days or about 13 hours of international flight time.

When multiple exams and/or views are performed you can estimate the cumulative risk by summing the dose and BERT estimates together. For example, a long legs AP and a scoliosis PA using the standard dose protocol would have an effective dose of approximately 0.09 mSv which is about 22 days of BERT or about 25 hours of international flight time.

The natural (non-radiation induced) childhood cancer incidence rate in Australia is about one in 5,800 per year, or one in 600 before the age of 15 years.

For reference, the Calman risk classification and terminology model is used.

Term	Risk range
High	<1:100
Moderate	1:100 to <1:1,000
Low	1:1,000 to <1:10,000
Very low	1:10,000 to <1:100,000
Minimal	1:100,000 to <1:1,000,000
Negligible	≥1:1,000,000

View/weight range	Typical effective dose (mSv)	Risk of cancer induction	Level of risk	BERT (1.5 mSv pa)	International flight time (hours)
DR stitching—(8 yrs to teen)					
Scoliosis AP	0.2	<1 in 17,100	Very low	~1.6 months	84
Scoliosis AP bending (2 views)	0.4	<1 in 8,800	Low	~3.1 months	150
Scoliosis PA	0.1	<1 in 30,600	Very low	~29 days	50
Scoliosis lateral	0.2	<1 in 17,100	Very low	~1.6 months	84
Long legs AP	0.04	<1 in 110,000	Minimal	~10 days	17
CR stitching—scoliosis AP					
8–12 yrs	0.2	<1 in 22,900	Very low	~1.2 months	63
Teen	0.3	<1 in 17,400	Very low	~2.3 months	121
CR stitching—scoliosis PA					
8–12 yrs	0.07	<1 in 49,000	Very low	~17 days	29
Teen	0.2	<1 in 33,700	Very low	~1.2 months	63
CR stitching—scoliosis lateral					
8–12 yrs	0.1	<1 in 27,900	Very low	~29 days	50
Teen	0.3	<1 in 20,900	Very low	~2 months	105
CR stitching—long legs AP					
5–8 yrs	<0.01	<1 in 1,346,000	Negligible	~2.4 days	4
8–10 yrs	0.02	<1 in 171,000	Minimal	~4.9 days	8
Teen	0.04	<1 in 96,100	Very low	~10 days	17
EOS standard dose (5 yrs to teen)					
Long legs AP	0.03	<1 in 118,000	Minimal	~7.3 days	13
Long legs AP and lateral	0.06	<1 in 49,400	Very Low	~12 days	25
Scoliosis AP	0.1	<1 in 30,300	Very low	~24 days	42
Scoliosis PA	0.06	<1 in 53,400	Very low	~12 days	25
Scoliosis lateral	0.1	<1 in 31,800	Very low	~22 days	38
Scoliosis PA and lateral	0.1	<1 in 19,700	Very Low	~1.2 months	63
EOS micro dose (5 yrs to teen)					
Long legs AP	<0.01	<1 in 925,000	Minimal	<2.4 days	<4
Long legs AP and lateral	<0.01	<1 in 423,000	Minimal	<2.4 days	<4
Scoliosis AP	0.01	<1 in 267,000	Minimal	~2.4 days	4
Scoliosis PA	<0.01	<1 in 485,000	Minimal	<2.4 days	<4
Scoliosis lateral	0.02	<1 in 190,000	Minimal	~4.9 days	8
Scoliosis PA and lateral	0.02	<1 in 135,000	Minimal	~4.9 days	8