Health problem addressed

Perform tests on whole blood to determine concentrations of analytes (e.g., cholesterol, electrolytes, glucose, calcium), measure electrolytes, pH, partial pressure of carbon dioxide and oxygen, and concentrations of many ions (sodium, potassium, chloride, bicarbonate) and metabolites (calcium, magnesium, glucose, lactate), which helps diagnose and treat numerous diseases, including diabetes, cancer, HIV, STD, hepatitis, kidney conditions, fertility, and thyroid problems.

Product description

Analyzers can be benchtop devices or placed on a cart; others are handheld. Reagents may be stored within the analyzer or reagent strips may be inserted into a slot. External components typically include a sample slot or tray and a keypad or touchscreen, barcode scanner, display, and ports to connect to a printer and/or computer. Internal components typically include a light source and photometer or a series of electrodes to analyze the sample.

Principles of operation

Samples are applied to a strip or tube containing reagents, which produces a chemical reaction. Photometric units use a light source that transmits light onto the sample; the amount of reflected or absorbed light is measured by a photodetector. Blood gas/pH, electrolyte, and some chemistry analysis uses electrodes to measure analyte concentrations in solution. Solid-state electrodes covered by a selectively permeable membrane allow passage of only the analyte being measured. The electrode registers changes in the electrical current passing through it; this current is proportional to the concentration of analyte in solution. The analyzer then calculates the presence and concentration of analytes, ions, and/or drugs and displays the results.

Operating steps

- Samples are inserted in a slot or loaded onto a tray.
- Patient information and tests ordered are entered using a keypad, touchscreen, or barcode scanner.
- If necessary, reagents are loaded.
- After the required test(s) are run, the results can be displayed on-screen, printed out, stored in the analyzer’s internal memory, transferred to a computer, and/or interfaced into EMR.

Reported problems

Operators should be aware of the risk of exposure to potentially infectious bloodborne pathogens during testing procedures and should use universal precautions, including wearing gloves, face shields or masks, and gowns.

Use and maintenance

User(s): Physician or nurse, laboratory technician
Maintenance: Biomedical engineering staff and/or service contract with the manufacturer or third-party organization
Training: Manufacturer-provided training, manual

Environment of use

Settings of use: Hospital; clinic; physician office; clinical laboratory
Requirements: Line power, biohazard disposal

Product specifications

Approx. dimensions (mm): 150 x 240 x 350 handheld units; 450 x 400 x 180 benchtop units
Approx. weight (kg): 4.5 handheld units; 14 benchtop units
Consumables: Reagents, reaction cuvettes, sample strips
Price range (USD): 2,300-10,000 (4,000 typical) for handheld units; 4,000-60,000 (15,000 typical) for benchtop units
Typical product life time: 8 years
Shelf life (consumables): 1-2 years reagents

Types and variations

- Handheld models analyze one sample at a time
- Benchtop models may analyze multiple samples simultaneously
- Specialized purpose models may measure only one analyte (e.g., cholesterol analyzers)