Provider Fact sheet for counseling Pregnant patients for XRAY and CT Studies

Patient Consent: Only needed for NONEMERGENT CT studies that include fetus in field of view. No consent for emergent imaging or imaging of patient without fetus in field of view (eg head CT).

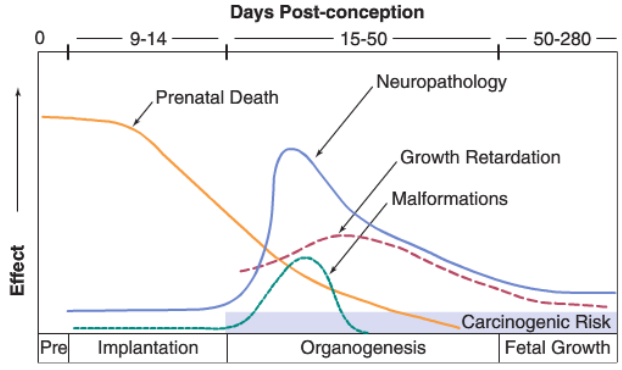
Is the fetus **NOT in field of view?** (eg head CT, chest CT, CXR, extremity xrays) :
NEGLIGIBLE RISK to fetus

Is the fetus **IN field of view?** (eg. CT ABD/Pelvis)

Two types of fetal risk (see figure below):

1)Teratogenic effects

a. ONLY from postconception age 2 - 15 wks (EGA 4-17weeks) AND
b. ONLY in the setting of multiple studies (fetal dose greater than 100mGy) - According to the National Council on Radiation Protection (NCRP) it is only at doses above 150 mGy that the risk of fetal effects is significantly increased. Lowered IQ is only seen at 100mGy and above.
c. A single phase standard CT ABD/PELVIS is only 4-25 mGy and DOES NOT meet threshold for teratogenic effects. A Single ER Panscan or CT ABD/PELVIS is NO RISK to fetus for teratogenic effects.
d. Multiple CT phases through pelvis can accumulate dose, however even three phases still typically under 100mGy threshold.



2) Childhood cancer risk

a. Risk present for entire pregnancy
b. Overall increase in cancer rates are very small

3) How to counsel the pregnant patient: " Cancer risk is small and the likelihood that your child will remain healthy with no adverse effects is only slightly different from that of any other child."

4) NOTE, abdominal plain film with fetus in view is very low fetal dose, order of magnitude less than CT scan, so even less risk than CT scan (see table below).

5) NOTE, no ionizing radiation is used for ultrasound or MRI, so this data ONLY pertains to x-ray and CT.

Our CT Protocols are optimized to utilize as little radiation as possible to obtain diagnostic studies.
Modifying protocols to decrease radiation in pregnant patients may result in non-diagnostic studies, which may result in poorer clinical outcomes or the need to repeat the study (with higher total radiation dose than simply performing the initial CT without modifications).

In a few appropriate circumstances, a study may be modified to reduce the scan range and number of phases of scanning. However, this will result in a less optimal study than the usual protocol would provide, and should only be implemented if the risks and benefits are recognized and approved by the clinical team.

TABLE 20-22 PROBABILITY OF BIRTHING HEALTHY CHILDREN

DOSE TO CONCEPTUS mGy[a]	CHILD WITH NO MENTAL RETARDATION (%)	CHILD WITH NO BIRTH DEFECT (%)	CHILD WILL NOT DEVELOP CANCER (%)[b,c]	CHILD WILL NOT DEVELOP CANCER OR HAVE MENTAL RETARDATION OR BIRTH DEFECT (%)[c]
0	99.6	96	99.77	95.40
1.0	99.6	96	99.76	95.39
2.5	99.6	96	99.75	95.38
5	99.6	96	99.74	95.37
10	99.6	96	99.71	95.34
100	99.6	96	99.17	94.82

[a]Refers to equivalent dose above natural background. Dose assumed to be delivered during the most sensitive period of gestation (mental retardation: 8–15 weeks post conception; malformation: 2–7 weeks post conception).
[b]Assumes conservative risk estimates, and it is possible that there is no added radiation-induced cancer risk. Childhood (0–15 years) cancer risk from fetal irradiation of 6%/Gy *Source*: Doll R, Wakeford R. Risk of childhood cancer from fetal irradiation *Br J Radiol* 1997;70:130–139; Wakeford R, Little MP. Risk coefficients for childhood cancer after intrauterine irradiation: a review. *Int J Radiat Biol* 2003;79:293–309; and ICRP 84 (2000) Pregnancy and Medical Radiation Vol 30, No 1.
[c]Precision displayed is only for the purpose of showing the magnitude of the potential change in risk as a function of dose and should not be interpreted as a measure of precision with which these outcomes can be predicted.
Source: Adapted and modified from Wagner LK, Hayman LA. Pregnancy in women radiologists. *Radiology* 1982;145:559–562 and ICRP Publication 84 (ICRP, 2000).

TABLE E-8 ESTIMATED CONCEPTUS DOSES FROM COMMON RADIOGRAPHIC, FLUOROSCOPIC, AND CT EXAMINATIONS

ESTIMATED CONCEPTUS DOSES FROM SINGLE CT ACQUISITION

EXAMINATION	DOSE LEVEL	TYPICAL CONCEPTUS DOSE (mGy)
EXTRA-ABDOMINAL		
Head CT	Standard	0
Chest CT		
Routine	Standard	0.2
Pulmonary embolus	Standard	0.2
CT angiography of coronary arteries	Standard	0.1
ABDOMINAL		
Abdomen, routine	Standard	4
Abdomen/pelvis, routine	Standard	25
CT angiography of aorta (chest through pelvis)	Standard	34
Abdomen/pelvis, stone protocol[a]	Reduced	10

[a]Anatomic coverage is the same as for routine abdominopelvic CT, but the tube current is decreased and the pitch is increased because standard image quality is not necessary for detection of high-contrast stones.

ESTIMATED CONCEPTUS DOSES FROM RADIOGRAPHIC AND FLUOROSCOPIC EXAMINATIONS

EXAMINATION	TYPICAL CONCEPTUS DOSE (mGy)
Cervical spine (AP, lat)	<0.001
Extremities	<0.001
Chest (PA, lat)	0.002
Thoracic spine (AP, lat)	0.003
Abdomen (AP)	
21-cm patient thickness	1
33-cm patient thickness	3
Lumbar spine (AP, lat)	1
Limited IVP[a]	6
Small-bowel study[b]	7
Double-contrast barium enema study[c]	7

AP, anteroposterior projection, lat, lateral projection, PA, posteroanterior projection.
[a]Limited IVP is assumed to include four abdominopelvic images. A patient thickness of 21 cm is assumed.
[b]A small-bowel study is assumed to include a 6-min fluoroscopic examination with the acquisition of 20 digital spot images.
[c]A double-contrast barium enema study is assumed to include a 4-min fluoroscopic examination with the acquisition of 12 digital spot images.
Source: McCollough CH, Schueler BA, Atwell TD, et al. Radiation exposure and pregnancy: when should we be concerned? *Radiographics* 2007;27:909–917.

References:

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Kanal K, Stewart B. Fetal Radiation Risk, Harborview online resource. (2005 Nov) https://depts.washington.edu/uwerad/protocols/resident_resources/pregnancy_radiation/radiation_risk.pdf

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