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TRANSFORMING HUMAN HEALTH

Communicating With Pediatric Patients and Their Families About Radiation Dose and Risk: A Radiologist's Perspective

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Disclosures

- No financial disclosures related to this talk.

Objectives

1 - Understand the risk-benefit analysis regarding medical imaging procedures in pediatrics

2- Create an approach to discuss risks with parents/caregiver

3- Develop a program using education for families and radiology team members.

Outline

1. Risks
- a. Risks of current medical imaging procedures and protocols
- b. Risk/Benefit analysis
- c. Communicating with families about radiation
- d. Awareness of risks by ordering clinicians and radiologists

2. Practice
- a. Current practice in radiology departments
- b. Methods of education
- c. Discussion with parents/caregivers
- d. Communication with children

3. Ideal program
- a. Provide radiologists with up-to-date medical imaging practice
- b. Define the role of physicists, technologists, nurses and child life specialists
- c. What should an effective program look like
- d. Discussion

Risks

- a. Risks of current medical imaging procedures and protocols
- b. Risk/Benefit analysis
- c. Communicating with families about radiation
- d. Awareness of risks by ordering clinicians and radiologists

Ionizing radiation
Computed tomography
radiography
nuclear medicine
interventional radiology

Sedation
neurodevelopment

Iodinated IV contrast (CT)
Renal toxicity
Anaphylaxis
Transient hypothyroidism

Gadolineum based IV
contrast – MRI
Deposition
Nephrogenic systemic
sclerosis

Fe containing MRI
contrast agents

Contrast enhanced
ultrasound
contrast agents

Risks of current medical imaging procedures and protocols

- The main stochastic risk in children is potential cancer development.
- Children are at greater risk than adults
  - More sensitive due to growth and dividing cells
  - Longer life expectancy
- Computed tomography (CT) is the largest contributor.
- Short latency tumors such as brain tumors and leukemia have been reported to be associated with head CT and abdominal CT.

Kutanzi KR et al. Pediatric Exposures to Ionizing Radiation: Carcinogenic Considerations. Int J Environ Res Public Health 2016

Risks of current medical imaging procedures and protocols

- Understand the risks of the procedures
- Know the up-to-date onsite protocols
- Many national and international organizations responsible for evaluating radiation risk agree that to be safe, we should act as if low doses of radiation cause harm.

- Practice the ALARA principle “**as low as reasonably achievable**”

Risk/benefit analysis
separate risk from benefit

Start with benefit

- Show understanding of the patient's "unique" medical history
- Highlight the medical need (*Justification)*
- Review the alternatives and options
  - Can ultrasound or MRI answer the question?

Risk/benefit analysis

Risk

- Know the current understanding of risk
- Be able to discuss national and institutional efforts to minimize administered radiation dose
- Be able to provide resources for parents

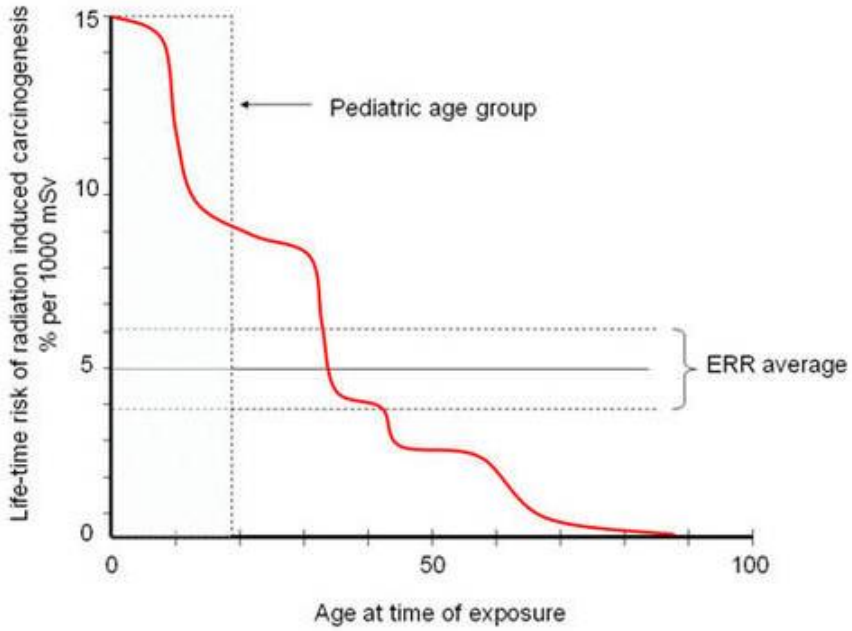


Figure 2 Adapted from ICRP Publication 60 (1990)

image gently®

The Image Gently Alliance

Peck DJ and Samei E. How to Understand and Communicate Radiation Risk, Image Wisely

Image Wisely,is a joint initiative of ACR, RSNA, ASRT and AAPM, provides information to the medical community to promote radiation safety in medical imaging.

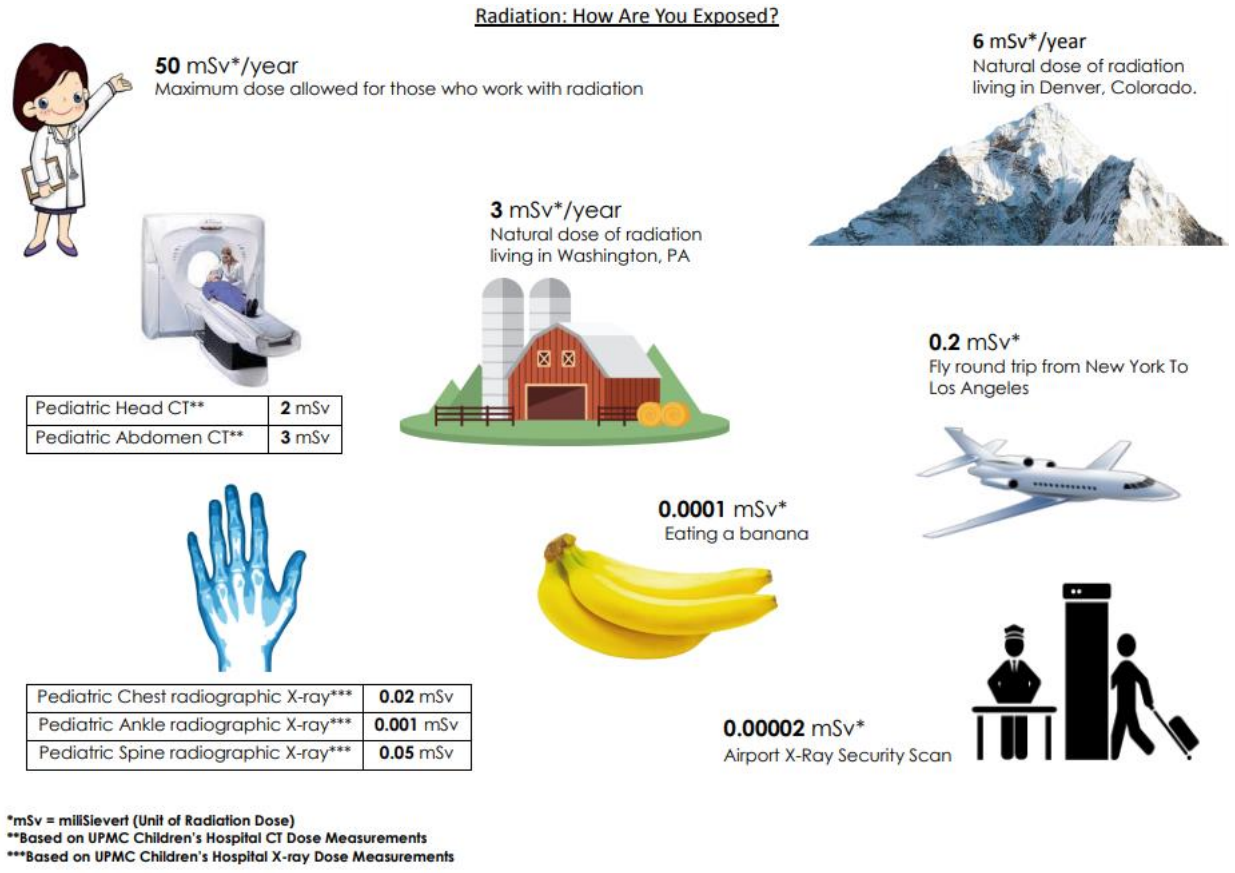
Discussing Risk

- Create analogies to risk in daily life

Risk of 1 CXR is analogous to cycling 10 miles, diving 300 miles, smoking 1.4 cigarettes.

Emphasize the additional minimal change in the natural risk of developing cancer.

(*Shane Foley, MD*)



Provided by Erfan Akbari

Communicating with families- Be prepared

Know what you are getting into

Gather information from others prior to discussion (Technologist, nursing, advanced practice providers, physician)

Schedule the meeting if possible

Identify family and patient “type”

Beware

Overprepared – has done “background research”

Feels ignored by medical establishment

mis-informed

Feels that medical care has been “wrong or induced harm”

Communicating with families

Clearly identify your role.

Confirm reason for discussion.

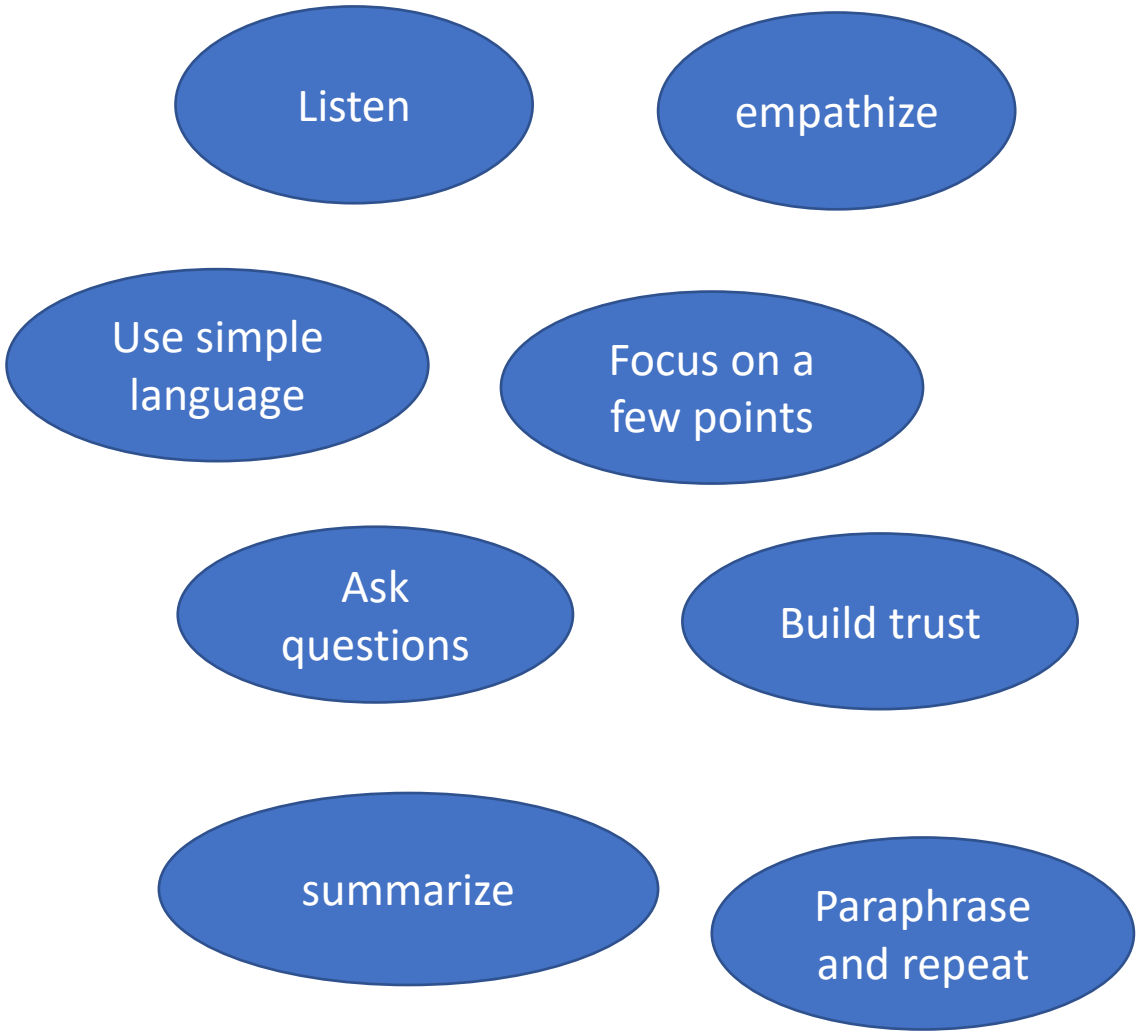
Ask -Are you in the medical field (assess level of understanding of terminology)

Frame question

What is your biggest concern?

Why are we here today?

What information would you like to discuss?



How should parents be informed?

- Use simple, plain language
- Stay away from statistics
- Use comparisons that put radiation exposure in perspective.
- Refer families to websites such as https://imagegently.org and https://radiologyinfo.org

Awareness of risks by ordering clinicians and radiologists

- Lack of awareness of risk on the part of referring physicians
- Clinicians may underestimate the CT-related radiation dose and associated risk of cancer.
- “community standards” do not discuss radiation as a potential risk
- lack of consensus among medical and scientific experts about the actual radiation risk from low-level radiation

Rice HE, Frush DT, Harker MJ, et al. Peer assessment of pediatric surgeons for potential risks of radiation exposure from computed tomography scans. J Pediatr Surg 2007; 42:1157–1164
Bulas DI et al. Image Gently: Why We Should Talk to Parents About CT in Children. AJR, 2009.

Practice

- a. Current practice in radiology departments
- b. Methods of education
- c. Discussion with parents/caregivers
- d. Communication with children

Current practice

- Adult practices may be using adult settings

High percentage of pediatric ER visits are at adult hospitals

- Pediatric practices typically have equipment and protocols optimized for children

Education

- ACR appropriate use criteria
- Practice guidelines

Table 5: Relative Radiation Level Scale		
Relative Radiation Level	**Effective dose range**	**Pediatric Effective Dose Estimate Range**
0	0	0
☢	Less than 0.1 mSv	Less than 0.03 mSv
☢☢	0.1 – 1.0 mSv	0.03 – 0.3 mSv
☢☢☢	1.0 – 10 mSv	0.3 – 3.0 mSv
☢☢☢☢	10 – 30 mSv	3.0 – 10 mSv
☢☢☢☢☢	30 – 100 mSv	10 – 30 mSv
** Adapted from ACR Appropriateness Criteria®, Radiation Dose Assessment Introduction 2016*		

Discussion with parents/caregivers

- Risks discussed by a trusted source such as a pediatrician or radiologist are better tolerated than those discovered from an unknown source, such as the Internet.
- By providing information up front, parent–patient autonomy is respected
- When parents assume a risk voluntarily, their acceptance is improved compared with when the risk has been imposed unknowingly on their child.

Larson DB, Rader SB, Forman HP, Fenton LZ. Informing parents about CT radiation exposure in children: it's OK to tell them. AJR 2007; 189:271–275

Benefit of informational handout

- **Study by Larsen D, Rader S, Forman P and Fenton L.**
- **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.** 100 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.

Radiologist-child interaction

- Explore level of interest or knowledge
- Beware of anxiety produced by parents
- Include parents in discussion

Childlife specialist

- Focused on child
- Address issues of anxiety
- Use age-appropriate tools to decrease anxiety (books, videos)
- Refer to physician if specific radiation questions are asked

Technologist

- Expected to provide information to allay fears of families.
  - Discuss collimation
  - Discuss reason for parent wearing lead and child not wearing it
- Provide information regarding practice against shield use.

  collimate, no repeats, do not obscure useful information

Ideal program

- a. Provide radiologists with up-to-date medical imaging practice
- b. Define the role of physicists, technologists, nurses and child life specialists
- c. What should an effective program look like

Ideal program:

- Voluntarily providing information at or near the time of performance of the CT examination is optimal and should be the goal rather than waiting for patient to request information.
- Format can be pamphlet, websites, videos.
- Nursing staff or technologists typically confirm appointments. This would be an ideal time to guide the family to the information or ask if they have questions.

- *In a survey conducted by Lee et al, only 15% of academic radiology departments provide radiation risk information before CT.*

Provide up-to-date medical education

- Discuss new technology – CT, fluoroscopy, radiography, interventional radiology, nuclear medicine
- Changes in practice – such as *not using* lead shielding
- Dose reduction practices – nuclear medicine administered dose
- Encourage on-site involvement in focused initiatives of national organizations
- Share with entire team in monthly conference- technologists, radiologists, nursing staff and advance practice providers
- Develop dose reduction processes with on-site physicist

What parents want from physicists

Study	Date of Study	Estimated Effective Dose (mSv)	Equivalent of Days Background Radiation*
PET PETCT_WB_DOTATATE (CT)	12/27/2019	0.50	61
Ga68-DOTATATE, 3.5 mCi (PET)	12/27/2019	3.37	410
FLUORO < 1HOUR (PICC)	12/27/2019	0.01	1
PET PETCT_HI_FDOPA (Child) (CT)	1/7/2020	0.09	11
F-18 DOPA, 7.1 mCi (PET)	1/7/2020	8.41	1023
CT Abdomen ABDOMEN_ENHANCED_Customized	1/7/2020	1.40	170
FLUORO < 1HOUR (PICC)	1/13/2020	0.08	9
XR ABD 2VW AP SUPINE & ERECT	1/28/2020	0.80	97
XR ABD 1VW AP SUPINE	2/1/2020	0.40	49
PET PETCT_WB_DOTATATE (CT)	12/9/2020	0.53	65
Ga68-DOTATATE, 3.69mCi (PET)	12/9/2020	3.55	432

Note

The estimated effective doses provided are based on our typical exam protocols and your child's age at the time of the studies. These values represent the ranges of radiation doses of the studies and were estimated based on reasonable assumptions and available pediatric dose evaluation tools. They are not intended to be interpreted as your child's personalized radiation dose monitoring.

*The average person in the U.S. receives an effective dose of about 3.1 mSv per year, or 0.008 mSv per day.

Summary

Table 13: Checklist on Dos and Don'ts When Communicating Risks*		
Category	**Do's**	**Don'ts**
Truthfulness	Tell the truth	Do not lie or avoid the truth
Absolutes	Avoid absolutes – nothing is absolute	Do not use the terms 'never' or 'always'
Jargon	Define all terms and acronyms	Do not use standard medical terminology
Negative	Use positive or neutral terms	Do not use negative terms or negative associations
Temper	Remain calm	Do not let your feelings interfere with your ability to communicate
Clarity	Ask whether you are being understood	Do not assume understanding
Abstraction	Use examples, metaphors, and analogies to aid understanding	Do not talk of theoretical concepts without using clear, non-technical justification
Attack	Only attack the issue	Do not attack the person or organization that may have made incorrect statements
Promise	Promise only what you are certain will occur	Do not make promises that you cannot back up and follow through on to ensure they occur
Speculation	Provide information only on what is being done and what you know	Do not discuss worst-case scenarios and unintended possible outcomes, unless required by protocol
Risk/Benefit comparison	Make risk and benefit statements separately	Do not discuss the risk relative to the benefit
Risk comparisons	Use tested comparison messages, cite trustworthy data/groups	Do not compare unrelated risks
**adapted from EPA Workbook on Risk Communication in Action (2007)*		

How to Understand and Communicate Radiation Risk

Donald Peck, PhD, FACR *Henry Ford Health System, Detroit, MI*
Ehsan Samei, PhD, *Duke University Medical Center, Durham, NC*
(Updated March 2017)

Resources

- AAPM
- ACR/RSNA/
- ICRP/NCRP/BEIR VV Phase 2
- CRCPD/NEXT
- Image Gently, Image Wisely

Thank you!!