Health problem addressed
These units are used for radiographic imaging of patients who cannot be moved to the radiology department and who are in areas—such as intensive and critical care units or operating and emergency rooms—that lack standard, fixed radiographic equipment. Medical applications can include general radiography and orthopedic, pediatric, skeletal, and abdominal imaging.

Product description
Mobile radiographic units consist of a wheeled cart that transports an x-ray generator (line- or battery-powered transformer), an x-ray tube and moveable tube stand, collimators, and a film-cassette or flat-panel detector storage drawer. Battery-powered units also contain a battery and charging system, and self-propelled units contain a motor drive.

Principles of operation
X-rays are produced by the x-ray tube (an evacuated tube with an anode and a cathode) when a stream of electrons, accelerated to high velocities by a high-voltage, collides with the tube’s target anode. A set of collimators confines the primary beam to the approximate size and shape that will cover only the area of diagnostic interest. Mobile CR units capture images using a photostimulable-phosphor plate. Mobile DR units are equipped with built-in or tethered flat panel detectors, which use a scintillator material to convert x-rays to visible light. An array of photodiodes on the aSi layer absorbs the light and translates it into a signal for digital display. On some units, the x-ray exposure is powered directly from the line voltage. While on others, the input line voltage charges the battery that powers the x-ray exposure.

Operating steps
• The patient is prepped and provided some form of radiation shielding.
• The unit is positioned around the patient, who is asked to remain motionless while the image is being taken.
• The operator takes the image by activating the x-ray beam using an exposure switch.
• The operator repositions the patient or unit if needed. Multiple images may be taken.

Reported problems
Critical care units are typically not equipped to shield patients and medical staff from radiation exposure. Personnel and nearby patients can be somewhat protected by protective lead aprons and movable radiation shielding. Mobile units may be large, heavy, and hard to maneuver; some units are unevenly balanced and may tip over. Because of the weight of the unit’s chassis, tube locks and support mechanisms may fail or require frequent alignment. Most units have safety features to prevent collisions during transport.

Use and maintenance
User(s): Surgeon; physician; radiographer or radiology technician; other medical staff
Maintenance: Biomedical engineering staff and/or service contract with the manufacturer or third-party organization
Training: Initial training by manufacturer, operator’s manuals, user’s guide

Environment of use
Settings of use: Intensive and critical care units; operating and emergency rooms; some units designed for private home, clinic, correctional facility, military field hospital radiography; physician office
Requirements: Stable line power or battery power

Product specifications
Approx. dimensions (mm): 1500 x 720 x 1300 for units with line power only; 1900 x 650 x 1300 for battery-powered units
Approx. weight (kg): 80-275 for units with line power only; 285-575 for battery-powered units
Consumables: Batteries (if applicable), CR cassettes (if applicable)
Price range (USD): 11,000-110,000 (20,000 typical) for units without battery capabilities; 48,000-320,000 (62,000 typical) for units with battery capabilities; 27,000-53,000 (36,000 typical) for CR-based imaging; 98,000-320,000 (162,000 typical) for direct digital imaging
Typical product life time: 8 years
Shelf life (consumables): No expiration date if kept under optimal storage conditions; 1 year for batteries

Types and variations
• Battery-powered units
• Units without battery power capabilities
• Can also be categorized by imaging type: film, computed radiography (CR), or direct digital