Hemodynamics

The measurement of physiologic parameters for diagnosis or the evaluation of treatment is one of the more precisely scientific areas of medicine. Of course, it is in the interpretation and application of these data wherein lies the stumbling block. Catheterization studies for cardiac diagnosis are done quite routinely in perhaps hundreds of institutions across the country. So, too, the collection of data during angiography as well as monitoring in surgery and the various types of intensive care units.

In a few institutions, the data are collected from patients in shock (usually regardless of cause) to reveal the degree of shock and to depict the response to treatment. Is the value of these clinical shock evaluation programs contingent on an aggressive medical team utilizing the latest rationale, treatment, and drugs? Why monitor shock if it is not or cannot be treated?

In order to support and properly utilize the "shock troops", of what size must an institution (a general hospital, for example) be? Does the potential justify the great expenditure in equipment and personnel? Are clinical shock evaluation programs only practical in the medical school hospital or university setting? How can these programs be adapted to the average private (four to five hundred bed general hospital, for instance) institution?

The treatment for shock is still not decisive, it has been said. Also, the latest theories, rationale, and treatments are said to be too avant-garde. Have they been proven effective or are they still highly experimental?

Will the clinical shock evaluation programs (as well as other hemodynamic data collection programs) attain wider usage and greater efficiency with improvements in bio-medical instrumentation? Is the profession as a whole awaiting instrumentation that can be used without intrusion into the human organism via arterial and venous cut-downs, etc.? Is equipment available, possibly as a byproduct of the "man-in-space" program, that can hurry this day?

The statement has been made by an electronics engineer that anything can be measured, "even the pressure of sunlight on a man's arm". In clinical evaluation trials is equipment that, by analyzing beat-by-beat changes in body surface impedance, can measure cardiac output, and yield characteristic waveforms depicting various cardiac pathology.

What part will computers play in the collection and interpretation of physiologic parameters? What medical training is necessary for the electronics man working in this area? On the other hand, what electronics training is needed by the medical personnel who are to be affiliated with these new and challenging programs? What coordinating personnel, if any, will be needed to effect the liaison among the patient, doctor, and engineer?

What new opportunities do these fantastic new instruments hold for the future of medical diagnosis or the evaluation of treatment? Where will the technologists be found who can operate these machines? What training must they have?

Several centers exist in which computers are in use in the area we define as hemodynamics. Is their main purpose to develop the proper programming (the soft-ware) to do the work of data collection and analysis as quickly and as accurately as possible? Medicine, to repeat, is not an exact science. Is this the greatest obstacle to be overcome in "computerizing" medicine?

Will it be possible in the near (maybe now) future that a doctor could, utilizing a computer station (a key board and a cathode ray tube) in his office, admit a patient, collect the history, and, with the assistance of the bio-medical instrumentation technologists and their "black boxes", do a complete medical work-up, including complete cardiac diagnostic studies, without leaving his office or breaking the patient's skin? Then, calling up this data for his interpretation and evaluation, could he "write" his orders and prescribe for this patient via his computer hook-up?

To view the extreme, will the doctor be reduced to reading a cathode ray tube and pushing buttons on a keyboard? Will the institution become the "clean room" at Control Data or IBM? Will the technologist remain as the catalyst between patient and machine?

Utilizing automated, multi-channel laboratory analyzing equipment, is it possible to measure routinely all eight (or twelve or sixteen) parameters of which the unit is capable as cheaply as running one measurement "by hand"? Could this mass of excess information, if properly utilized, not improve the quality of medical care?