How to Discuss CT Radiation Risks with our "Customers"

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No Disclosures

Content is important…

- **Image Gently**
- **Image Wisely**
- **RadiologyInfo.org**

What is *Image Gently?*

- A *communication* campaign by….
- Alliance for Radiation Safety in Pediatric Imaging
- *for education and awareness: imaging experts, referrers, patients, caregivers and public*

ADVOCACY

- Several modalities addressed…CT, IR, fluoro, RNI, CR/DR
- To improve medical radiation protection for children
- 70+ health care organizations/agencies (>25 international)
- >800,000 participants worldwide: radiologists
  technologists
  medical physicists
  other providers

Content is important…

Definition of Terms in Dose-Risk Tables

Effective dose is an estimated whole-body radiation dose in units of milliSieverts (mSv) that can be used to estimate the potential risk of inducing cancer for each type of imaging study utilizing ionizing radiation. Effective dose is based on gender-averaged and age-averaged estimates for adults, ICRP 103, 2007. To place this risk into perspective when communicating with patients, the level of environmental background radiation, as well as the risk of dying from several natural events is listed below. The risk levels have been color coded for natural events and imaging studies.

Average Annual Effective Dose from Natural Background Radiation	
United States	3.1 mSv
State of Colorado	4.0 mSv
Color Code for Risk Levels	
Approximate additional risk of fatal cancer for an adult	**Risk Level**
less than 1 in 1,000,000	Negligible
1 in 1,000,000 to 1 in 100,000	Minimal
1 in 100,000 to 1 in 10,000	Very Low
1 in 10,000 to 1 in 1,000	Low
1 in 1000 to 1 in 500	Moderate
Estimated Lifetime Risks of Death	
Lightning Strike	1 in 100,000
Bicycle Accident	1 in 10,000
Drowning	1 in 1,000
Motor Vehicle Accident	1 in 100
Cancer (Natural Causes)	1 in 5

Conventional Radiography		
Adult X-Ray Exam	**Average Effective Dose (mSv)**	**Lifetime Risk of Cancer Death**
Dual X-Ray Absorptiometry	0.001	1 in 24 million
Extremity	0.005	1 in 5 million
Chest (PA only)	0.02	1 in 1.2 million
Chest (PA & Lateral)	0.05	1 in 480,000
Cervical Spine	0.2	1 in 120,000
Bilateral Mammography	0.48	Age 50: 1 in 129,000*
Abdomen/Hip/Pelvis	0.7	1 in 35,000
Thoracic or Lumbar Spine	1.25	1 in 20,000
Small-Bowel Series	3	1 in 8,000
ERCP	4	1 in 6,000
Upper GI Series (with fluoro)	6	1 in 4,000
Barium Enema	8	1 in 3,000

*Based on age-dependent estimates for females, from BEIR VII, 2006.

Adult CT Scans		
Head	2	1 in 12,000
Calcium Scoring	3	1 in 8,000
Neck	3	1 in 8,000
Pelvis	6	1 in 4,000
Spine	6	1 in 4,000
Chest	7	1 in 3,500
Abdomen	8	1 in 3,000
Virtual Colonoscopy	10	1 in 2,400
Coronary Angiography	12	1 in 2,000
Chest for PE	15	1 in 1,600
3-Phase Liver Study	15	1 in 1,600

Nuclear Medicine		
Adult Nuclear Medicine Exam	**Average Effective Dose (mSv)**	**Lifetime Risk of Cancer Death**
Lung ventilation (99mTc-DTPA)	0.2	1 in 120,000
GI emptying (99mTc-labeled solids)	0.4	1 in 60,000
Lung ventilation (133Xe)	0.5	1 in 50,000
Renal (99mTc-DTPA)	1.8	1 in 14,000
Thyroid scan (Sodium iodine-123)	1.9	1 in 13,000
Liver-spleen (99mTc-sulfur colloid)	2.1	1 in 12,000
Lung perfusion (99mTc-MAA)	2	1 in 12,000
Renal (99mTc-glucoheptonate)	2	1 in 12,000
Renal (99mTc-MAG3)	2.6	1 in 9,400
Biliary tract (99mTc-disofenin)	3.1	1 in 7,900
Renal (99mTc-DMSA)	3.3	1 in 7,400
Thyroid scan (99mTc-pertechnetate)	4.8	1 in 5,000
Brain (99mTc-ECD-neurolite)	5.7	1 in 4,800
Bone (99mTc-MDP)	6.3	1 in 4,000
Parathyroid scan (99mTc-sestamibi)	6.7	1 in 3,600
White blood cells (111In)	6.7	1 in 3,600
Brain (99mTc-HMPAO-exametazime)	6.9	1 in 3,500
PET mammography (F18-FDG)	7	1 in 3,500
GI bleeding (99mTc-labeled RBCs)	7.8	1 in 3,100
Cardiac ventriculography (99mTc-labeled RBC)	7.8	1 in 3,100
White blood cells (99mTc)	8.1	1 in 3,000

http://www.ucdenver.edu/academics/colleges/medicalschool/departments/Radiology/Documents/Rad%20Card%202.jpg

Our “Customers”

- Patients
- Families/caregivers
- Public
- “Clinical” colleagues
- Imaging colleagues (and staff)
- Administration
- Regulatory organizations
- Government
- Media

Medical (Imaging) Environment

- Potential lack of control
  (helplessness)
- Unfamiliarity (i.e., in Radiology)
- Decisions for others
- High anxiety
- Sense of urgency
- Potential consequences
- Limited access

Importance of Communication:

- A core competency:
  "interpersonal and communication skills"
- Failures often cause errors
- Poor communication: basis for litigation
- For radiology: communication is beyond the report
- High quality correlated with patient satisfaction
- Improved outcomes
- Historically, insufficient training

Gunderman AJR 2001; 177: 41
Lown Acad Radiol 2001; 15: 425

Teaching Effective Communication

- Sensitivity
- Courtesy
- Compassion
- Appropriateness
- Honesty
- Openness

Gunderman AJR 2001; 177: 41

….or, common sense

Other Comments

- It's Ok to say "I don't know".
  - … when nobody knows
- Provide resources or access, contact info.
- What is said and what is heard (understood) may differ
  - "…what do you understand?"
- Do not be (seem) rushed.
- What would you/your family want to hear?

Your child may have a significant brain injury… so we need to do a CT scan

- Question: "I heard that CT scans can cause cancer. Will my son get cancer?
- Answer: " We don't know for sure."

- Question: "What is the radiation from the CT?"
- Answer: "I don't know."

- Question: "How will the CT be done?"
- Answer: "I don't know."

- Question: "Do you keep track of CT radiation for children?"
- Answer: "I don't know."

What Should You Say?

1. That is a good question
2. I can answer that
3. We have (*hopefully*) expertise
   - know the facts
   - we minimize the radiation
4. This is a necessary/important exam
   - I avoid risk “numbers”
5. Other questions?

Why? What do parents hear when you say "1 in 2,000 risk of cancer"?

1 in 2,000 = "my child" AND 1999 others

Will you discourage having the examination?

Informing Parents About CT Radiation Exposure in Children: It's OK to Tell Them

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OBJECTIVE. The purpose of our study was to determine how parents' understanding of and willingness to allow their children to undergo CT change after receiving information regarding radiation dose and risk.

MATERIALS AND METHODS. One hundred parents of children undergoing nonemergent CT studies at a tertiary-care children's hospital were surveyed before and after reading an informational handout describing radiation risk. Parental knowledge of whether CT uses radiation or increases lifetime risk of cancer was assessed, as was willingness to permit their child to undergo both a CT examination that their child's doctor recommended and one for which their doctor thought observation might be equally effective.

RESULTS. Of the 100 parents who were surveyed, 66% believed CT uses radiation before reading the handout, versus 99% afterward ($p < 0.01$). Before reading the handout, 13% believed CT increases the lifetime risk of cancer, versus 86% afterward ($p < 0.01$). After reading the handout, parents became less willing to have their child undergo CT given a hypothetic situation in which their doctor believed that either CT or observation would be equally effective ($p < 0.01$), but their willingness to have their child undergo CT recommended by their doctor did not significantly change. After reading the handout, 62% of parents reported no change in level of concern. No parent refused or requested to defer CT after reading the handout.

CONCLUSION. A brief informational handout can improve parental understanding of the potential increased risk of cancer related to pediatric CT without causing parents to refuse studies recommended by the referring physician.

Keywords: CT, pediatric imaging, radiation

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Utilization of CT continues to steadily increase in the pediatric population [1–3]. Although CT examinations make up approximately 11% of the number of radiologic procedures, radiation from CT delivers approximately 70% of the medically related radiation dose to the general U.S. population [4].

Even small doses of radiation may pose an increased risk of cancer [5–7], and children are thought to be at increased risk compared with adults [2, 8–10]. However, the risk remains theoretic and has generated considerable attention and controversy in both the medical literature and the lay press [11–13]. Regardless, because of the potential risk, established as-low-as-reasonably-achievable (ALARA) principles have been the standard in the radiology community for many years and are especially applicable in the case of pediatric CT [14].

The U.S. Food and Drug Administration (FDA) has outlined a three-pronged strategy to minimize avoidable pediatric CT radiation dose: optimize CT settings for pediatric patients, minimize multiple phases in contrast-enhanced studies, and minimize inappropriate CT referrals [15]. The first two elements rely almost completely on imaging professionals, whereas the third element relies more heavily on referring clinicians. Studies have shown that clinicians usually underestimate CT-related radiation dose and associated risk of cancer [16, 17]. Furthermore, some experts believe that as many as 30% of all pediatric CT examinations are unlikely to benefit the individual or could be easily and effectively replaced by a nonionizing imaging technique [18]. Acting on these findings, at least one institution has shown that educating clinicians can help stem the increase in CT referrals [3].

Patients also generally have a poor understanding of the radiation dose and risk associated with CT [16]. Some experts believe that parents may contribute to the increasing demand for CT as they seek rapid diagnosis without understanding the potential risks [4].

TABLE 2: Willingness to Allow Child to Undergo CT Before and After Reading Handout

No. (%) of Parents Before	No. (%) of Parents After	Response
67 (67)	57 (58)	Willing to allow CT, no concerns
32 (32)	40 (40)	Willing to allow CT, some concerns
1 (1)	2 (2)	Willing to allow CT, strong concerns
0	0	Unwilling to allow CT
100	99	Total

Larson et al AJR 2007; 189

Conversations: Remember

Our duty is also "CT is extremely helpful"