

# Best Practice for Chest Bedside Examination

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## **Challenge:**

Achieving **consistent good image quality in chest examinations** in an ICU environment, in particular, creating comparable image quality, detail visibility, and projection technique across a time-series of images under changing patient conditions, is not easy. This is compounded by the fact that bed examination cannot be controlled by an automatic exposure control device, and patient positioning is not easy due to cables, oxygen inhalers, injection pumps, and other equipment.

## **Solution:**

Standardization is the key to achieving good, and stable image quality. All steps in the process must be identified and controlled in order to achieve such standardization.

### Steps to Standardize:

- 1) The patient position must be similar every time (unless different clinical questions are asked). This step to get consistent patient positioning must be discussed and agreed between the radiology department and the ICU.
- 2) Clear documentation of “what has been done” must be on the clinical image for review by the radiologist. This includes the date/time stamp, markers for Right/Left side, and patient position, (in addition, also “bed exam”) and, most important, exposure technique including SID/Grid used.
- 3) Mobile X-ray systems can have different inherent filtration. Similar exposure technique values on the display can, therefore, lead to a different detector dose due to a different beam quality. The use of the same mobile units is recommended in such cases.
- 4) Radiologists and radiographers must understand the importance of viewing conditions on PACS workstations. Different monitors or different viewing conditions when using a printer can have an impact on the diagnostic process.

## **Workflow used in Frankfurt University Hospital using DRX Revolution Mobile DR:**

Based on an automatic tilt-measurement mechanism integrated into the detector (Grid alignment Kit), the system is able to determine if the patient position (view) is supine, semi erect or erect, and will, based on this information, select the correct view processing and view name for this exam.

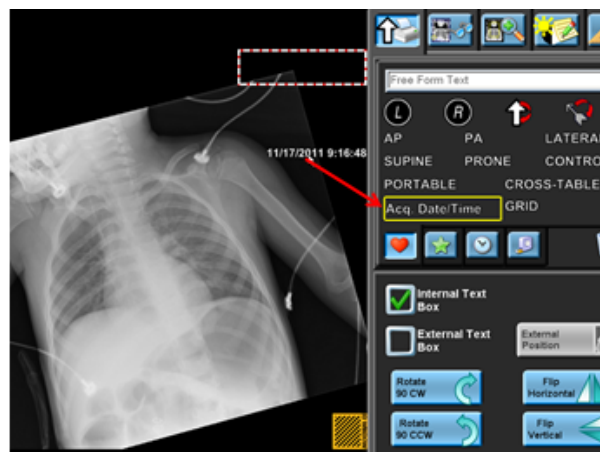
The Patient positioning procedure is relatively simple, and can be applied at almost any other hospital. All patients are positioned totally supine (regardless of bed type). The bed is driven to its lowest position (electrically driven). This brings the patient to a standard height. The image receptor (DRX-1C, wireless detector, size 35x43 cm) with a grid (a parallel line, 70 lines per cm, ratio 6:1) is placed under the patient, with the patient positioned correctly for an AP view relative to the receptor.

The tube has a standard distance to the receptor of 140 - 150 cm. This range is accepted, and also depends somewhat on the height of the radiographer. The central beam is always perpendicular to the center of the detector. Collimation to the skin line is mandatory. The standard adult exposure technique uses 125 kV. The mAs varies from 1.4 mAs to 1.6 mAs, depending on patient size. The Exposure Index (EI) indicates approximately the exposure received by the detector (an EI of 1400-1500 corresponds to roughly a 400-speed exposure). The EI is also an important indicator for the radiologist, since it can signal if an image is under or overexposed.

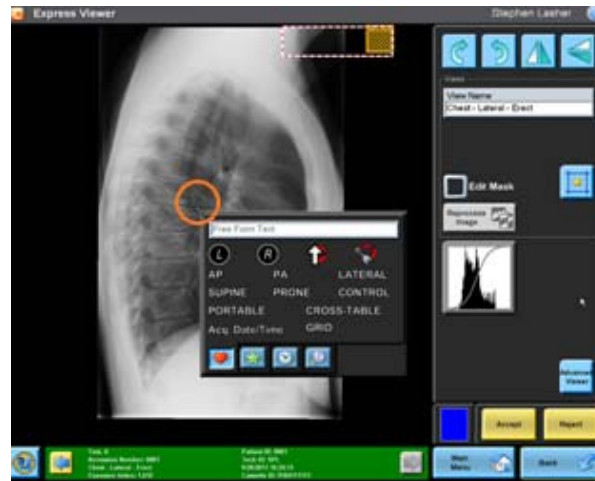
All data are transferred via a wireless or wired connection to a PACS. The DICOM header contains information on exposure data, grid type, Exposure Index, SID measured with the grid alignment tool and other information for processing the view.

Special data are entered at image level as there are:

- Information for bed examination
- Information about where this exam has been performed
- If needed overlay information with date and exam time can be added



The ability to add freely configurable text or to modify existing text to suit the needs of the users enables the creation of clear documentation of the imaging event.



An important factor for getting consistent image quality is the use of a dedicated mobile X-ray unit for a department. Performing chest images with different mobile units can lead to different beam quality and therefore to different image quality. When changing units, radiographers normally do not change or adapt their exposure techniques to the used mobile unit. Therefore it is recommended to have the same unit for dedicated ICU use. Also different other techniques can lead to different image impressions for the radiologist, and may make diagnosis more difficult.