MI 132: Unit 7
Exposure Technique Selection

Reading Hospital School of Health Sciences

MI Program

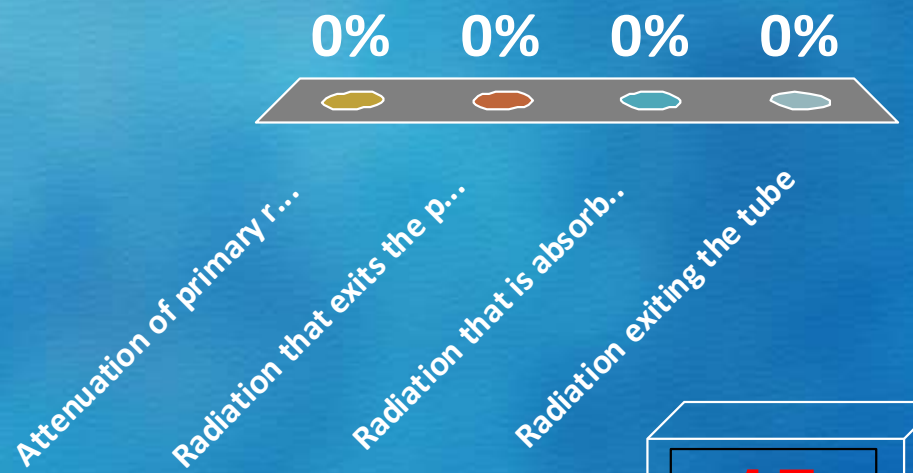
2022-2023

Automatic Exposure Control (AEC)

#1 - Why are AEC systems used in radiography?

AEC devices work by measuring:

A. Attenuation of primary radiation by the patient
B. Radiation that exits the patient
C. Radiation that is absorbed by the patient
D. Radiation exiting the tube



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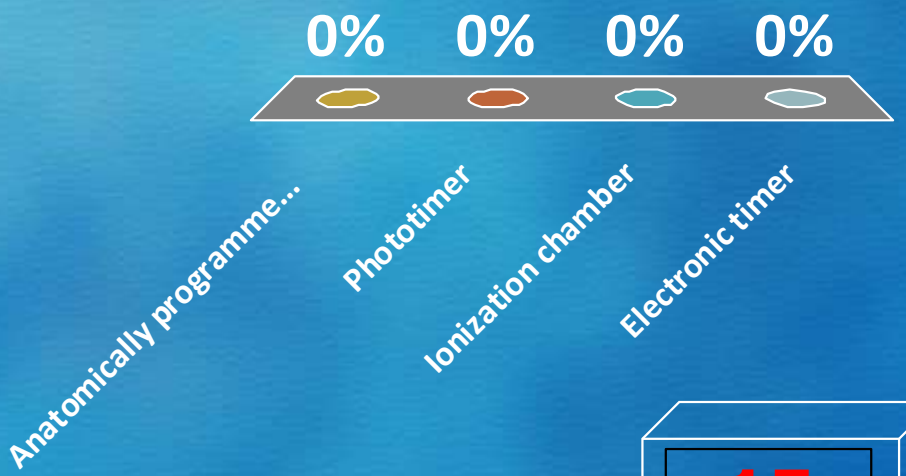
Which of the following exposure systems operate by ionizing air that creates an electrical charge?

A. Anatomically programmed technique
B. Phototimer
★ C. Ionization chamber
D. Electronic timer



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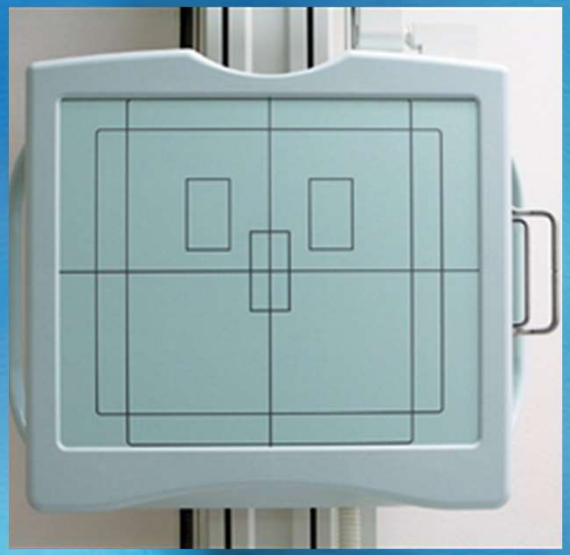
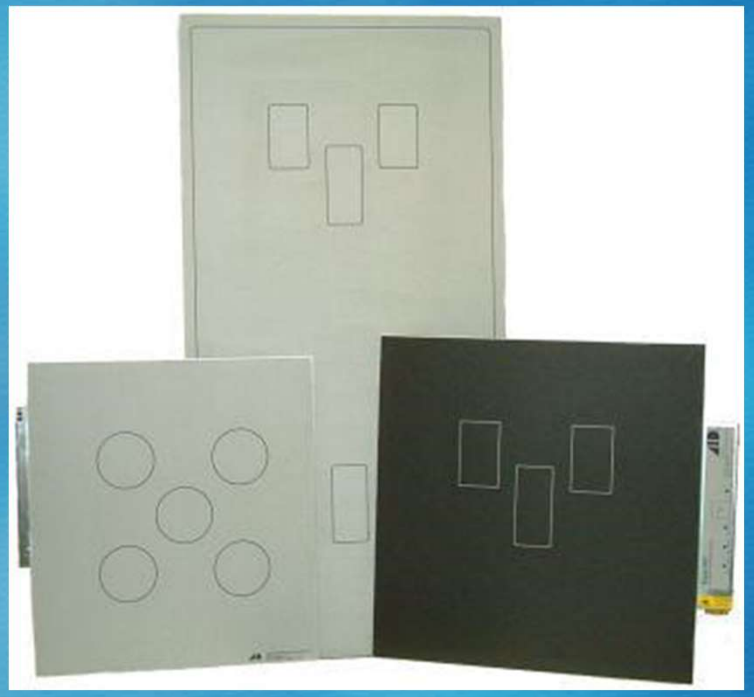
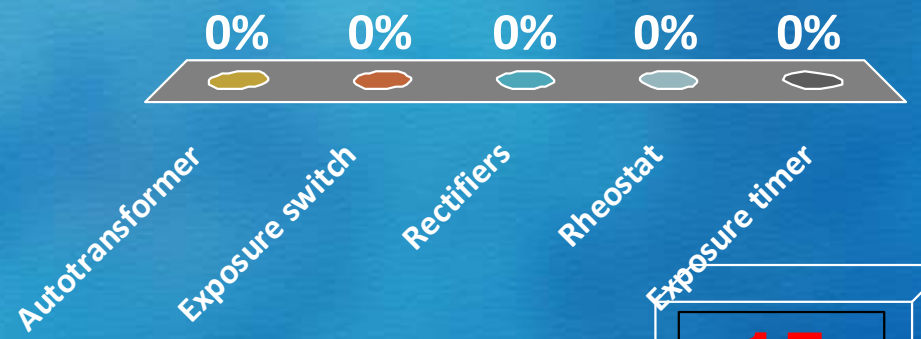
Automatic Exposure Control (AEC)





The AEC serves the same role as what device located in the primary circuit?

A. Autotransformer
B. Exposure switch
C. Rectifiers
D. Rheostat
★E. Exposure timer



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mAs Readout

#3 - Define mAs readout AND list two reasons why it's important for a radiographer to review this display after exposures.

When using AEC, an increase in kVp will:

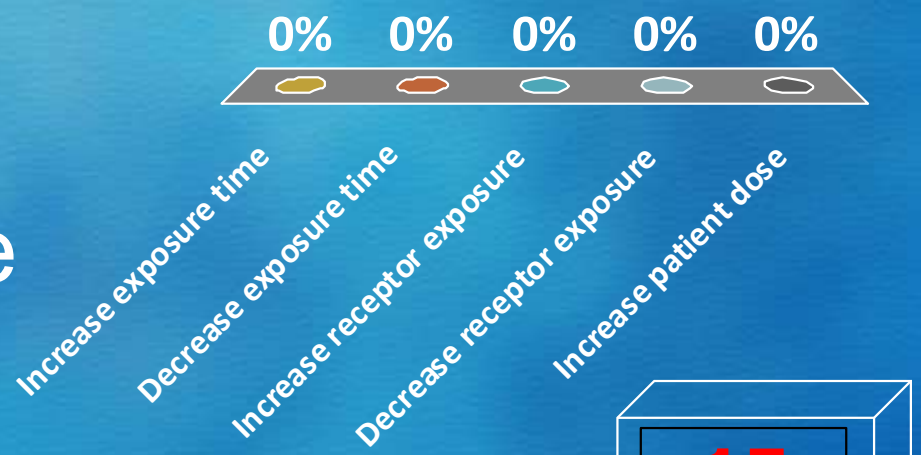
A. Increase exposure time

★ B. Decrease exposure time

C. Increase receptor exposure

D. Decrease receptor exposure

E. Increase patient dose



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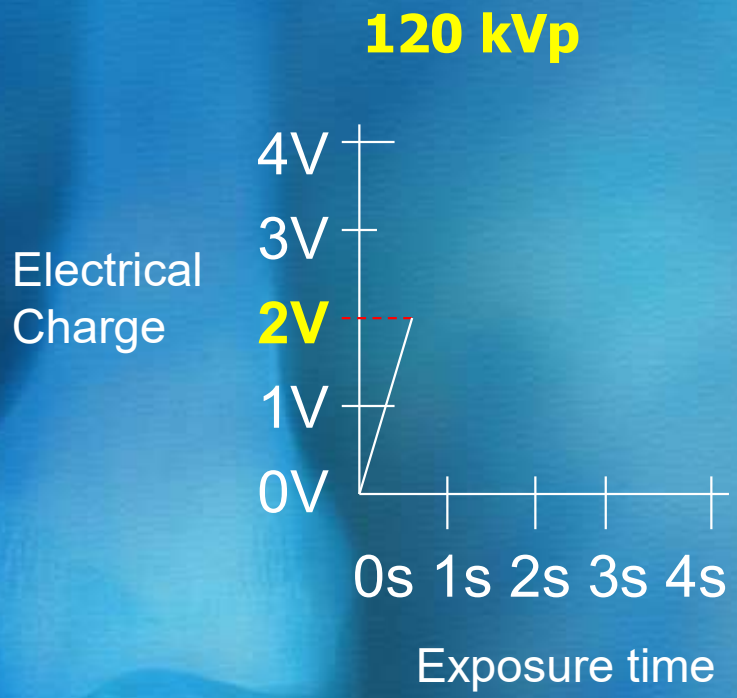
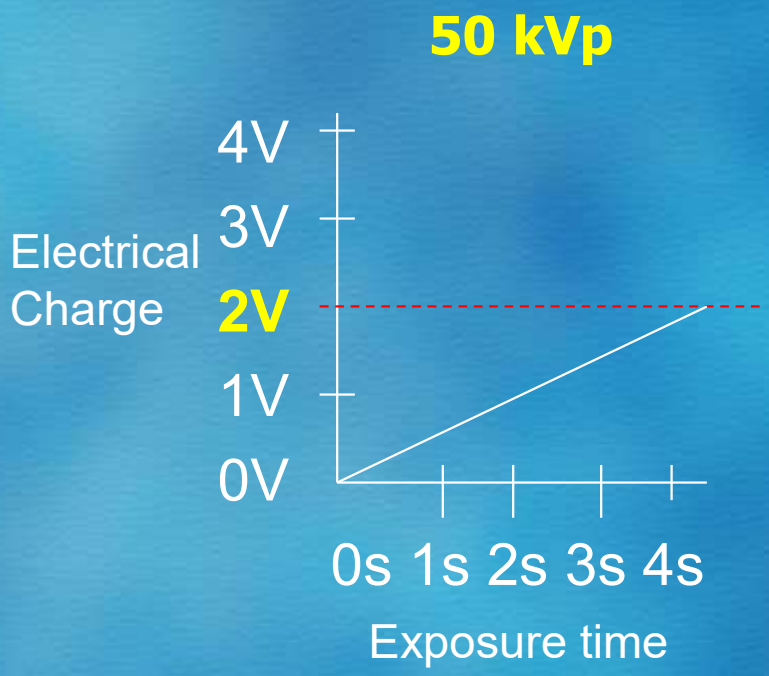

120 kVp
Electrical Charge
4V
3V
2V
1V
0V
0s 1s 2s 3s 4s
Exposure time


50 kVp
Electrical Charge
4V
3V
2V
1V
0V
0s 1s 2s 3s 4s
Exposure time

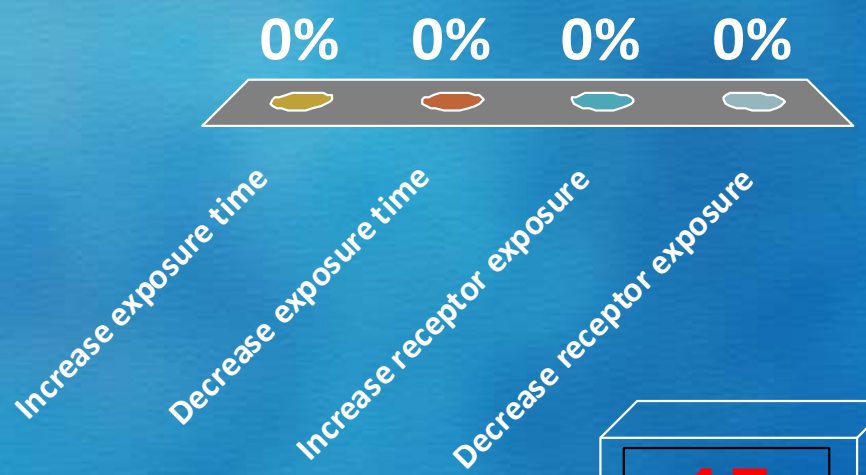
When using AEC, an increase in mA will:

A. Increase exposure time

★ B. Decrease exposure time

C. Increase receptor exposure

D. Decrease receptor exposure



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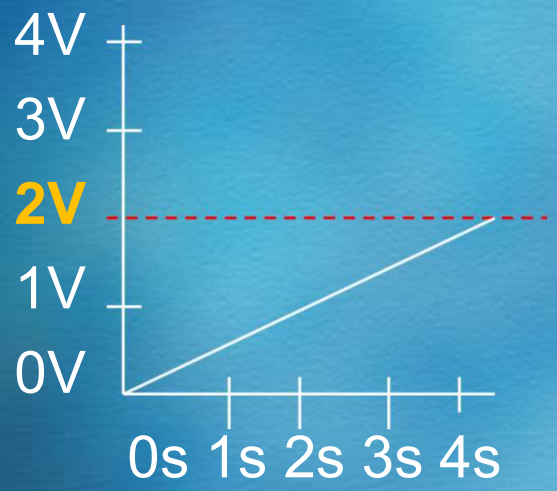
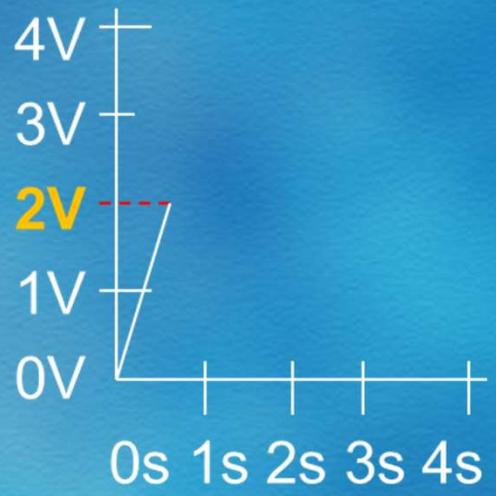
100 mA

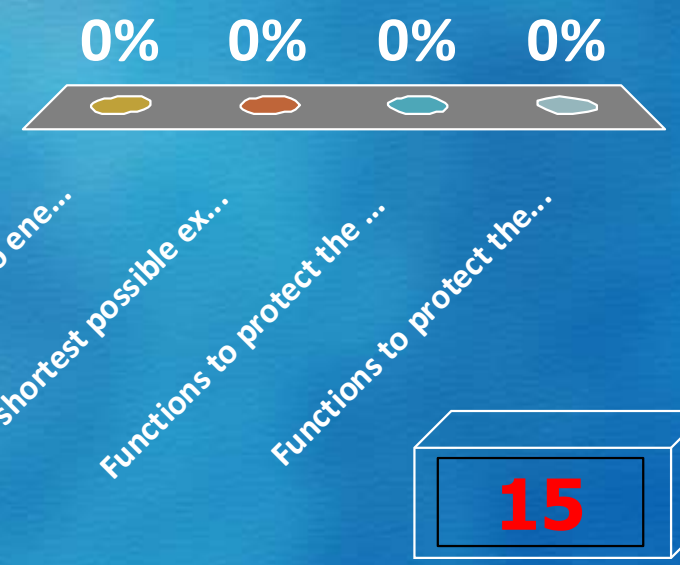


400 mA



The MRT of an AEC system is:

A. The time required to energize the tube
B. The shortest possible exposure time
C. Functions to protect the patient from overexposure
D. Functions to protect the tube from excessive heat



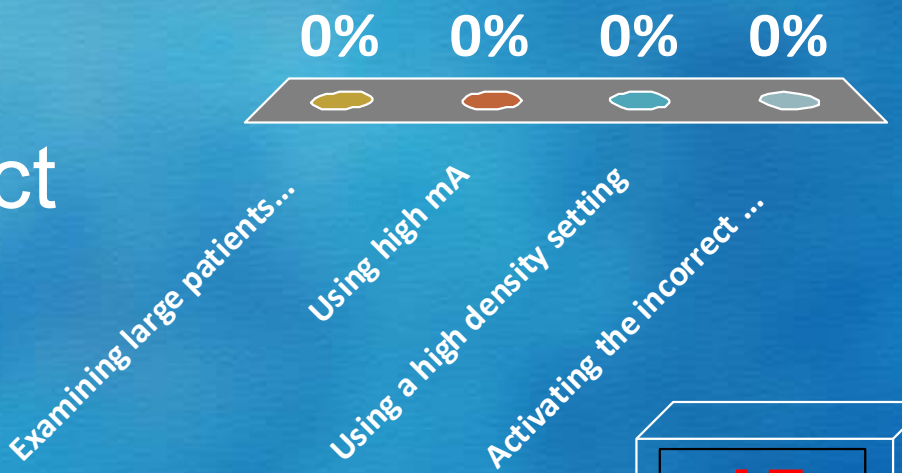
MRT times longer than the amount of time needed to terminate the preset exposure can be caused by:

A. Examining large patients or body parts

★B. Using high mA

C. Using a high density setting

D. Activating the incorrect image receptor



Back-up Time

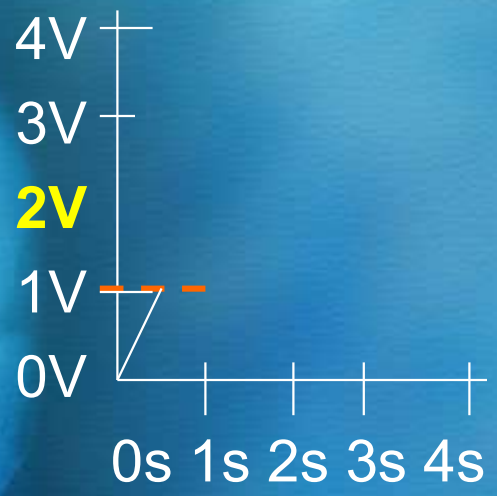
#7 - Define back-up time (BUT) AND idenfity its main purpose.

- Identify how a back-up time that is too short or too long will affect receptor/patient exposure.

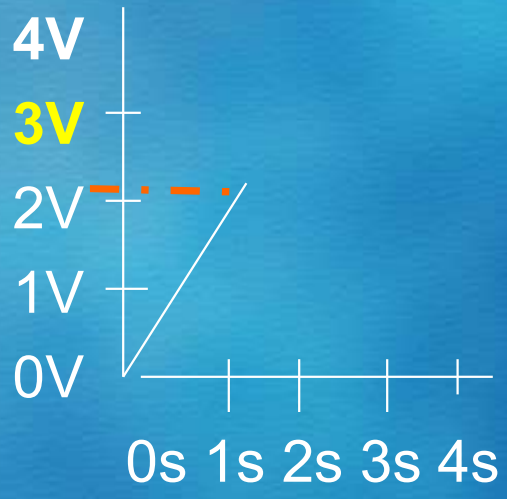
Density Adjustment

#8 - Identify the purpose of density controls.

200mA 60kVp **0** den

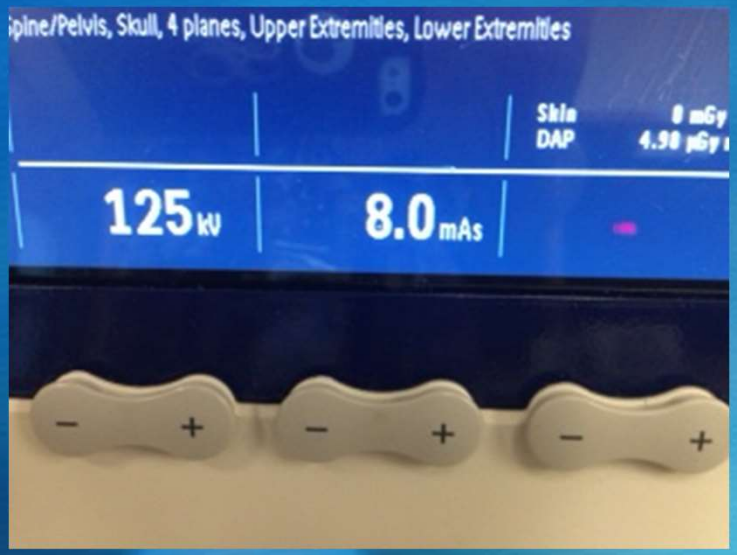


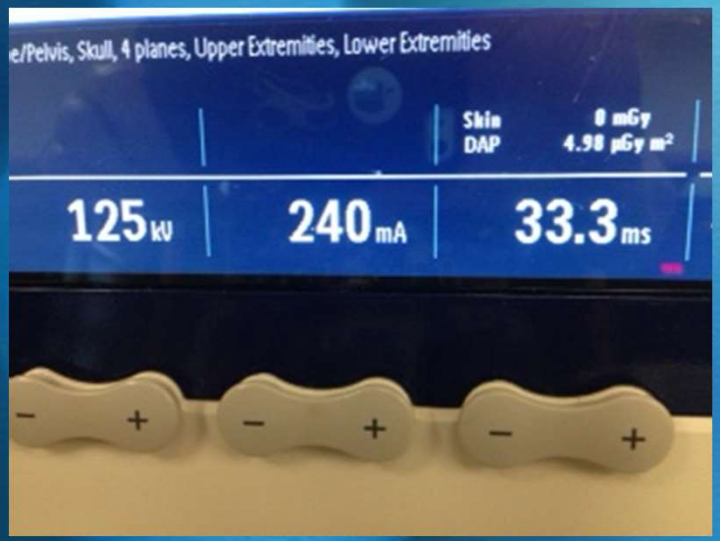
200mA 60kVp **+1 den**



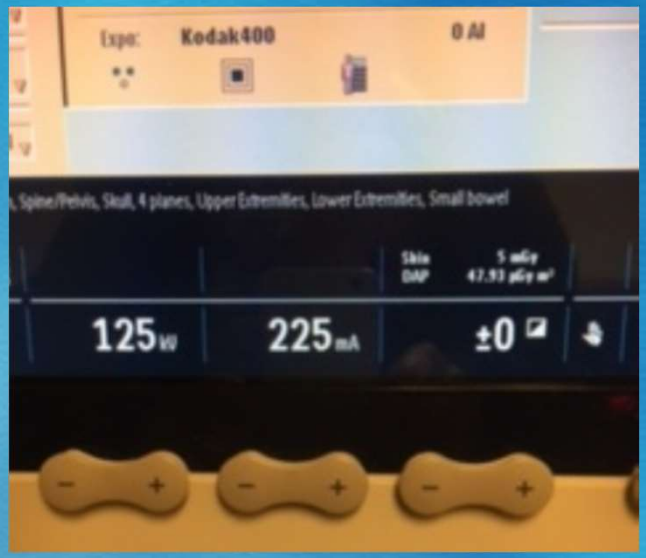
- Changing density should **not** be routine!
  - However, this is the factor that **NEEDS** to be changed if not within acceptable exposure indicator range and AEC is being used
    - *As long as centering and detector configuration is accurate!*

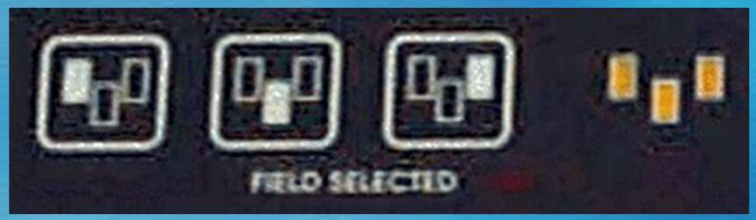
Manual


pine/Pelvis, Skull, 4 planes, Upper Extremities, Lower Extremities
Skin DAP
125 kV
8.0 mAs


e/Pelvis, Skull, 4 planes, Upper Extremities, Lower Extremities
Skin DAP
0 mGy
4.98 µGy m²
125 kV
240 mA
33.3 ms

AEC

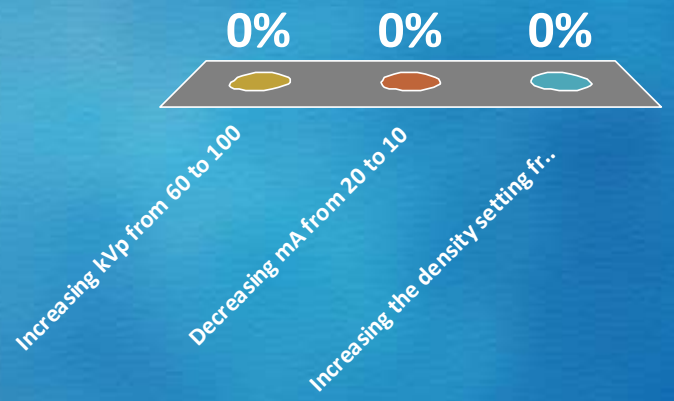

Expo
Kodak400
0 AI
125 kV
225 mA
±0


FIELD SELECTED


102kV
0
S400
abdom.ap ch-S=
abd.lat ch-S=
chest ch-S=
shoulder ch-S=

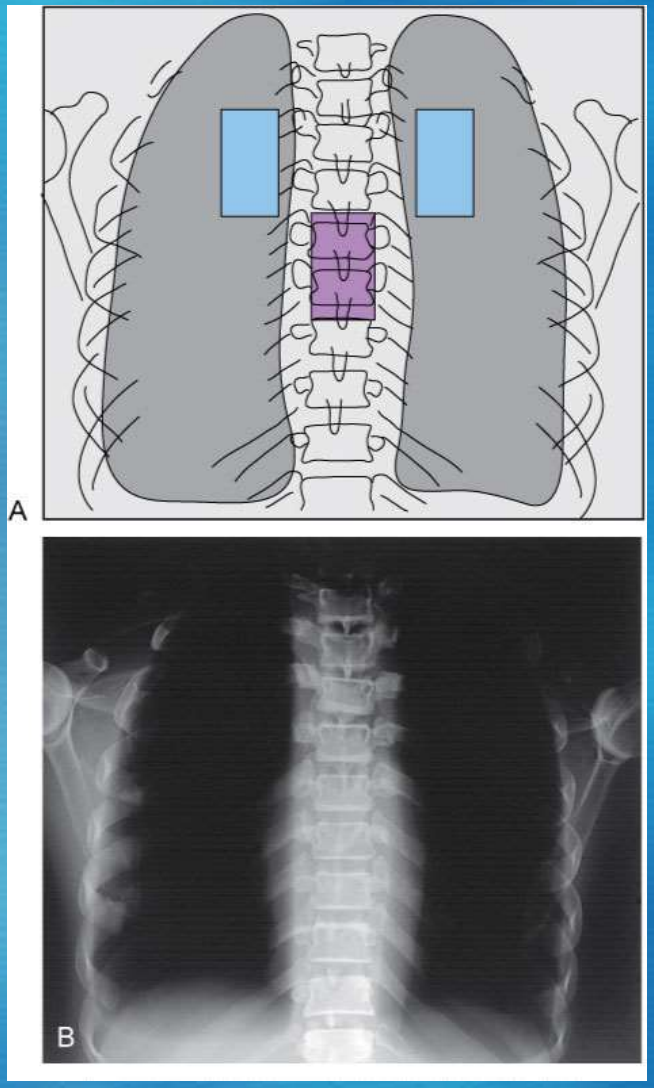
In which scenario will the exposure terminate sooner when using AEC?

- ✓ A. Increasing kVp from 60 to 100
- B. Decreasing mA from 20 to 10
- C. Increasing the density setting from 0 to +1



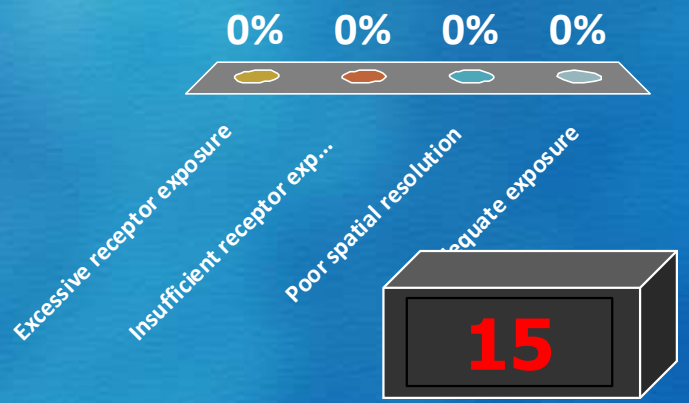
Alignment and Positioning Considerations

#9 - Identify the 3 alignment and positioning considerations when using AEC AND how they influence the effectiveness of AEC.

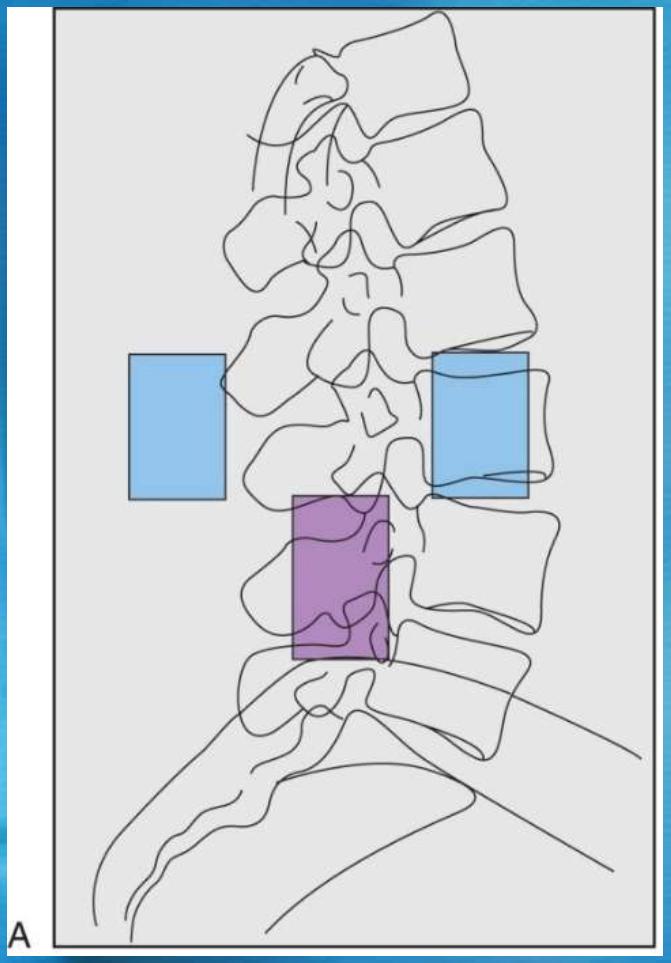


If an image of a knee was acquired on an average size knee using AEC and an outer cell was activated, the resulting image would demonstrate:

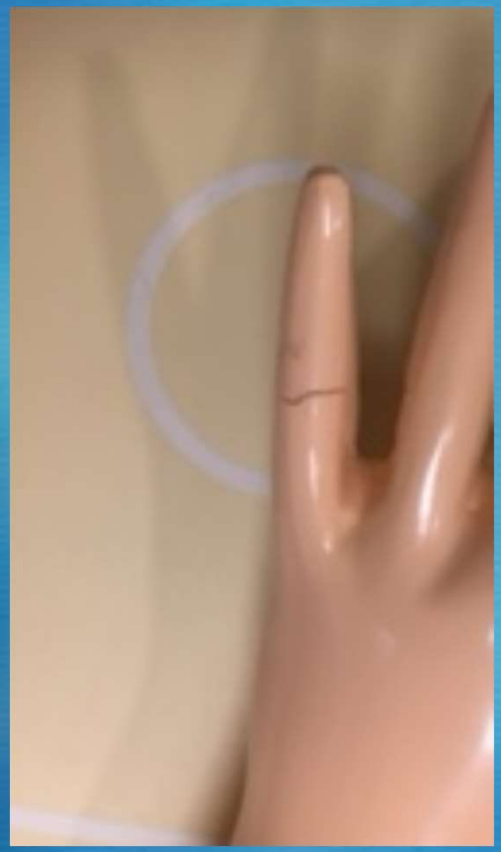
A. Excessive receptor exposure
B. Insufficient receptor exposure
C. Poor spatial resolution
D. Adequate exposure



Patient Centering



Detector Size



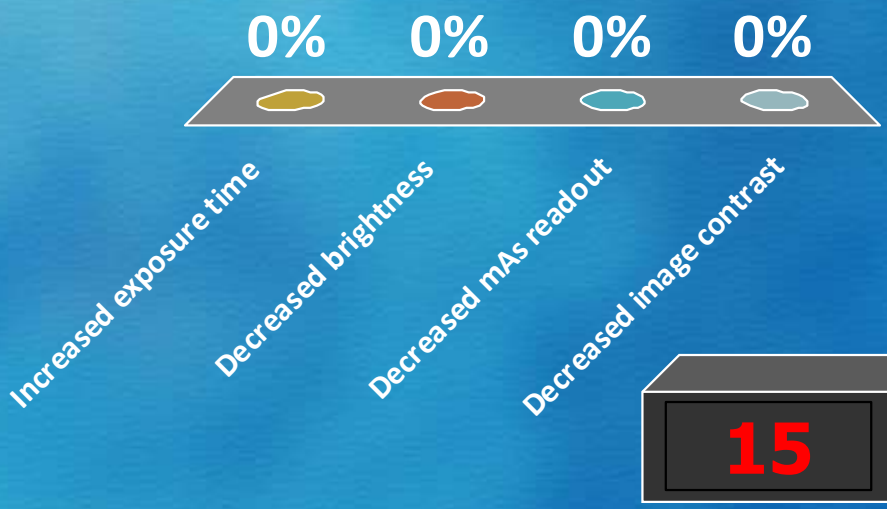
Over- or Under- Exposure

Identify if over- or under-exposure would occur from the following:

- Center cell selected for PA chest with centering down MSP
- Outer cell selected for AP shoulder with centering over shoulder
- Centered too far laterally on AP hip with center cell activated
- Centered too lateral on an oblique c-spine with center cell activated
- 1 y/o ped chest with two outer cells activated

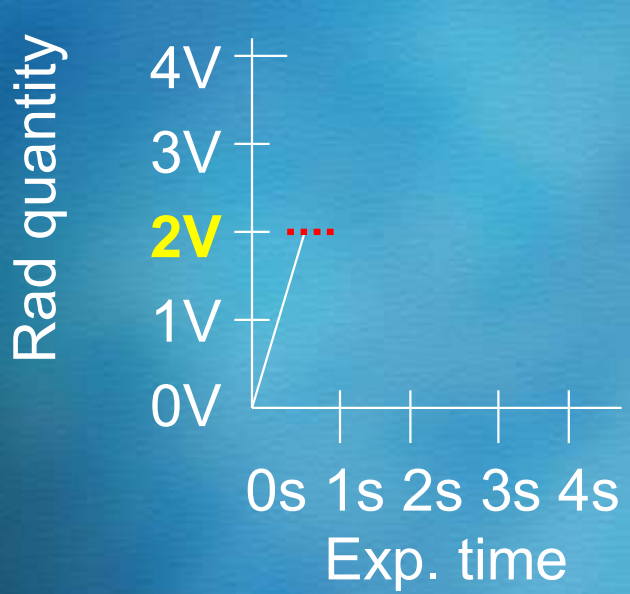
Decreasing patient thickness while using an AEC device would result in:

A. Increased exposure time
B. Decreased brightness
C. Decreased mAs readout
D. Decreased image contrast

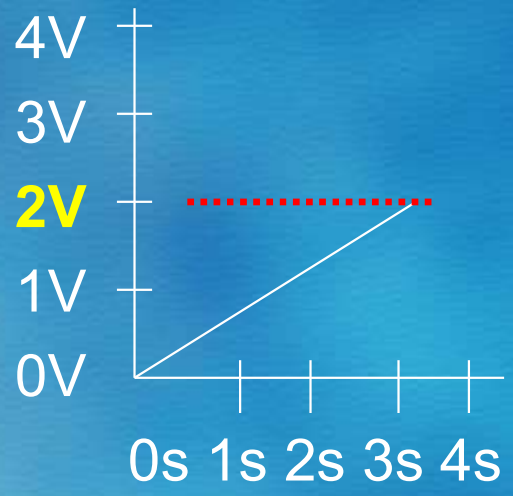


Patient Size

Small patient



Large patient



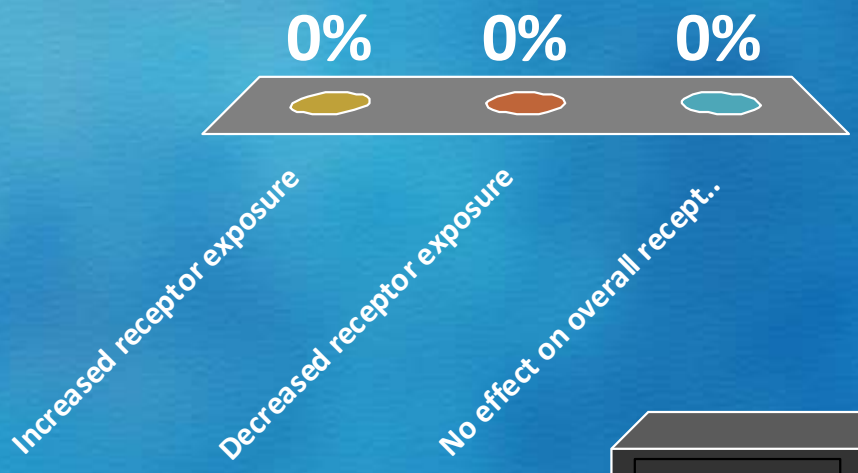
Compensating Issues

#11 - Explain how the following affect exposure time and receptor exposure when using AEC:

a. Pathology
b. Contrast media
c. Prothesis
d. Collimation
e. Image receptor

When using AEC, an additive pathology will lead to:

A. Increased receptor exposure
B. Decreased receptor exposure
C. No effect on overall receptor exposure



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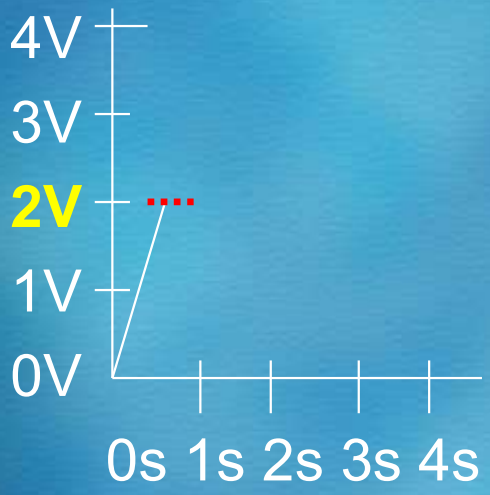
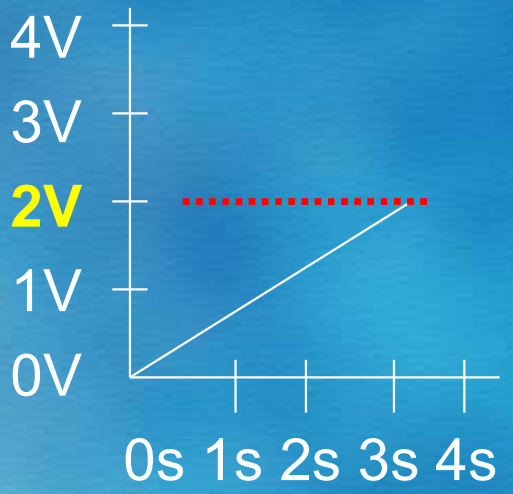
Pathology

No pathology

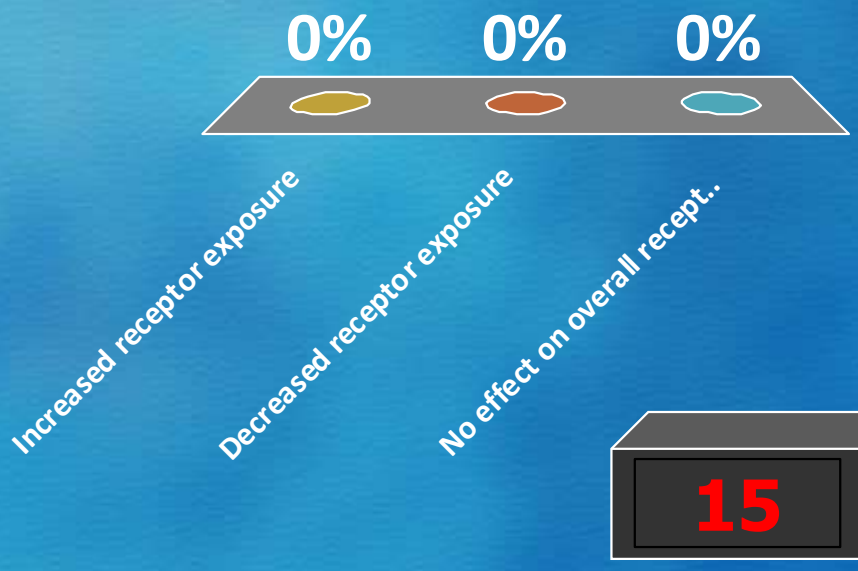


Fluid



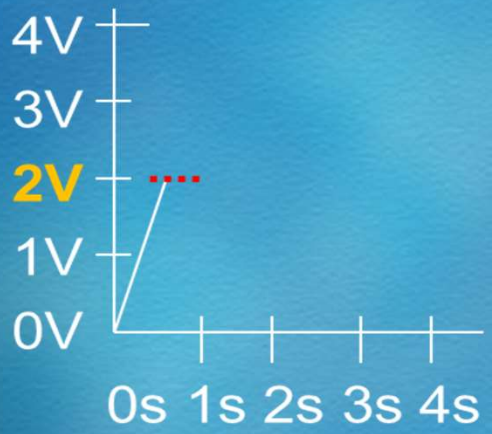
When using AEC, positive contrast media will lead to:

A. Increased receptor exposure
B. Decreased receptor exposure
C. No effect on overall receptor exposure

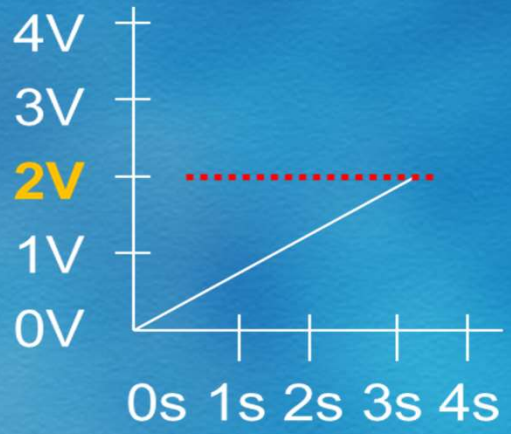


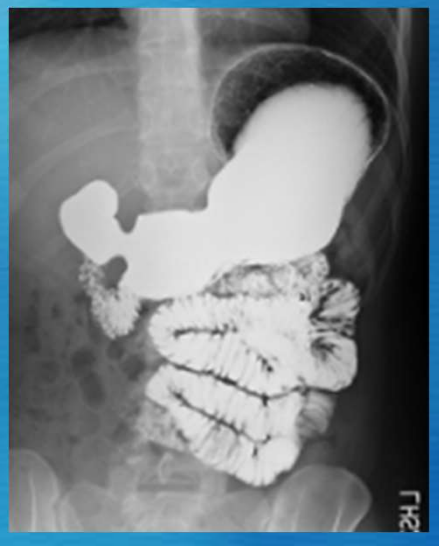
Contrast Media or Prosthesis

No contrast



Positive Contrast



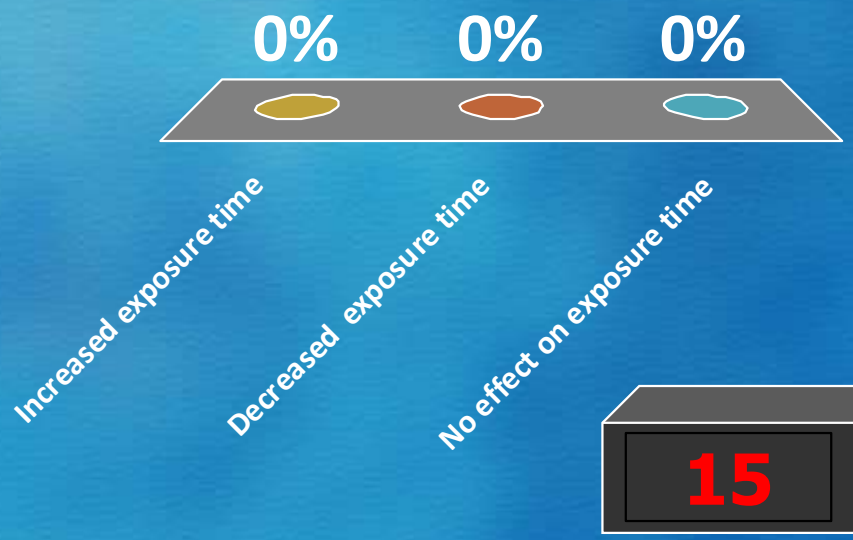


When using AEC, insufficient collimation may lead to:

A. Increased exposure time

B. Decreased exposure time

C. No effect on exposure time

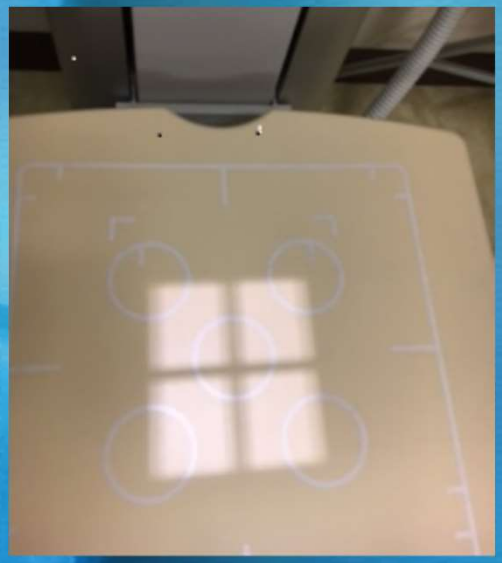


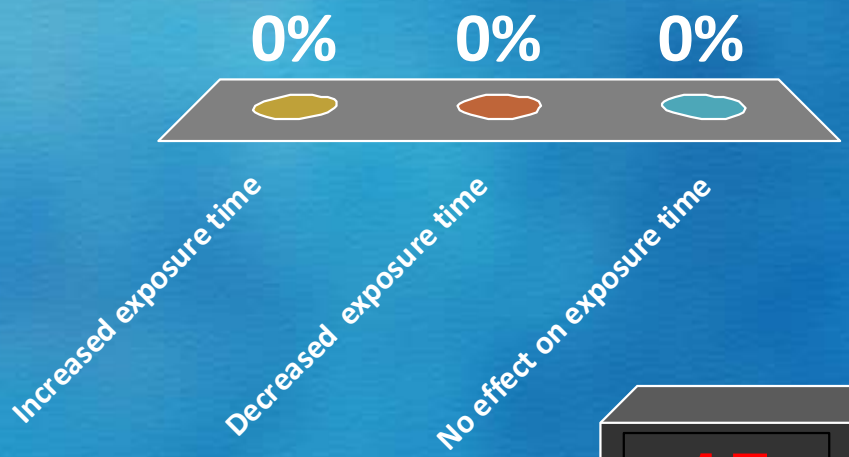
When using AEC, excessive collimation may lead to:

A. Increased exposure time

B. Decreased exposure time

C. No effect on exposure time





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IR Variations

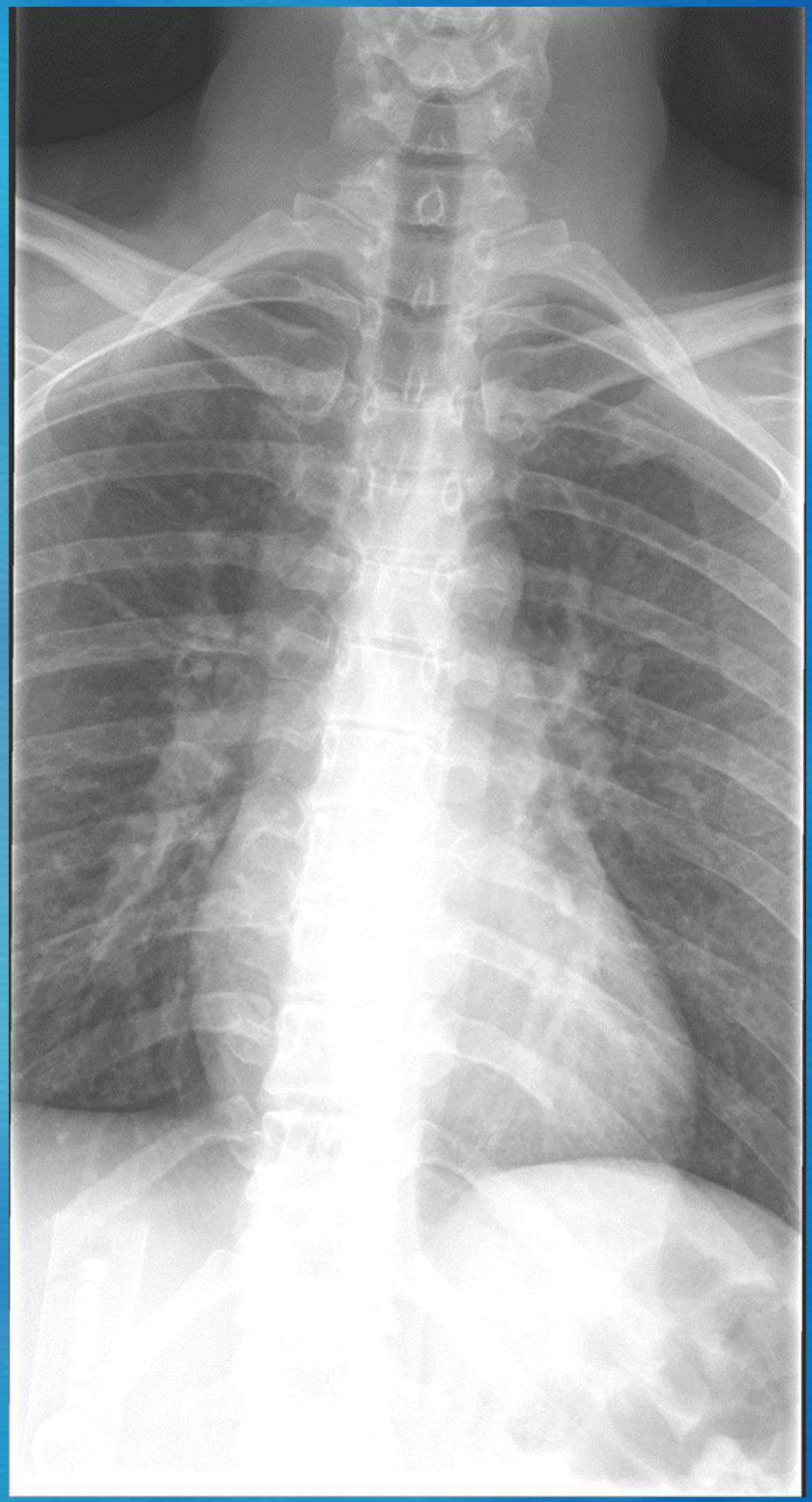
- When calibration is performed, it is done for a particular type of image receptor.
  - Different types of image receptors cannot be interchanged easily.
  - Image quality and patient exposure will be compromised.


TROUBLE SHOOTING AEC EXPOSURE ERRORS

Under or Over-exposed Image?

What would you do to correct image quality?

- AP Tspine
  DR Technique used:
  90 kVp, upper outer two chambers activated
- EI indicates underexposure
- What do you think the error is?



- Obl C-spine

DR Technique used: 85 kVp, center cell chamber activated

- Over– or under-exposed?
- What do you think the error is?

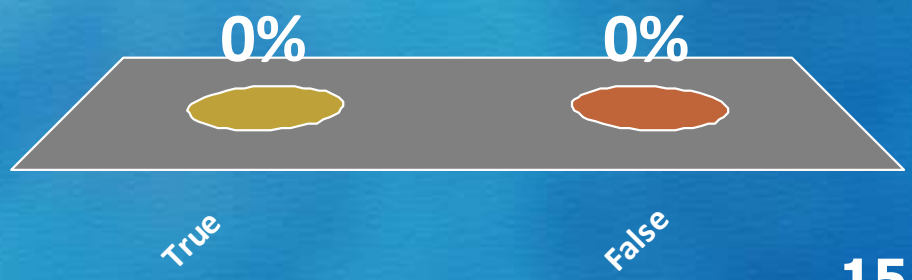
Anatomically Programmed Technique

#12 - Describe anatomically programmed technique.

When using APR, technologists are unable to change the established technical factor settings.

A. True

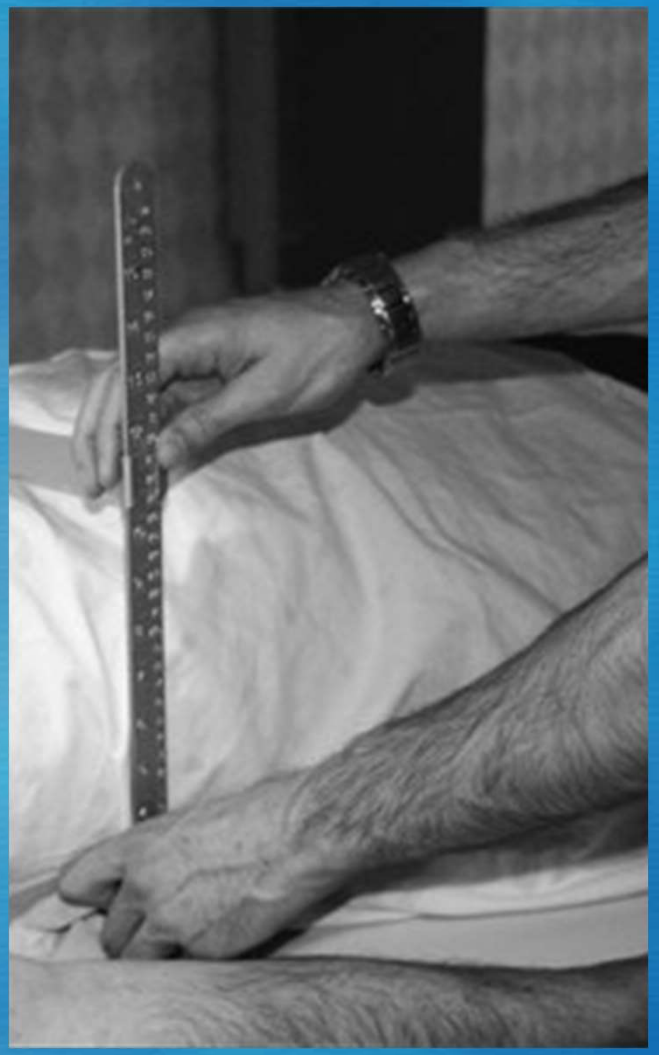
★B. False



Exposure technique charts

#13 - List three benefits of using exposure technique charts.

#14 - Identify two manners in which part measurement with calipers can be performed to set the appropriate technique.



Variable kVp-Fixed mAs

#15 - Explain how technical factors are modified when using a variable kVp-fixed mAs technique chart.

Variable kVp–Fixed mAs Technique Chart (Cont.)

- Benefit – easy to formulate

- Considerations:
  - Should still not decrease kVp lower than minimum kVp levels established – otherwise will be under-penetrated
  - Changing kVp changes subject contrast and these types of charts tend to be less accurate for extremes in normal part size measurements
  - Accurate measurement is essential
  - Changing kVp for variations in part thickness may be ineffective throughout the range of radiographic examination

Variable kVp–Fixed mAs Technique Chart (Cont.)

Technique book established an AP Abdomen technique for 8 mAs @ 78 kVp for a patient measuring 22 cm. What technique should be used for a patient measuring 25 cm using a variable kVp technique system?

Fixed kVp–Variable mAs Technique Chart

#16 - Explain how technical factors are modified for part measurement when using a **fixed kVp-variable mAs** technique chart.

Fixed kVp–Variable mAs Technique Chart (Cont.)

#17 - List five advantages of a fixed kVp-variable mAs technique chart.

Shoulder:	6-10cm	70KVP	8 MAS
	11-15cm	70KVP	16 MAS

Fixed kVp–Variable mAs Technique Chart (Cont.)

Technique book established an AP Abdomen technique for 8 mAs @ 78 kVp for a patient measuring 22 cm. What technique should be used for a patient measuring 26 cm using a fixed kVp technique system?

Comparative Anatomy

#18 - Explain how the concept of comparative anatomy is used in practice and to develop technique charts.

Comparative Anatomy

Abdomen = pelvis = L-spine

AP Forearm = AP elbow = AP Foot

AP Shoulder = AP knee

Lat ankle = Lat foot / heel

Ped knee = Adult elbow

Ped low leg = Adult forearm or elbow

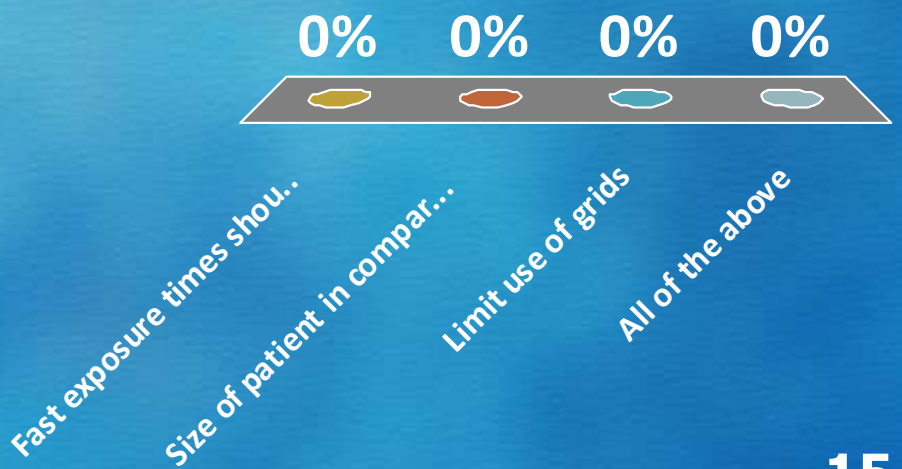
Ped hip = Adult knee

Special Considerations

- Patient Type – Pediatric, Geriatric, Bariatric
- Projections and Positions
- Casts and Splints
- Pathologic Conditions
- Soft Tissue
- Contrast Media

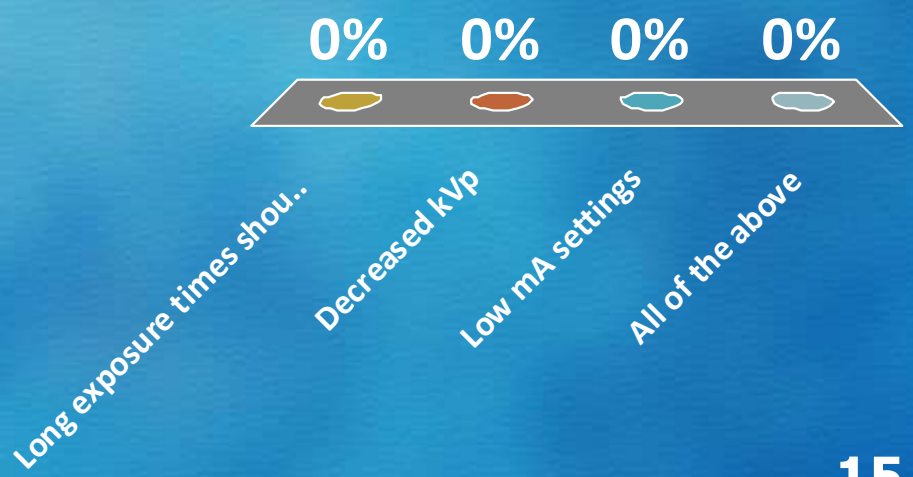
Which of the following are TRUE concerning technique setting on pediatric patients:

A. Fast exposure times should be used
B. Size of patient in comparison to active AEC detectors needs to be considered
C. Limit use of grids
★D. All of the above



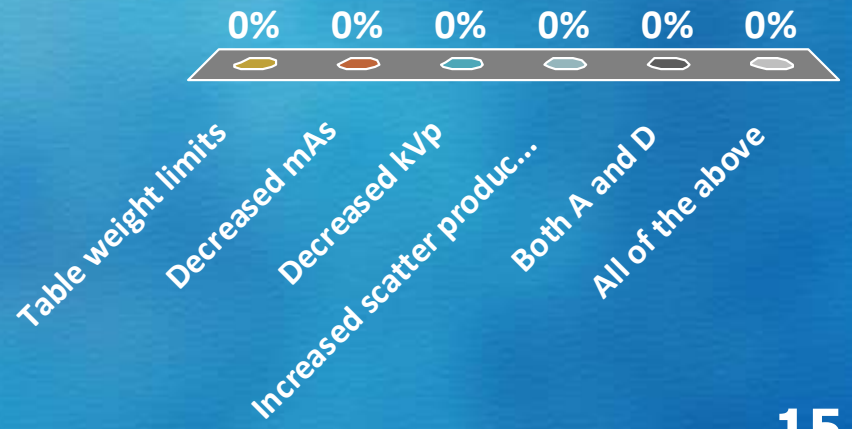
Which of the following are TRUE concerning technique setting on geriatric patients:

A. Long exposure times should be used
★ B. Decreased kVp
C. Low mA settings
D. All of the above



Which of the following are TRUE concerning considerations that need to be taken into account for bariatric patients:

A. Table weight limits
B. Decreased mAs
C. Decreased kVp
D. Increased scatter production and grid usage
★ E. Both A and D
F. All of the above

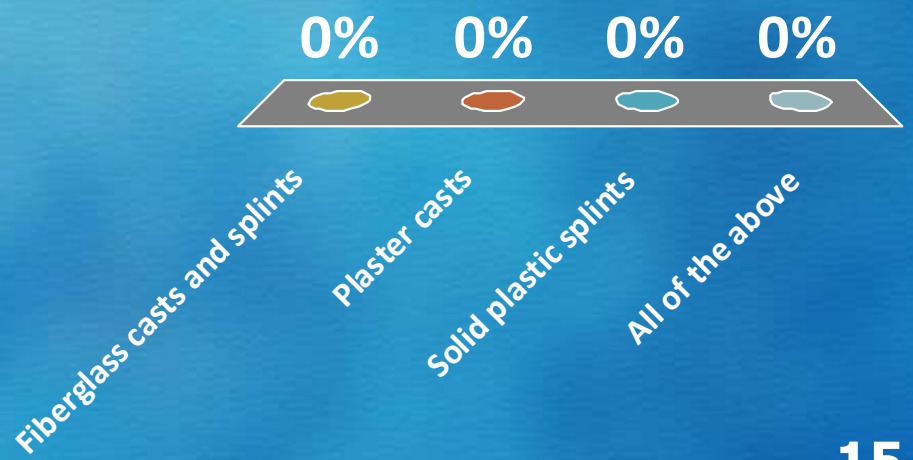


Projections and Positions

#19d. Explain how techniques may need to be modified for different projections and positions.

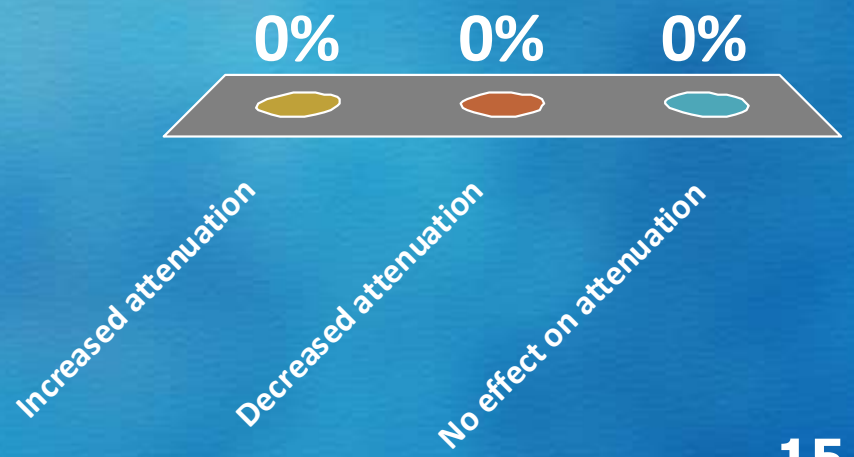
Which of the following ALWAYS requires an increase in technical factors?

A. Fiberglass casts and splints
★B. Plaster casts
C. Solid plastic splints
D. All of the above



How is attenuation affected by an additive pathology?

- ★ A. Increased attenuation
- B. Decreased attenuation
- C. No effect on attenuation



What type of technical factor adjustments are required for an additive pathology?

A. Decreased mAs
★ B. Increased kVp
C. Increased density setting
D. No technical factor modification is required

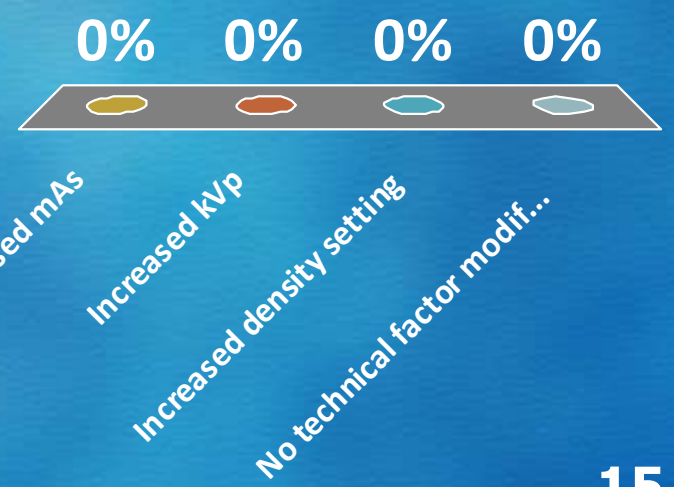
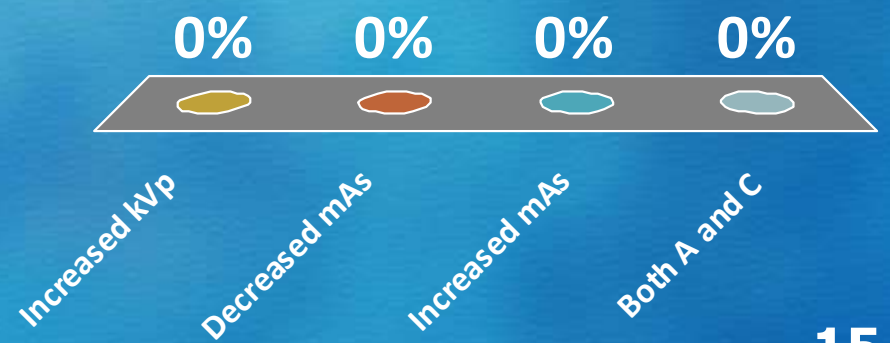


TABLE 13-5 Some Common Additive and Destructive Diseases and Conditions by Anatomic Area

Additive Conditions	Destructive Conditions
Abdomen	
Aortic aneurysm	Bowel obstruction
Ascites	Free air
Cirrhosis	
Hypertrophy of some organs (e.g., splenomegaly)	
Chest	
Atelectasis	Emphysema
Congestive heart failure	Pneumothorax
Malignancy	
Pleural effusion	
Pneumonia	
Skeleton	
Hydrocephalus	Gout
Metastases (osteoblastic)	Metastases (osteolytic)
Osteochondroma (exostoses)	Multiple myeloma
Paget disease (late stage)	Paget disease (early stage)
Nonspecific Sites	
Abscess	Atrophy
Edema	Emaciation
Sclerosis	Malnutrition

What type of technical factor adjustments are required to better visualize soft tissue?

A. Increased kVp
★ B. Decreased mAs
C. Increased mAs
D. Both A and C



Contrast media

#19. Explain how techniques may need to be modified for:

L. Positive Contrast media

M. Negative Contrast media