Monitor, Bedside, Electroencephalography

Health problem addressed
EEG monitors are used for observing and diagnosing a variety of neurologic conditions, including epilepsy, related convulsive disorders, and brain death. They can also be used to evaluate psychiatric disorders and differentiate among various psychiatric and neurologic conditions. In addition, electroencephalographic studies with EEG monitors can assist in localizing tumors or lesions on or near the surface of the brain.

Product description
EEG monitors use electrodes placed on a patient’s scalp to measure, amplify, display in graphic form, and record the weak electrical signals generated by the brain. They continuously display processed EEG signals in graphic form over a period of time so that waveform and pattern changes can be readily detected. EEG monitors use computers to analyze and generate large amounts of electroencephalographic data (as in Fourier analysis), which are processed and displayed in various formats. Many systems can produce and display certain types of EPs or event-related potentials, a specific type of EEG signal that occurs in response to a periodically applied external stimulus.

Principles of operation
Low-amplitude (microvolt range) EPs believed to be generated by large numbers of nerve cells known as pyramidal cells, which are located in the outer layer (cortex) of the brain, polarize and depolarize in response to various stimuli, creating the EEG waveform. These fluctuating electrical potentials are detected by electrodes placed on the scalp and are displayed and/or recorded on the EEG. Each EEG channel amplifies a signal from a pair of electrodes, and these amplified signals can be printed on a chart recorder and/or displayed on a monitor.

Operating steps
Scalp electrodes are usually affixed by a technician with a conductive adhesive or paste. Cup, or disk, electrodes are affixed to the scalp with a special adhesive called collodion or with a conductive paste. Regardless of the electrode-placement procedure used, patients usually lie down, remain awake, and keep their eyes closed during an EEG recording; however, sleep EEG recordings (polysomnography) are also common. The set of electrode pairs that the technician selects for recording is called a montage.

Reported problems
The most common problem is improper electrode application. Avoiding this problem requires use of proper technique during skin preparation and electrode attachment, in addition to positioning the electrodes in the correct system configurations. Poor electrode contact with the scalp can distort the results of EEG recordings. A recurring difficulty with electroencephalography is the failure of EEG monitors to filter out artifacts, which can result in an incorrect signal interpretation or inability to analyze the EEG signal.

Use and maintenance
User(s): Neurologists, neurosurgeons, or other physicians, EEG technicians, sleep lab technicians, nurses, anesthesiologists, OR technicians, Maintenance: Biomedical or clinical engineer/technician, medical staff, manufacturer/servicer Training: Initial training by manufacturer, operator’s manuals, user’s guide

Environment of use
Settings of use: ICUs, OR, sleep lab, EEG lab, neurology clinics Requirements: Uninterruptible power source, battery backup, good lead/cable connections, conductive gel

Product specifications
Approx. dimensions (mm): 350 x 50 x 390 Approx. weight (kg): 8 Consumables: Electrodes, conductive gel Price range (USD): 1,750 - 113,000 Typical product life time (years): 8-10 Shelf life (consumables): NA

Types and variations
Computer laptop, mobile console, or monitor