

The Value of Chemical Screening Profiles on Blood*

SEYMOUR BAKERMAN, M.D.

*Professor of Pathology, Medical College of Virginia,
Health Sciences Division of Virginia Commonwealth University, Richmond*

Chemical screening profiles on blood specimens are designed to yield information that may lead to new and additional clinical diagnoses, to revision of clinically established diagnoses, to confirmed impressions of the physician and to following the course of diseases during a patient's hospitalization. Screening profiles on blood are designed to indicate diseases of the liver, kidney, heart, striated muscle and other organs; they may be helpful in the diagnosis of anemia, diabetes mellitus, gout, congestive heart failure, osteomalacia and hyperlipidemia, hyperparathyroidism and other diseases. When these screening profiles were first introduced, there was widespread skepticism among physicians as to their value and their yield and some skepticism remains as to the usefulness of a broad spectrum of laboratory tests.

The relative number of new clinical diagnoses generated from blood chemistry screening profiles has been reported in five studies of three different patient populations: hospital patients, hospital clinic patients and patients presenting to doctors' offices (Table 1). The percentage of new diagnoses ranged from 3–16.9% with the percentage tending to increase with the number and selection of tests. New clinical diagnoses were obtained in 4% and 8.3% of hospital patients, 3% of hospital clinic patients, and 5.5% and 16.9% of patients presenting to doctors' offices. The blood chemistries that were most frequently abnormal were glucose, bilirubin, alkaline phosphatase, serum glutamic oxalacetic transaminase (SGOT), lactic dehydrogenase (LDH), uric acid, cholesterol, creatinine, urea nitrogen and hemo-

globin; the diagnoses that were suggested and subsequently confirmed by the abnormal blood chemistries are given in Table 2. Diagnoses other than those listed in this table were generated but at a lower frequency.

Occasionally, elevated calcium led to a diagnosis of primary hyperparathyroidism and an elevated protein led to a diagnosis of multiple myeloma. If these blood screening profiles had uniformly included other blood tests, such as iron and iron binding capacity for anemia, triglycerides for hyperlipoproteinemia and protein bound iodine (PBI) or thyroxine (T-4) for thyroid disease, then the percentage of patients yielding new diagnoses would have increased. It must be emphasized that the initial chemical screening tests in themselves did not usually lead directly to the assigned diagnosis but more definitive tests were required.

Table 2 indicates the laboratory screening values that generated new clinical diagnoses and in most instances, required a change in treatment. Thus, the screening tests contributed to the recognition of otherwise unsuspected disease. The abnormal test results may be of value in arriving at earlier diagnoses, earlier treatment and reduction of time for subsequent investigation since the results are available sooner than under previous conditions where laboratory tests were ordered individually. If clinical features alone were used to guide the physician in ordering laboratory tests, abnormal test values would be obtained in less than 1.5% of the patients (4). Selection of the most appropriate tests for chemical screening is still not complete since different populations of patients may require different groupings of chemical screening tests.

* Presented by Dr. Bakerman at the 44th Annual McGuire Lecture Series, March 22, 1973, at the Medical College of Virginia, Richmond.

TABLE 1

NEW DIAGNOSES OBTAINED BY CHEMICAL SCREENING PROFILES ON BLOOD IN DIFFERENT PATIENT POPULATIONS

Patient Population	Percent of Patients Yielding New Diagnoses
Hospital Patients	4.0 (Belliveau <i>et al.</i> , 1970) 8.3 (Carmalt <i>et al.</i> , 1970)
Hospital Clinic Patients	3.0 (Young and Drake, 1966)
Patients Presenting to Doctors' Offices	5.5 (Percy-Robb <i>et al.</i> , 1971) 16.9 (Carmalt <i>et al.</i> , 1970)

TABLE 2

ABNORMAL BLOOD CHEMISTRIES BY CHEMICAL SCREENING PROFILES AND FREQUENTLY FOUND NEW DIAGNOSES

Abnormal Blood Chemistries	Diagnoses
Glucose	Diabetes Mellitus Inadequate Control
Bilirubin	Liver Disease Congestive Heart Failure
Alkaline Phosphatase	Liver Disease Osteomalacia
Serum Glutamic Oxalacetic Transaminase (SGOT)	Liver Disease
Lactic Dehydrogenase (LDH)	Gout
Uric Acid	
Cholesterol	Hyperlipoproteinemia Liver Disease Hyper- or Hypothyroidism
Creatinine	Renal Disease
Urea Nitrogen	
Hemoglobin	Anemia Polycythemia

Data are not included on abnormal laboratory values that tended to confirm the impressions of the physician based on his history and physical examination of the patient. These profiles also contribute to patient care by providing indicated laboratory tests rapidly and efficiently (3). These profiles also help to detect organ systems that may be functioning normally and thus, may not require a doctor's attention. If these data were available, then the value of chemical screening profiles would be even more apparent.

REFERENCES

- BELLIVEAU, R. E., FITZGERALD, J. E. AND NICKERSON, D. A. Evaluation of routine profile chemistry screening of all patients admitted to a community hospital. *Am. J. Clin. Pathol.* 53:447, 1970.
- CARMALT, M. H. B., FREEMAN, P., STEPHENS, A. J. H. AND WHITEHEAD, T. P. Value of routine blood tests in patients attending the general practitioner. *Br. Med. J.* 1:620, 1970.
- DOUGHADAY, W. H., ERICKSON, M. M. AND WHITE, W. Screening programs. *N. Engl. J. Med.* 283:1410, 1970.
- PERCY-ROBB, I. W., CRUIKSHANK, D., LAMONT, L. AND WHITBY, L. G. Biochemical screening programme in general practice. A clinical follow-up. *Br. Med. J.* 1:596, 1971.
- YOUNG, D. M. AND DRAKE, N. Unsolicited laboratory information in automation in analytical chemistry. *Technicon Symposium 1965*, New York. *Mediad* p. 427, 1966.