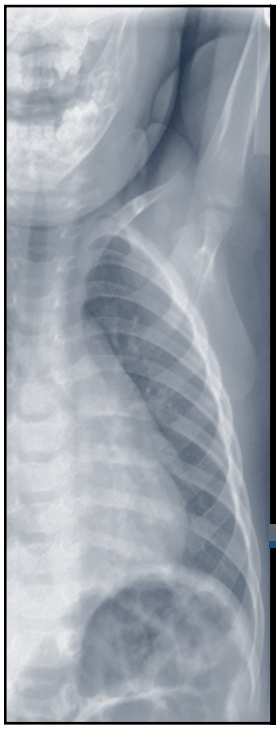


Image Analysis Principles

MI 123: Clinical Seminar I

1

The Importance of Image Analysis

Image Analysis = The evaluation of radiographic images for acceptability

- Performed by Radiographers
  - Requires knowledge of what is acceptable *and* of department protocols
  - Radiographers must ensure all elements of their images meet quality standards
- We are the "eyes" for the Radiologist

2

Elements of a radiograph

Optimal images…

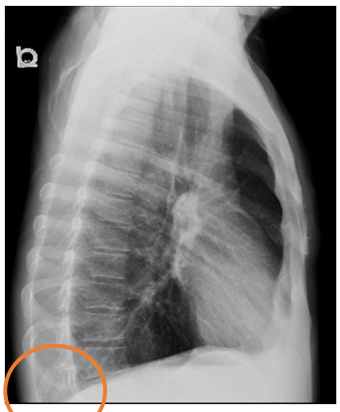
1. Are oriented correctly
2. Include all anatomy of interest
3. Demonstrate anatomy in the proper position by…
   - Maintaining the geometric integrity of all anatomy
   - Centering accurately for optimal visualization of anatomy
4. Exhibit adequate collimation
5. Include the correct lead marker
6. Display the best possible visibility and resolution with minimal noise
7. Exclude any preventable artifacts

3

- Orientation

4

- Anatomy of Interest

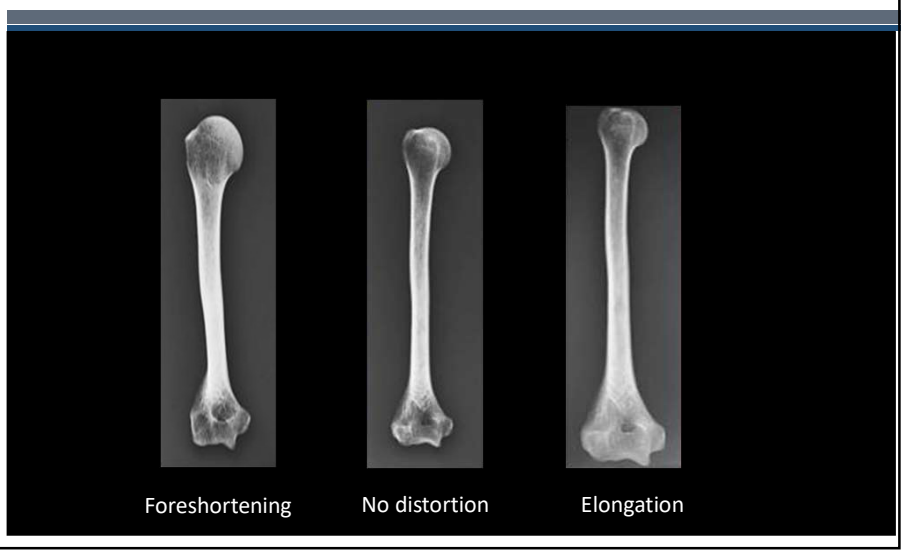


5

- Positioning

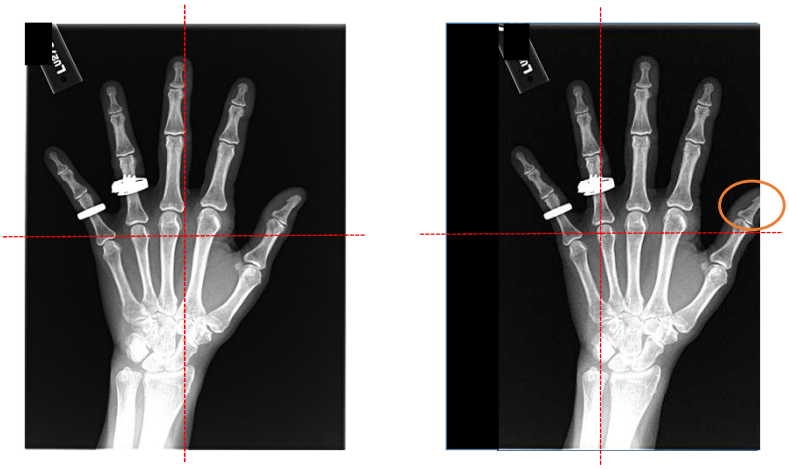
6

- Geometric integrity

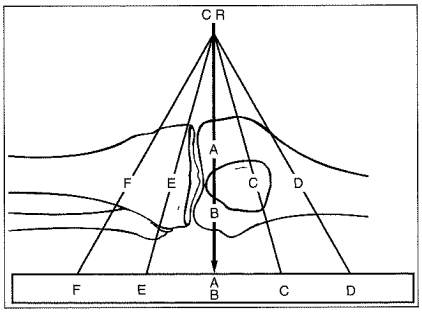


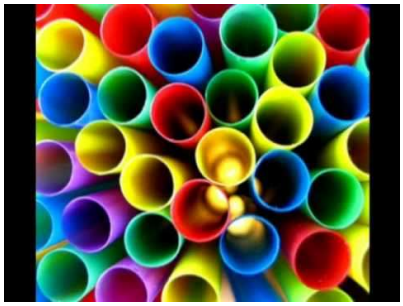
7

- Centering



8



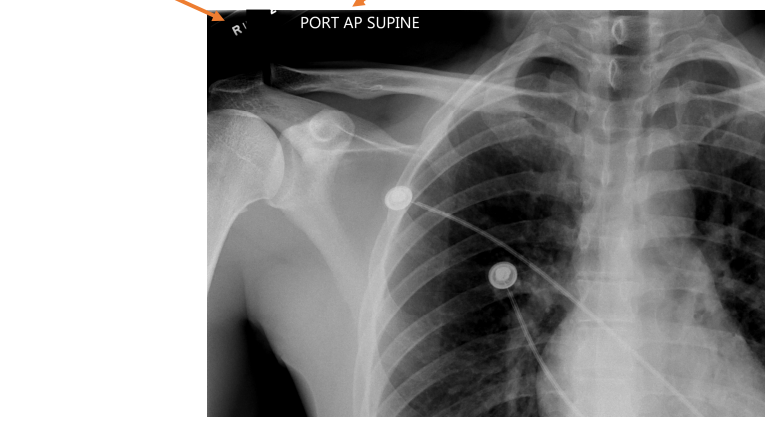


9

- Collimation

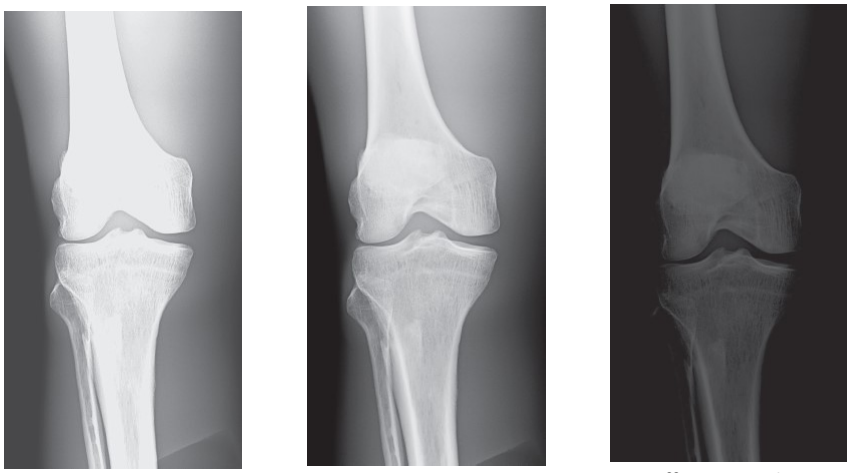
10

- Markers



11

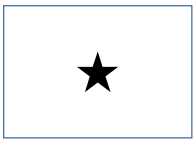
- Visibility: Brightness



Excessive Brightness | Proper Brightness | Insufficient Brightness

12

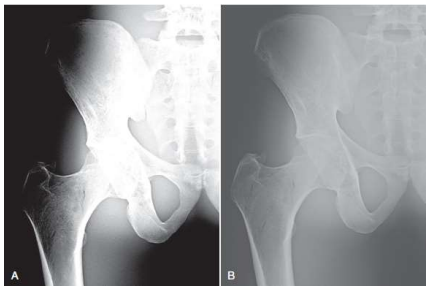
- Visibility: Contrast



= High Contrast

= Low Contrast

= no contrast

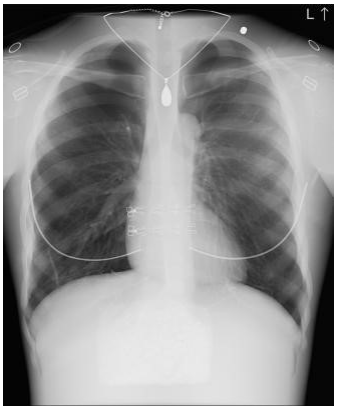


13

- Resolution

14

- Artifacts



15

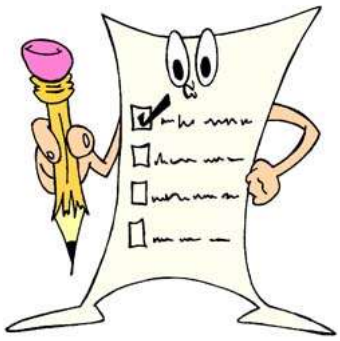
Wait, There's More!

- Proper tube angulation
- Correct demographic information
  - Patient name, view performed, institution data
- Shielding (if applied) is properly placed
- No patient motion
- Breathing instructions were given and followed (if applicable)

16

Image Analysis Critique Method

- Oriented correctly?
- Necessary anatomy included?
- Centered well?
- Positioned accurately?
- Collimated as required?
- Marker(s) on correctly?
- What is the EI?
- Artifacts?
- Was image criteria met for this image?
  - Yes or No
    - If No, how would you correct it?



17

Is this image repeatable?

Technologists must decide if the image is …

- Acceptable (*meeting evaluation criteria*)
- Not Acceptable (*not meeting evaluation criteria and errors affect diagnostic quality – Repeatable*)

18

Repeating an image

Technologists must use critical thinking to determine how to sufficiently fix the errors before re-exposing the patient.

STUDENTS MAY *NEVER* REPEAT AN IMAGE WITHOUT A REGISTERED TECHNOLOGIST'S ASSISTANCE.

19

Other Factors Affecting Acceptability

A. Visual acuity/perception
B. Radiologists' and physicians' preferences
C. Exam demands versus patient ability

20

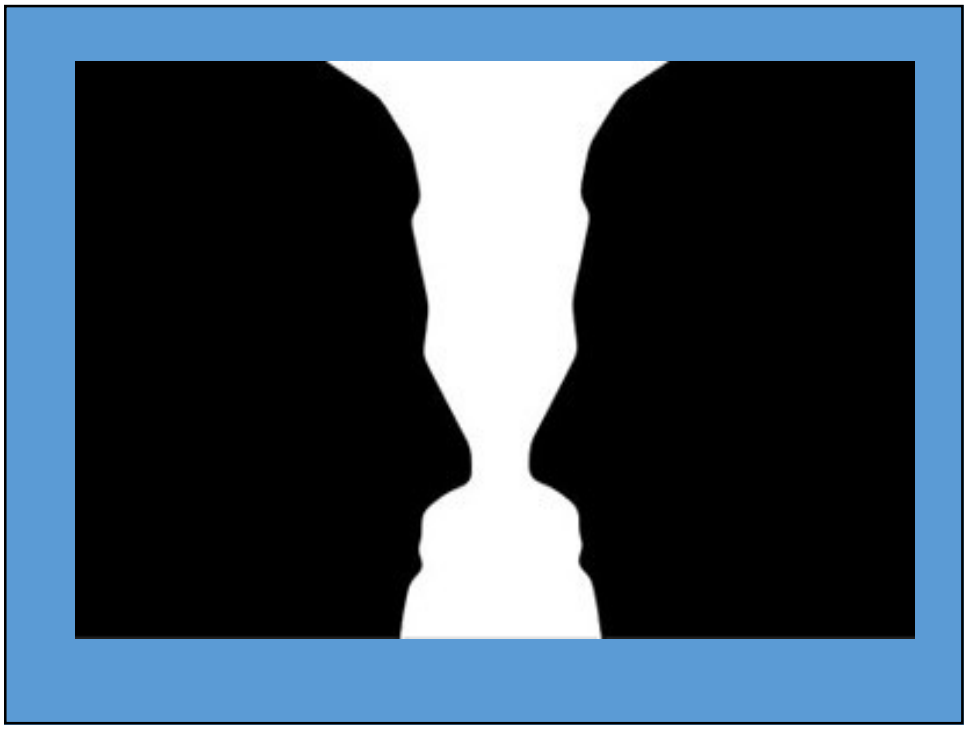
- Visual Acuity

Affected by…

- Lighting
- Pathology
- Viewing distance- varying distance changes perception
  - Optic Nerve area - creates a blind spot for viewing at 9”
- Misperception

21

22



23

- Radiologists' Preferences

- Desired contrast/ density
- Desired orientation of images
- Repeat? Or no repeat?

24

- Patient ability

- Acceptable vs Not Acceptable
- Documentation is our friend!

25

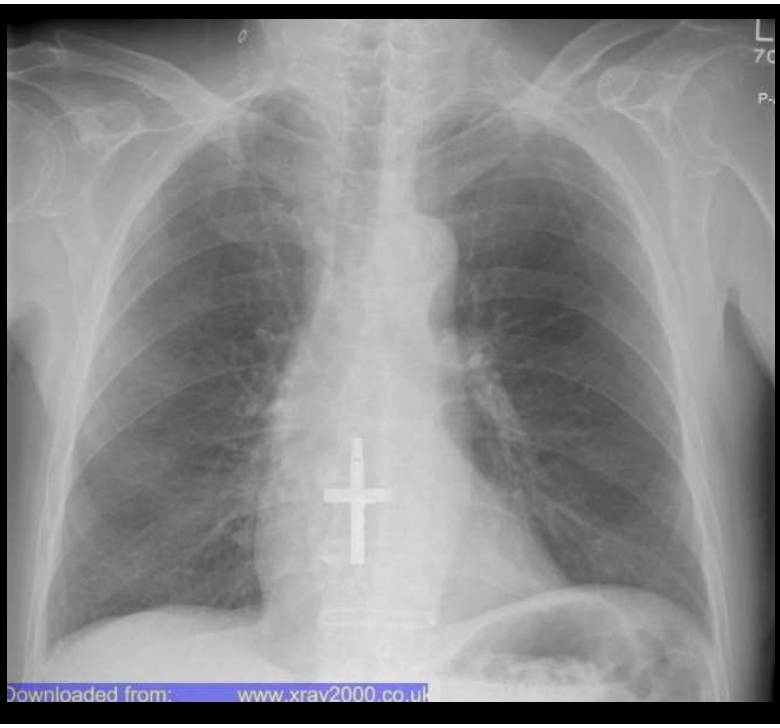
Corrective Actions may need to occur for the following with Image Analysis…

- Technical factors?
- Procedural factors?
- Equipment?
- Artifacts?

26

EXAMPLES

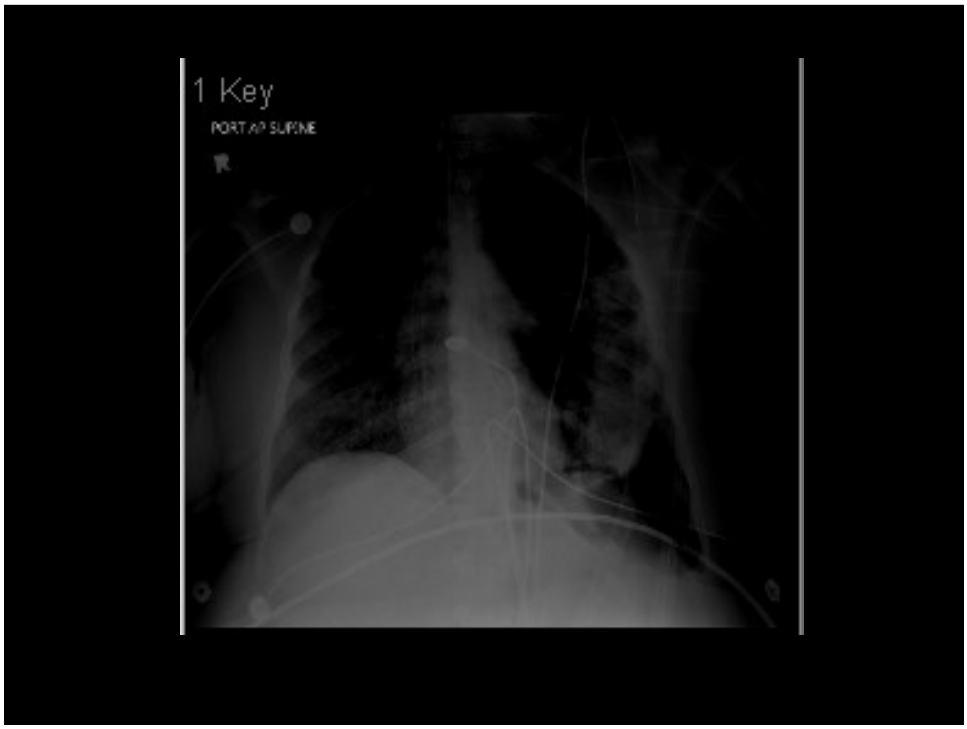
27



28

29

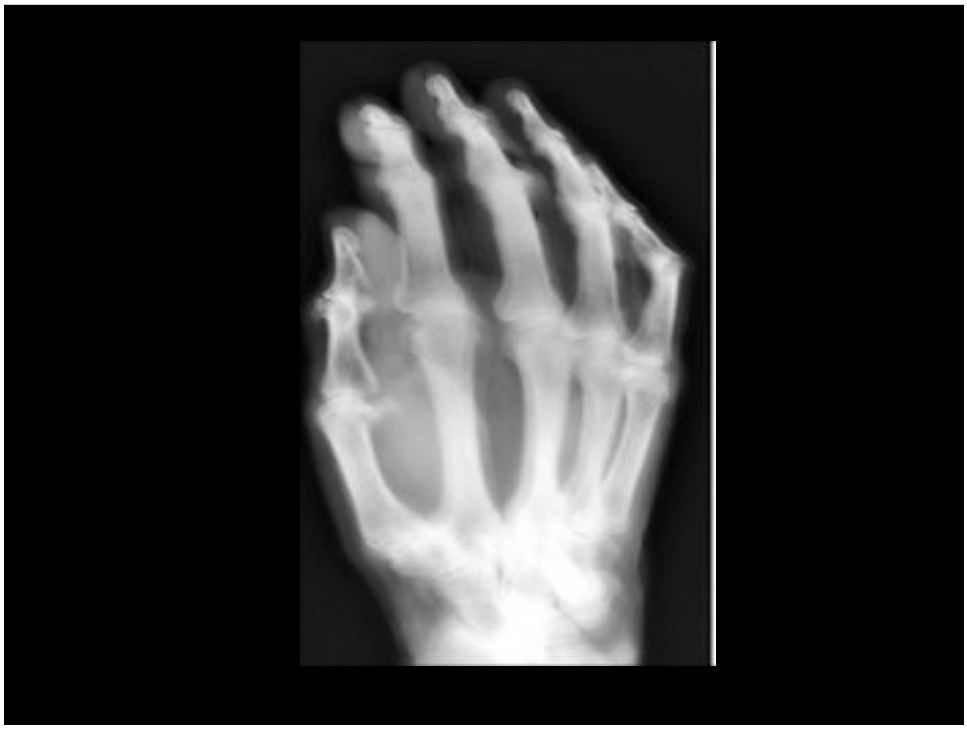
30


1 Key
PORT AP SUPINE

31


L
24
ap
Downloaded from: www.xray2000.co.uk

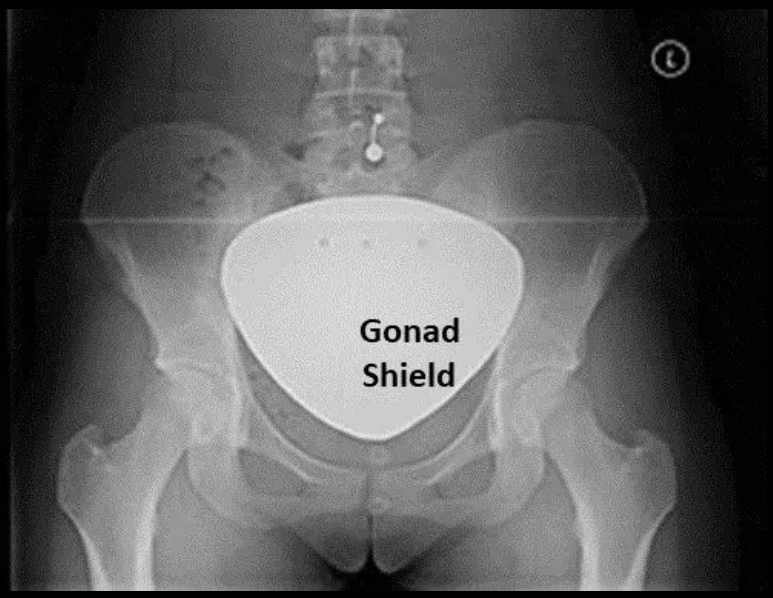
32



33

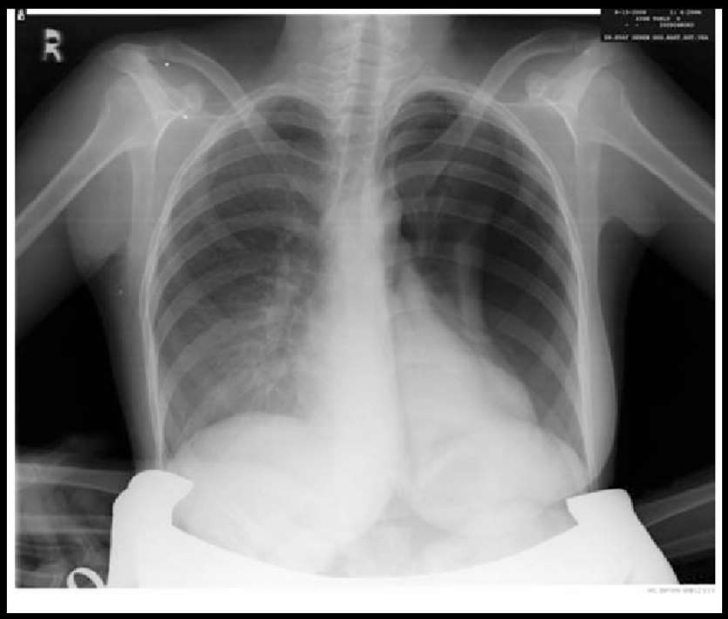
34

We no longer shield! Can you see why this could pose a problem?



35

We no longer shield! Can you see why this could pose a problem?



36

37

We no longer shield at RH

As of December 2021, after years of research and studies, it has been decided that shielding is no longer necessary and can in fact increase the rate of repeats due to shielding usage.

- In April of 2019, the American Association of Physicists in Medicine (AAPM) released a position statement outlining reasons for limiting the routine use of fetal and gonadal shielding in medical imaging1. This position statement has since been endorsed by the American College of Radiology (ACR), as well of many other associations and organizations as listed on the attached document

AAPM Patient Gonadal and Fetal Shielding in Diagnostic Imaging 2021.pdf

38

Knowledge for RT and students to know

- The dose required to cause infertility is much higher than that used during a medical imaging exam.
- Shields may cover up parts of your body that your doctor needs to be able to see. If this happens, we may have to repeat your image
- The change in practice is due to improvements in imaging technology and a better understanding of how radiation might affect the body.
- For pregnant patient – the amount of radiation used in medical imaging is much lower than what is known to cause any harm to an unborn baby. Shields will not reduce the amount of radiation to your unborn baby but may cover up parts of your body that your doctor needs to be able to see.

39

Patient questions with talking points for you to educate

- **Pt question: Why do you not shield patients anymore?**
  Patient shielding has been used for more than 70 years. We have better equipment that uses *much less* radiation and operates differently. We also know more about how radiation affects the human body and that some parts of the body. Most modern X-ray machines can automatically determine how much radiation to use based on the part of the body being imaged. If a shield gets in the way, it could mean an increase in radiation dose. Since we have equipment that can give us better information using less radiation than in the past, patient shields are no longer beneficial.
- **Pt question: Doesn't shielding make me safer?** The amount of radiation used in most imaging exams is so small that the risk to you is either very small or zero. Shields provide negligible protection. You get more radiation from natural radiation outside from an x-ray

40

- **Pt Question: But what's the harm in shielding?** When the reproductive organs are far away from the part of your body being imaged, there is no benefit from using shielding. When the part of your body receiving X-rays is close to your reproductive organs, a shield may cover up parts of your body that your doctor needs to be able to see. If this happens, we may have to repeat your exam.

- **Pt Question: Won't radiation exposure to my sperm or ovaries harm my future children?** This has never been seen in humans even after many generations (years) of studying it closely. This is true even for people who have been exposed to much larger amounts of radiation than what is used in medical imaging

- **Pt Question: I still want a shield, will you shield me?** We do not recommend using lead shielding during imaging exams. Some exams can never be done using a shield because it would always cover parts of the body we need to see. But, if you insist that we use a shield, we will honor your request if it is possible to do so without compromising the exam your child is having

41