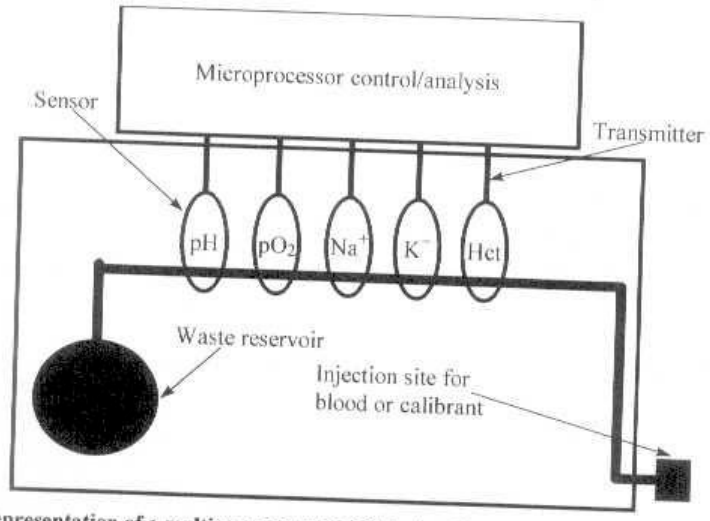

FIGURE 3. Schematic representation of a multiparameter POCT device. Note multiple sensors in-line with blood injection port to allow for simultaneous measurement of all parameters.

injected into the POCT instrument. While this does not provide true "real-time" measurements, it does allow for rapid (seconds to minutes) determination of desired variables. Most of these devices originated as single parameter instruments (Ref 6), however, most now do multiple parameters with a single sample. Two of these devices, the i-STAT Portable Clinical Analyzer (i-STAT Corp., Princeton, NJ) and the IRMA (Immediate Response Mobile Analysis) System (Diametrics, Inc., St. Paul, MN), have been evaluated extensively for their utility as portable, handheld analyzers.

To evaluate the accuracy of the i-STAT (Fig 3), it was used in an emergency department by staff without previous laboratory training (Ref 7). Samples from 574 patients were analyzed and compared with standard laboratory measurements. There was excellent correlation with urea nitrogen, glucose, and potassium. The correlations for hematocrit, sodium, and chloride were less satisfactory. A more recent study, however, found acceptable correlation in the emergency department and the stat laboratory for all analytes (Ref 8).

FIGURE 4. Handheld i-STAT Portable Clinical Analyzer with cartridge ready for insertion.

The IRMA has also been evaluated in the hospital setting (Fig 5). Zaloga et al analyzed 239 split blood samples in critical care patients in an intensive care unit (Ref 9). They found correlation coefficients between 0.96 to 0.99 for pO_2, pCO_2, and pH with a decrease in the turnaround time. Similarly, Wahr and colleagues reported similar results using the IRMA to assess blood gases and pH during cardiopulmonary bypass surgery (Ref 10).

A number of other devices exist and a recent review summarizes the features of each (Ref 11).

In Vivo and *Ex Vivo* Instruments

A more novel approach to the use of POCT involves *in vivo* and *ex vivo* testing devices. This includes familiar technology such as mixed venous oxygen saturation monitoring by use of pulmonary artery catheters. More novel and developing concepts such as continuous arterial blood gas monitoring through the placement of sensors directly into the artery are beginning to appear (Ref 12). Excessive expense and fragility of the systems (Fig 6) has limited their overall use and acceptance.

A more practical approach is *ex vivo* monitoring. This is accomplished by positioning the sensors outside of the body and allowing blood to travel from an invasive line to the sensor site before returning to the circulation. This is similar to the use of blood gas sensors placed in-line on a cardiopulmonary bypass machine. The measurements can be done continuously or on an "as needed" basis. Currently, there are no devices of this type in widespread use.