Radiographic/fluoroscopic units, mobile

Health problem addressed

These units provide radiographic and fluoroscopic (real-time) imaging for a variety of general surgical, cardiac, and neurologic applications, including aneurysm repair, pacemaker implantation, hip replacement, needle biopsy, catheter placement, and percutaneous lithotripsy. C-arms can be equipped with digital options for use in angioplasty, neurosurgery, and trauma care.

Product description

Most systems consist of two wheeled units, one supporting the C-arm and the control console (typically mounted on top of the x-ray generator housing) and the other supporting display monitors and recording devices. The C-arm consists of a curved arm with an x-ray tube mounted on one end and an image intensifier or flat-panel digital detector on the other. The stand is constructed so that the C-arm can perform both linear and rotating motions for optimum positioning with respect to the patient.

Principles of operation

X-rays are produced by the x-ray tube when a stream of electrons, accelerated to high velocities by a high-voltage supply, collides with the tube’s target anode. A set of collimators confines the primary beam to the approximate size and shape of the diagnostic interest. X-rays emerging from the patient carry the image information to the input phosphor of an image intensifier or to a flat-panel digital detector. The energy of the x-rays detected at the input phosphor is emitted as light that causes the photocathode to release electrons. These electrons are accelerated and focused to produce an image on the output screen. All fluoroscopic systems use a camera to scan and transmit the image to a remote display monitor. Flat-panel detectors use a scintillator material to convert x-rays to visible light, which is translated into a signal suitable for digital display.

Operating steps

• The patient is prepped, which may include ingestion or injection of contrast dye and/or catheter insertion, and provided some form of radiation shielding.
• The unit is positioned around the patient, who is typically asked to remain motionless or follow specific movement directions for the duration of the procedure.
• The patient is imaged. Depending on the procedure, this may take up to 60 minutes.

Reported problems

Patients and medical staff should be shielded from radiation exposure (e.g., lead aprons, removable radiation shielding). Mobile units may be hard to maneuver; and, if unevenly balanced may tip over. Collisions of the image intensifier and the tube housing with the patient can injure the patient and damage the arm components. Because of the weight of the unit’s chassis, tube locks and support mechanisms may fail or require frequent alignment. C-arms must be protected against body fluids that can collect in the C-arm during examinations and cause tube failure.

Use and maintenance

User(s): Radiologist; radiology technician; other medical staff
Maintenance: Biomedical engineering staff and/or service contract with the manufacturer or third-party organization
Training: Initial on-site training by manufacturer (typically 1-5 days), operator’s manuals, user’s guide

Environment of use

Settings of use: Intensive and critical care units; operating and emergency rooms
Requirements: Stable line power; sufficient space for C-arm movement

Product specifications

Approx. dimensions (mm): 1,800 x 850 x 1,600
Approx. weight (kg): 200-400
Consumables: NA
Price range (USD): 80,000-375,000 (150,000 typical); price covers all types and variations
Typical product life time: 8 years
Shelf life (consumables): NA

Types and variations

• Can include an image intensifier or a flat-panel detector