CONTINUING EDUCATION TEST: Principles of CT: Radiation Dose and Image Quality

1. Why is the radiation dose received by patients from CT much harder to calculate (estimate) than the radiation dose received from planar radiography?

A. The maximum dose occurs at the point the x-ray beam first penetrates the skin of the body.
B. X-ray beams enter the patient’s body from all directions.
C. Measurements need to be made on the inside of the body, versus the skin.
D. As the tube rotates during CT, different areas of the body receive different amounts of dose.
E. A and B.
F. B, C, and D.

2. Which of the following statements about dose to a slice of tissue from CT scanning is correct?

A. The amount of dose is not affected by the position of the slice within the series of slices.
B. Dose to adjacent slices is usually insignificant.
C. Several factors such as scanner geometry, collimator design, and slice spacing contribute to the actual dose.
D. The end slices receive a higher dose than the central slices.
E. All of the above.

3. How are patient radiation exposure doses from CT estimated?

A. With dosimetry phantoms standardized by the Food and Drug Administration.
B. With small film-type detectors placed inside the scanner during a patient study.
C. With small crystal TLD detectors taped to the surface of the skin at precise locations.
D. A or C.
4. Which of the following principles is the basis for calculating the dose received by each slice of tissue scanned by CT?
   
   A. The contribution of dose from adjacent slices is inversely proportional to their distance from the slice dose being measured.
   
   B. The dose that a scanned slice (x) gives to all other slices equals that received by slice x from all other slices.
   
   C. The more medial the slice scanned, the less effect it has on adjacent slices.

5. How is the radiation dose determined when using a phantom?
   
   A. By inserting an ionization chamber into the phantom holes.
   
   B. By inserting a Geiger-Muller meter probe into the phantom holes.
   
   C. By inserting a specially designed film into the phantom holes.
   
   D. Any of the above.

6. With regard to radiation dose from a CT scanner, what does the Food and Drug Administration require CT manufacturers to report in their sales literature?
   
   A. The maximum amount of dose from a routine procedure.
   
   B. The scanner scatter fraction for routine studies.
   
   C. The multiple-slice average dose.
   
   D. The CT dose index measured over 100 mm for images used in the sales literature.

7. Which of the following statements about the radiation dose from CT is incorrect?
   
   A. The effective dose to the head is much higher than the effective dose to the body.
   
   B. The CT dose index provides an estimate of the radiation dose to the area scanned.
C. The higher the dose, the better the image quality.
D. The radiation dose is higher from CT than from planar radiography.

8. The fraction of primary x-rays exiting a patient that contribute to the image is called…
A. Geometric efficiency.
B. Dose efficiency.
C. Absorption efficiency.
D. Detective efficiency

9. What are the 4 basic factors that affect CT image quality?
A. Display contrast, noise, peak kilovoltage, and patient size.
B. Body weight, beam hardness, spatial resolution, and noise.
C. Body composition, Compton scatter, peak kilovoltage, and beam hardness.
D. Peak kilovoltage, tissue attenuation, spatial resolution, and display contrast.
E. Image noise, spatial resolution, image contrast, and artifacts.

10. How can a filter affect the appearance of noise in an image?
A. “Smöother” filters blur the noise and make it visually more pronounced.
B. “Sharper” filters enhance the appearance of image noise.
C. Filters have no effect on the appearance of noise.

11. Spatial resolution in CT is primarily affected by…
A. Scan time.
B. Reconstruction filter.
C. Size and spacing of measurements.

D. Subject contrast.

E. B and C.

12. Which of the following statements about CT is correct?

A. A primary advantage of CT is the ability to visualize low-contrast structures.

B. The higher the dose, the less the image noise.

C. The higher the dose, the greater the image noise.

D. A and B.

E. A and C.