

# Minimizing Radiation Exposure for Patients and Surgeons

Innovasis Spine Symposium  
Deer Valley 2018



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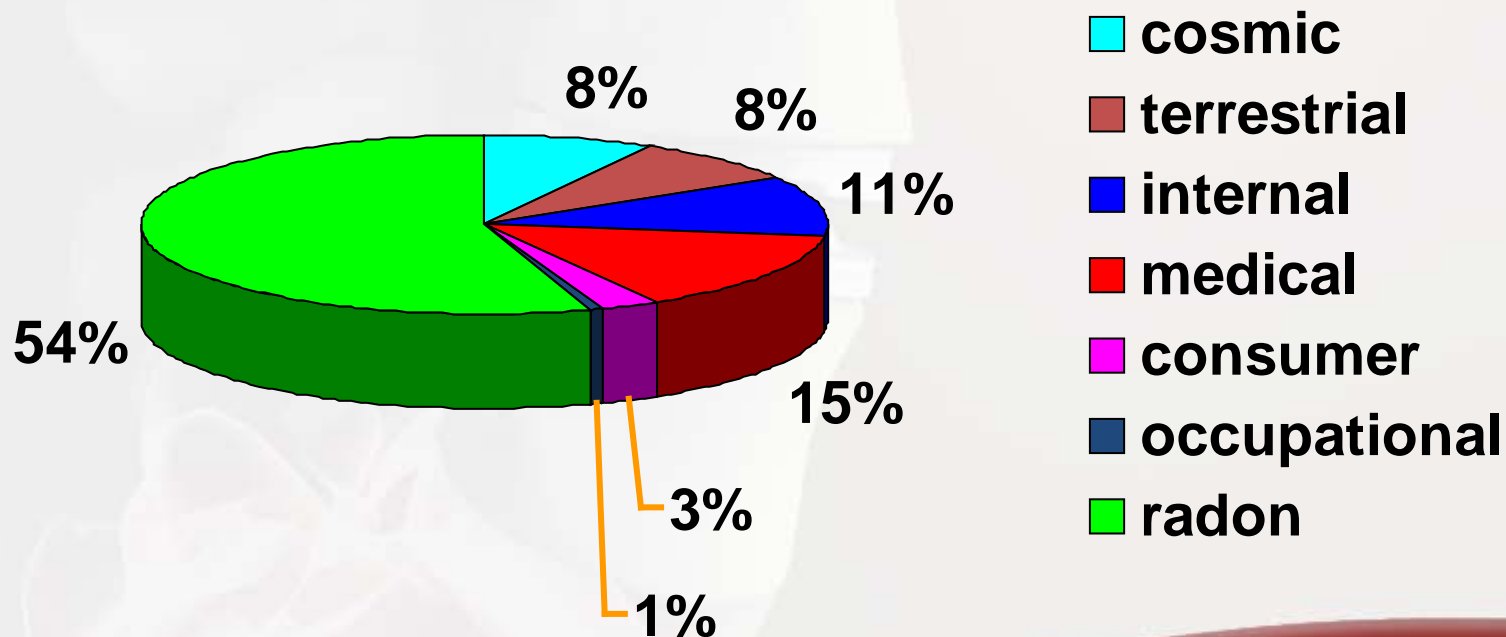
Flower Mound



**Radiation  
is Bad**

# Radiation Sources

Total Average Yearly US Population Dose  
(Approx 350 mrem/yr)

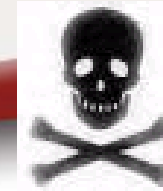


# Flouroscopy Radiation Example

150 lb Patient undergoing Lumbar flouro

1 min flouro = 30 mGy = **120** Chest X-Rays

**100 mGy = ~3mins of Fluoro**



# Amount of Radiation

- “Large” Person Kyphoplasty - 100 mGy
- 3 level XLIF – 100 mGy
- Dr Brown XLIF Study – 100 mGy

## Remember 100 mGy

# National Research Council (BEIR)

- **“Linear-to-threshold” risk model between the development of solid cancer and previous ionizing radiation**
- **Ionizing radiation has been associated with:**
  - **Local skin/soft tissue damage**
  - **Cataracts**
  - **Solid organ malignancy and leukemia**

# National Council on Radiation Protection

- **Occupational exposure limits (OELs)**
  - **Body = 50 mSv**
  - **Lens of eye = 150 mSv**
  - **Skin, hands, feet = 500 mSv**
- **Common radiation doses**
  - **Background radiation = 3 mSv/year**
  - **Standard CXR = 0.1 mSv**
  - **Whole body CT scan = 10 mSv**

## Exposure Limits

	MPD	ALARA
	(mGy/yr)	
• <b>Whole Body</b> (head, trunk, arms above elbows, legs above knees)	50	5
• <b>Extremities</b> (arms below elbow, legs below knee)	500	50
• <b>Individual organs; skin</b>	500	50
• <b>Lens of the eye</b>	150	15
• <b>PATIENT</b>	<b>unlimited!!!!</b>	



# Risk for induced cancer from a whole-body dose:

For 20-year-olds, induced risk somewhere  
~0.6% - 2.0% per 100 mGy

Age:

Baby 2x> 20 yo 2x> 50yo

Sex:

Females 1.3-2x >> Males

So think of it as 1%/100mGy, more if you're female

TABLE 12D-1 Lifetime Attributable Risk of Cancer Incidence<sup>a</sup>

Cancer Site	Age at Exposure (years)										
	0	5	10	15	20	30	40	50	60	70	80
<i>Males</i>											
Stomach	76	65	55	46	40	28	27	25	20	14	7
Colon	336	285	241	204	173	125	122	104	84	64	30
Liver	61	50	43	36	30	22	21	18	14	10	3
Lung	314	261	216	180	149	105	104	84	64	44	34
Prostate	93	80	67	57	48	35	35	28	20	14	5
Bladder	209	177	150	127	108	79	79	64	44	30	23
Other	1123	672	503	394	312	198	172	144	104	74	23
Thyroid	115	76	50	33	21	9	3	2	1	0.3	0.0
All solid	2326	1667	1325	1076	881	602	564	444	324	224	126
Leukemia	237	149	120	105	96	84	84	64	44	30	48
All cancers	2563	1816	1445	1182	977	686	648	591	489	343	174
<i>Females</i>											
Stomach	101	85	72	61	52	36	35	25	18	11	11
Colon	220	187	158	134	114	82	79	64	44	30	23
Liver	28	23	20	16	14	10	10	8	6	4	2
Lung	733	608	504	417	346	242	240	184	134	94	77
Breast	1171	914	712	553	429	253	141	104	74	44	4
Uterus	50	42	36	30	26	18	16	14	10	7	2
Ovary	104	87	73	60	50	34	31	25	18	11	5
Bladder	212	180	152	129	109	79	78	64	44	30	24
Other	1339	719	523	409	323	207	181	148	109	68	30
Thyroid	634	419	275	178	113	41	14	4	1	0.3	0.0
All solid	4592	3265	2525	1988	1575	1002	824	678	529	358	177
Leukemia	185	112	86	76	71	65	62	62	57	51	37
All cancers	4777	3377	2611	2064	1646	1065	886	740	586	409	214

100,000 women aged 30

Single dose of 100 mGy

Over their lifetime

NOTE: Number of cases per 100,000 persons exposed to a single dose of 0.1 Gy.