Importance of computers in radiography & analogue vs. computed systems

By

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Computer Applications 466

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Key terms

• Importance of computers in radiography.

• Analogue system.

• Computed system.
Importance of computers in radiography

• Diagnostic imaging departments have a dual mission that requires them to maintain the highest quality and consistency of patient care while maximizing efficiency and productivity.

• Quality?
• Consistency?
• Efficiency?
• Productivity?
Importance of computers in radiography

• The dual mission can be affected in its current format by the following factors:

1. Unpredictable patient flow.
2. Technologist fatigue.
3. Unnecessary administration work.
4. Inadequate continuous education programs.
Importance of computers in radiography

• How can we overcome those problems?
- With the advent of computer technologies in the imaging department, some of these operational inefficiencies can be addressed through the combined use of computed radiography, hospital and radiology information systems, and picture archiving and communication systems (PACS).
Importance of computers in radiography

- What are the advantages of computers in the department?

1. Minimize examination time. 3.5-6.5 minutes according to a recent study.
2. Eliminate human errors. 69% of errors are attributed to humans according to the literature.
3. Minimize work-flow steps. See fig-1.
Importance of computers in radiography

Fig-1: Work-flow steps in two film-screen departments compared to filmless department.
Analogue system

- **What is analogue radiography?**
  - Analogue radiography uses film to capture, display and store radiographic images.
  - This method uses a computer to read digitized, projected X-rays of the human body or other targeted objects that are presented on an X-ray film.
  - With this system most films have an emulsion layer on both sides of the base.
Analogue system

- What is the essential difference between film used in analogue system and film used in conventional radiography?
  - The essential difference between analog and film technology is that while film technology uses dark areas that disperse the image causing scatter radiation, analog technology orders the same in rows and columns, making the images readable in quantum numbers, referred to as pixels.
Analogue system

• Advantages:

1. **Increased clarity**: The distortions are far fewer than in the older film technology, and the focus is sharper. Analog images also provide vastly improved spatial resolution, so the images enable deeper understanding of impacted diseases and organisms.
Analogue system

• **Advantages:**

2. **Flexibility:** With film imaging, the images cannot be changed once they are processed because they depend on external factors such as brightness and the way the images develop. However, with analogue technology, parameters such as contrast and brightness can be manipulated, because it uses measurable pixel values, which can be altered to enable a better understanding of the image.
Analogue system

- Advantages:
  3. **Cost savings**: An analogue radiograph device has a high initial cost, but the cost can be more than offset in the long run due to savings on input and operating costs. With analogue radiography, recurring expenses such as films, chemicals needed for processing films and labor for processing are eliminated.
Computed system

• **What is computed radiography?**
  
  - CR uses an imaging plate instead of a film-loaded cassette to obtain the image; the imaging plate is loaded into a CR reader and scanned. The imaging plate (IP) is made of photostimulable phosphor.
  
  - The images are displayed on a workstation monitor and can be digitally altered, transferred or stored. Thus computed radiography is the gateway to digital imaging.
Computed system

• **What are the similarities between CR & DR?**
  - Both CR and DR use a medium to capture x-ray energy and both produce a digital image that can be enhanced for soft copy diagnosis or further review.
  - Both CR and DR can also present an image within seconds of exposure.
  - Both CR and DR use image processing or enhancement due to the digital format of each.
Computed system

• How CR differ from DR?
  - CR generally involves the use of a cassette that houses the imaging plate, similar to traditional film-screen systems, to record the image whereas DR typically captures the image directly onto a flat panel detector without the use of a cassette.
  - DR in the form of a portable detector starts at around $150,000.00, while a basic low volume CR can start as low as $30,000.00.
Computed system

• Advantages:

1. No silver based film or chemicals are required to process film.

2. Reduced film storage costs because images can be stored digitally.

3. Computed radiography often requires fewer retakes due to under- or over-exposure which results in lower overall dose to the patient.
Computed system

• Advantages:

4. Image acquisition is much faster - image previews can be available in less than 15 seconds.

5. By adjusting image brightness and/or contrast, a wide range of thicknesses may be examined in one exposure, unlike conventional film based radiography, which may require a different exposure or multiple film speeds in one exposure to cover wide thickness range in a component.
Computed system

• **Advantages:**

6. Images can be enhanced digitally to aid in interpretation.

7. Images can be stored on disk or transmitted for off-site review.

8. Ever growing technology makes the CR more affordable than ever today. With Chemicals, dark room storage and staff to organize them, a CR system is more cost effective while being environmentally conscious.
Computed system

• Disadvantages:

1. Imaging plates are expensive and can be damaged if the system being used requires manual handling of the IPs. Theoretically, IPs may be reused thousands of times, but constant use will always result in damage to the IP and image artifacts, eventually to the point of necessary replacement.

2. Increased radiation exposure.

- 2\textsuperscript{nd} assignment (Discuss briefly how CR can cause increased radiation exposure to patients). Max 2 typed paragraphs.
Analogue your brain to a computed lifestyle 😊

• Next lecture will be on Thursday 7/10/2010.

• 2nd assignment due Thursday 14/10/2010.

• Talk to Dr. Raed to reschedule your research class.