

MI 132: Unit 7  
Exposure Technique Selection

Reading Hospital School of Health Sciences  
MI Program  
2022-2023

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Automatic Exposure Control (AEC)

#1 - Why are AEC systems used in radiography?

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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

0% 0% 0% 0%

Attenuation of primary r...  
Radiation that exits the p...  
Radiation that's absorb...  
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)



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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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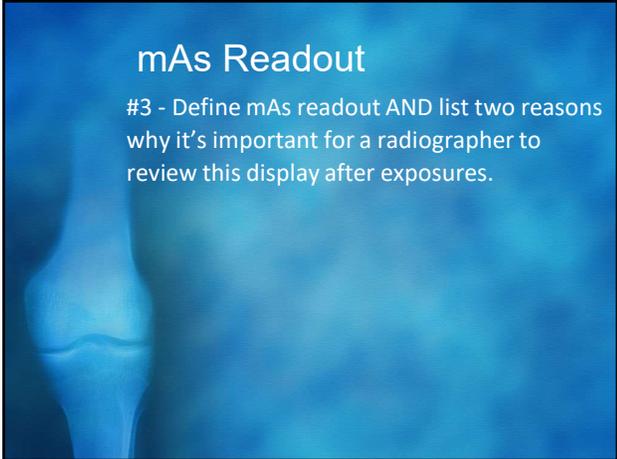
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## mAs Readout

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



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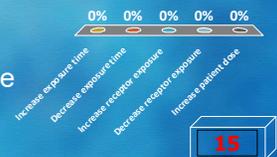
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## When using AEC, an increase in kVp will:

- A. Increase exposure time
- ★ B. Decrease exposure time
- C. Increase receptor exposure
- D. Decrease receptor exposure
- E. Increase patient dose



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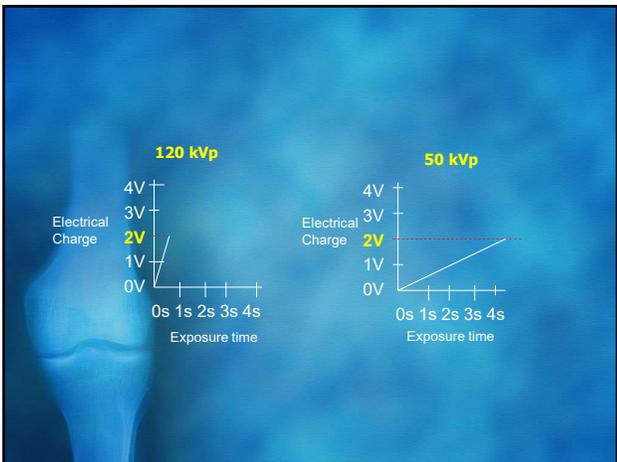
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When using AEC, an increase in mA will:

- A. Increase exposure time
- ★ B. Decrease exposure time
- C. Increase receptor exposure
- D. Decrease receptor exposure

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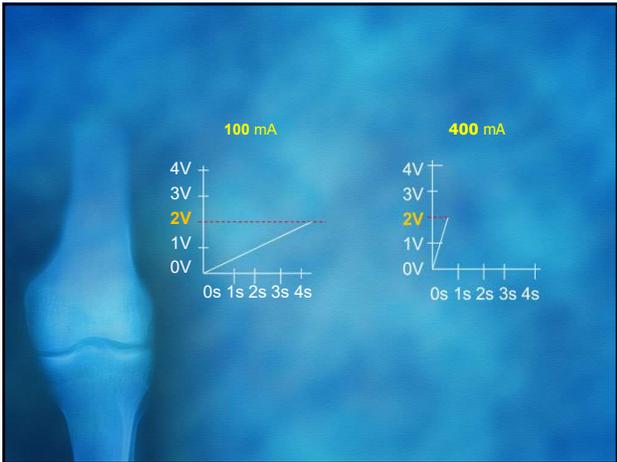
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The MRT of an AEC system is:

- 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

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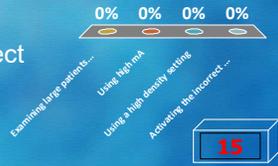
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MRT times longer than the amount of time needed to terminate the preset exposure can be caused by:

- A. Examining large patients or body parts
- ★ B. Using high mA
- C. Using a high density setting
- D. Activating the incorrect image receptor



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## Back-up Time

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

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

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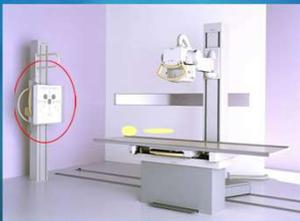
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## Density Adjustment

#8 - Identify the purpose of density controls.

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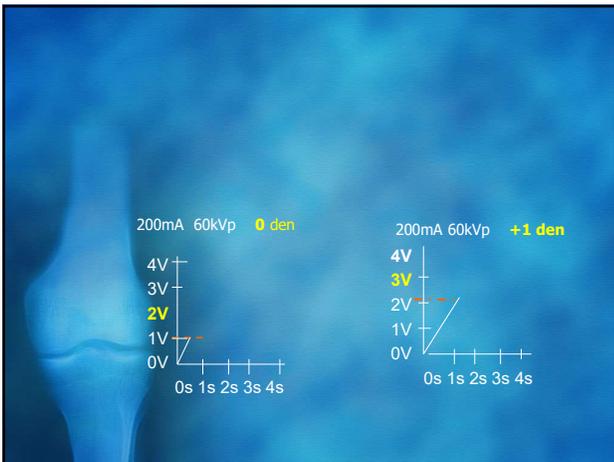
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- Changing density should **not** be routine!
  - However, this is the factor that **NEEDS** to be changed if not within acceptable exposure indicator range and AEC is being used
    - As long as centering and detector configuration is accurate!

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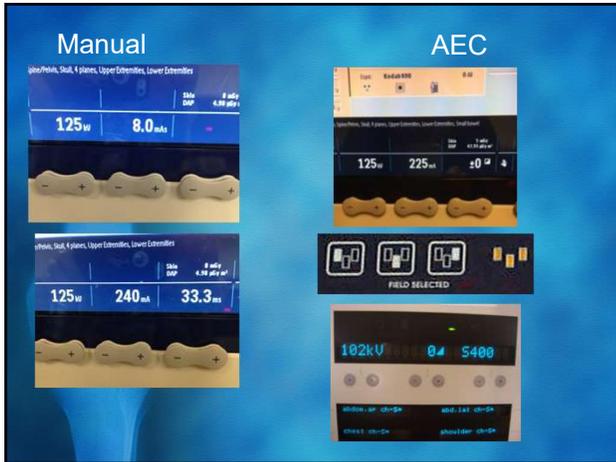
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In which scenario will the exposure terminate sooner when using AEC?

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

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### Alignment and Positioning Considerations

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

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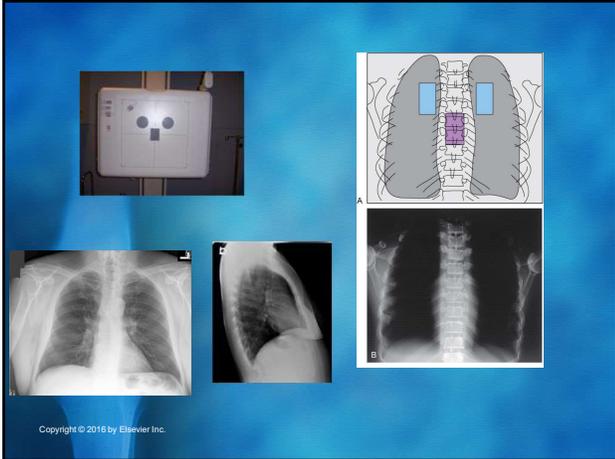
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If an image of a knee was acquired on an average size knee using AEC and an outer cell was activated, the resulting image would demonstrate:

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

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### Patient Centering

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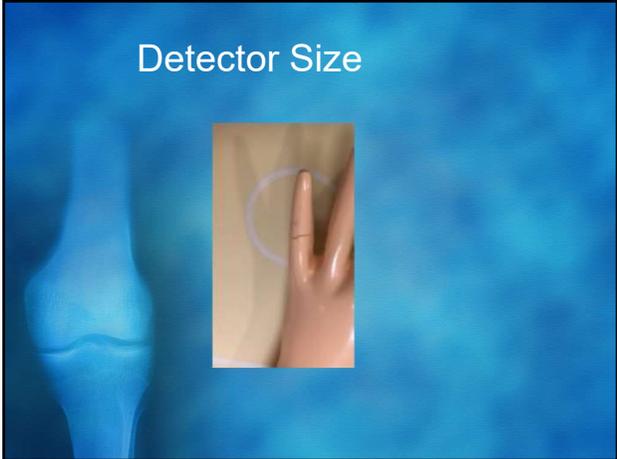
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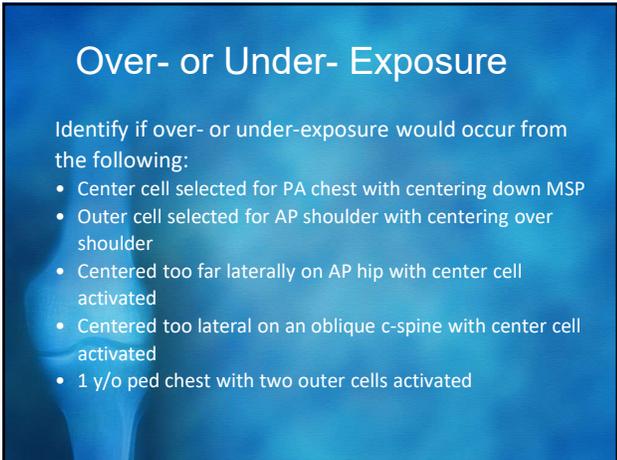
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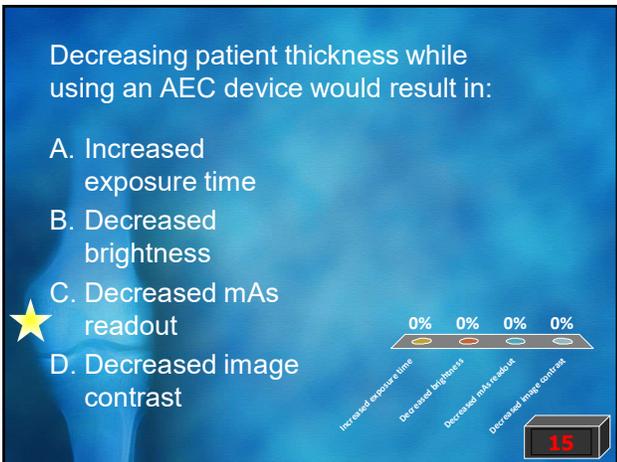
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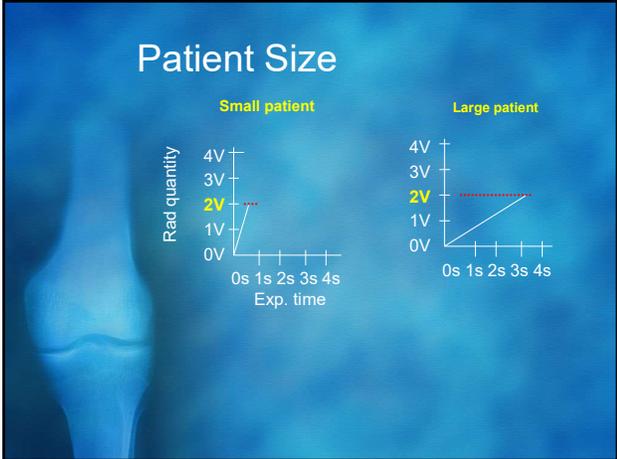
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### Compensating Issues

#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

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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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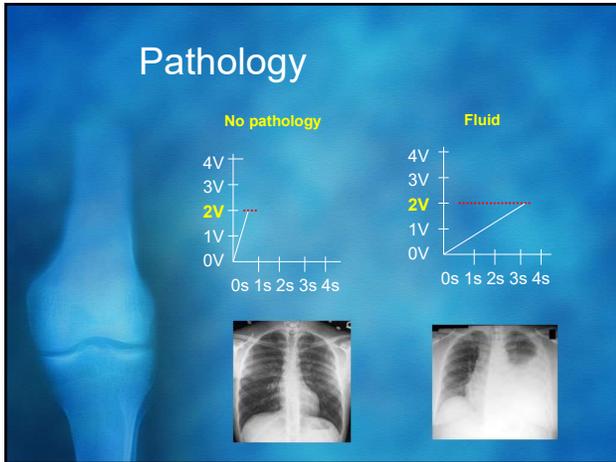
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When using AEC, positive contrast media will lead to:

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

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Increased receptor exposure    Decreased receptor exposure    No effect on overall receptor exposure

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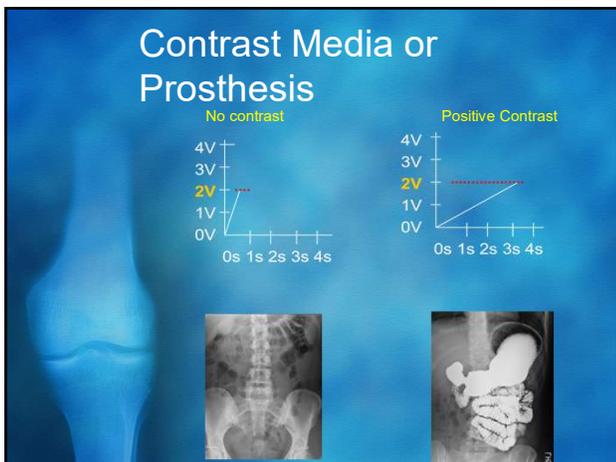
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When using AEC, insufficient collimation may lead to:

- A. Increased exposure time
- ★ B. Decreased exposure time
- C. No effect on exposure time

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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.

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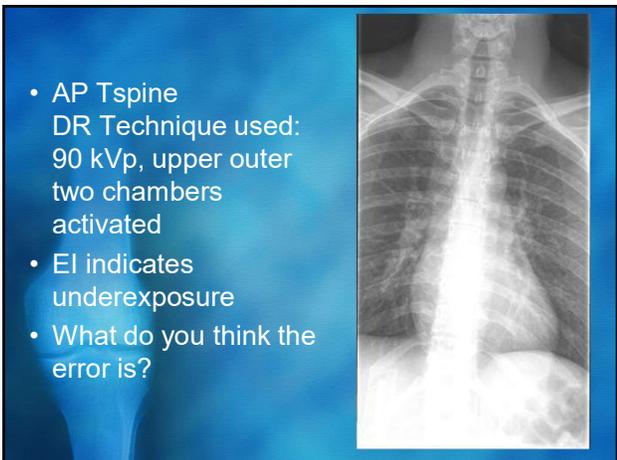
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- Obl C-spine DR Technique used: 85 kVp, center cell chamber activated
- Over- or under-exposed?
- What do you think the error is?



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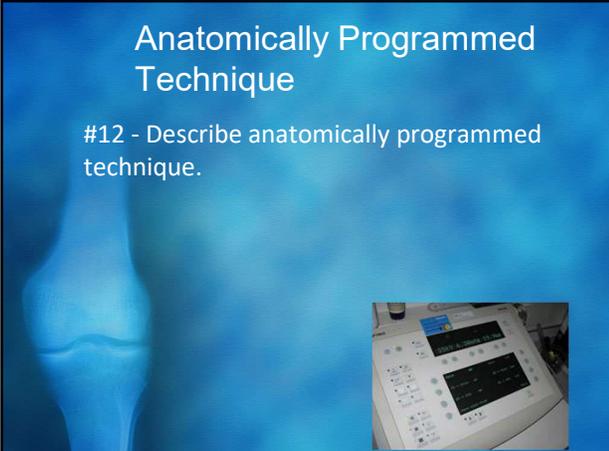
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### Anatomically Programmed Technique

#12 - Describe anatomically programmed technique.



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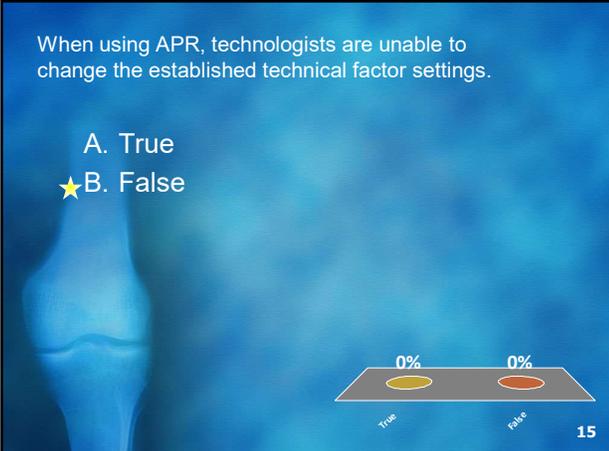
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When using APR, technologists are unable to change the established technical factor settings.

A. True  
 ★ B. False



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## Exposure technique charts

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



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



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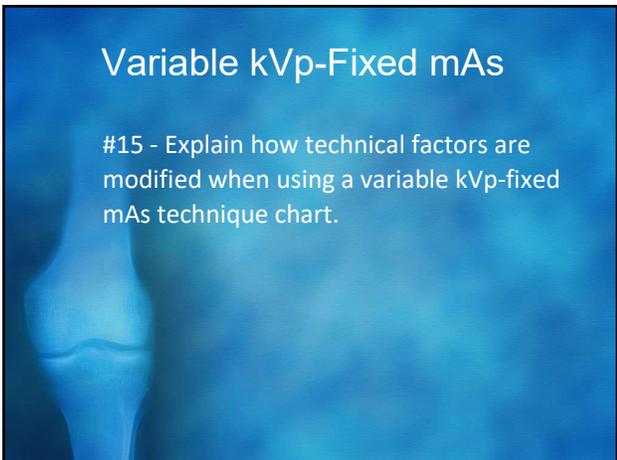
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## Variable kVp-Fixed mAs

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



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## 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

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## 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?

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## 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.

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## 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

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## 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?

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## Comparative Anatomy

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

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## 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



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## Special Considerations

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



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

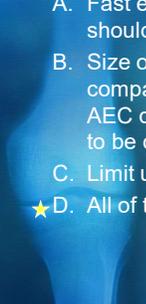
- A. Fast exposure times should be used
- B. Size of patient in comparison to active AEC detectors needs to be considered
- C. Limit use of grids
- ★ D. All of the above

0% 0% 0% 0%



Fast exposure times should...  
 Size of patient in compar...  
 Limit use of grids  
 All of the above

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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

0% 0% 0% 0%

Long exposure times should be used  
Decreased kVp  
Low mA settings  
All of the above

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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

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Table weight limits  
Decreased mAs  
Decreased kVp  
Increased scatter production...  
Both A and D  
All of the above

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## Projections and Positions

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

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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

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fiberglass casts and splints  
plaster casts  
solid plastic splints  
all of the above

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How is attenuation affected by an additive pathology?

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

0% 0% 0%

increased attenuation  
decreased attenuation  
no effect on attenuation

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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

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Decreased mAs  
Increased kVp  
Increased density setting  
No technical factor modifi...

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

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

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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

0% 0% 0% 0%

Increased kVp Decreased mAs Increased mAs Both A and C

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## Contrast media

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

- L. Positive Contrast media
- M. Negative Contrast media



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