A TIME-COST ANALYSIS OF THE BLOOD COLLECTING AND RESULT-REPORTING SYSTEM AT BAYLOR UNIVERSITY MEDICAL CENTER, DALLAS, TEXAS

A Problem Solving Thesis

Submitted to the Faculty of

Baylor University

In Partial Fulfillment of the

Requirements for the Degree

of

Master of Hospital Administration

By

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Waco, Texas

August 1972

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DATE: August 19, 1972

ABSTRACT

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A copy of this document may be obtained from University Microfilms, University of Michigan, Ann Arbor, Michigan 48108.

The objectives of this study were to determine the time and cost involved in blood collecting at Baylor University Medical Center. This study was accomplished through the use of a questionnaire filled out by all blood collectors for a one-week period. The time and money involved were found to be significant, amounting to over 270 hours per week and accounting for 5.0 per cent of the total medical technologists' time available, 10.1 per cent of student technologists' time, and 2.2 per cent of technicians' time. The total cost of blood collecting projected for a year was $47,720, or 5.7 per cent, of the total personnel budget for the laboratory.

The literature was reviewed and several alternatives were considered for reducing time and cost for blood collecting, and increasing efficiency. Patient needs and desires were foremost at all times. Several recommendations were made including the use of an admission screening procedure, utilization of a central collecting service, establishment of a laboratory ward for prolonged procedures, and the development of duplicated master forms for reporting test results.

ACKNOWLEDGMENTS

The writer wishes to acknowledge the cooperation, assistance, and courtesies extended to him by many members of the Baylor University Medical Center Staff. In the administration, Dr. Boone Powell, Executive Director, Howard Chase, Associate Director, and Paul Calmes, Associate Director, were particularly helpful. In the laboratory, Dr. George Race, Director of Laboratories, Dr. Gwendolyn Crass, Director of Hematology, Dr. Norman Helgeson, Director of the Microbiology Department, and Dr. Richard Speer, Director of the Chemistry Department, plus many other laboratory administrators who gave of their time and support, making it a pleasure to be associated with the laboratory for the three weeks of the study. Appreciation must also be expressed to all of the doctors, nurses, and ancillary personnel throughout the center who were interviewed and were most patient and informative.

Lastly, this study could not have been successful without the superb cooperation of the numerous laboratory technologists, technicians, aides, and posters, who took the time and trouble to fill out the numerous questionnaires, and, to whom, I am deeply grateful.

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CHAPTER I

INTRODUCTION

General Information Concerning the Problem

In the last few years, all clinical laboratories have experienced a large growth in the number of procedures requested, performed, and reported. This growth has been due to several factors: increasing number of patients, additional number of tests available, expanding technology, and growing sophistication and specialization of physicians in requesting more complete and complex procedures. Also, patients have become more knowledgeable regarding the value of laboratory procedures and expect at least some kind of test to be performed at almost every visit to a physician.

Laboratories have risen to meet this demand by expanding in size, personnel, and technology. The laboratory personnel are better trained, many of them recipients of baccalaureate degrees, and are able to individually perform a wide variety of laboratory procedures. Recently, many tests have become automated; for example, the autoanalyzer which automatically performs up to twelve separate chemical tests

on one small sample of the patient's serum. Different types of "counters" are also used, which count red cells, white cells, and compute hemaglobins, hematocrits, and cell indices. These machines are automatically calibrated to perform tests with more accuracy and speed than any laboratory technician. The results are either read off digital counters or reported on pen-graph paper which can be placed directly in the patient's chart. Some of these automated blood analyzers have been coupled to computers so that the results can be stored or reported directly to the ward or physician through various types of reporting mechanisms. The ordering of laboratory procedures in a few hospitals has also been automated through the use of cathode ray tubes and punch cards.[1]

The increased technology, sophistication, and automation of clinical laboratories have partially relieved the ever-increasing burden on laboratory technicians as well as physicians and nurses. However, there is one segment in the chain of ordering, collecting, testing, and reporting the results of blood analysis that has not significantly changed, and that is blood collecting. Since

the time when blood was first drawn from a patient for analysis until the present, little change has occurred in the collecting procedure. It still requires a trained person with a needle, syringe, tourniquet, and alcohol sponge to puncture the patient's vein, collect the blood sample, and transport it to the laboratory. There have been some improvements in the instruments used, but the basic procedure is unchanged. This basic procedure is the one area that has not advanced or responded to automation to increase efficiency and to cut costs.

In the past, low-salaried interns and residents, and occasionally nurses, collected blood samples as an additional duty, and transported these to the laboratory. With increasing salaries and competition for these personnel, responsibility for blood collecting has been transferred to the laboratory. Little interest had been paid to blood collecting until the soaring costs of laboratory tests, due primarily to increasing personnel wages, caused some laboratory administrators to look into this time-consuming procedure.

Also, the ordering and reporting of laboratory results has not advanced significantly in most institutions.

The physician usually writes the order for a test, the ward nurse transcribes this order to an appropriate laboratory slip, and this slip is transported to the laboratory either by hand or pneumatic tube. Then, someone from the laboratory must proceed to the appropriate hospital ward, collect the blood sample, and return it to the laboratory. After the test is performed, the results are usually recorded on the laboratory slip and returned to the ward for placement in the patient's chart or transcription to a master flow sheet in the chart. As noted earlier, a few hospitals have automated the ordering and reporting, but the great majority has not.

There are numerous problems which arise in the traditional system. Laboratory slips are occasionally mismarked, have inadequate patient or ward identification, or are lost in transit to the laboratory or back to the ward. It is often difficult to obtain adequately trained personnel to collect blood samples, especially at the peak early morning period. Specimens can be mislabeled, mislaid, broken in transit, or set aside too long to be of any value. Obviously, the more times that laboratory results are hand-transcribed from machine to laboratory slip to

master flowsheet, the greater possibility exists for human error. Lastly, there is excessive manpower-time involved which costs an ever-increasing amount of money.

The Hospital Setting and History of the Hospital

Baylor University Medical Center (BUMC) in Dallas, Texas, is a nonprofit, voluntary, church-affiliated, short-term, general hospital which was founded in 1903. This center has enjoyed a steady growth from a bed capacity in 1914 of 250 beds to a present bed capacity of 950 beds. It currently ranks thirtieth in number of beds among voluntary, general hospitals in the United States, ninth in number of admissions, and fifth in number of births.[2]

Presently, the center occupies an area of about five city blocks in the northeastern section of Dallas, and comprises four interlinked hospitals: Veal, Truett, Women and Children's, and Jonsson, plus a building known as the "Y" building. On the same grounds there is a medical library, and the Baylor University Dental School. A new 300-bed hospital, the Collins, is being constructed across one street; and the BUMC-owned Wadley Research Institute and Blood Bank lies across another street. Because of its

growth, diversity, and expanded services, the interconnected hospitals and related activities assumed the title "medical center" in 1959. A sketch of the medical center is included as Appendix A.

The older, five-floor Veal Hospital has been converted into administrative offices, outpatient clinics, and specialty clinics. The top three floors of the five-floor "Y" building are occupied by the clinical and anatomic laboratories and offices. Inpatient areas are in the Truett, Women and Children's, and Jonsson hospitals which all have seven floors. Due to the rapid expansion, changing configuration of the center, and the changes in bed capacity, it is not possible to accurately delineate beds by ward, or "nursing unit," as they are called at BUMC. The Truett hospital has about 450 beds while the Women and Children's and Jonsson hospitals each have about 250 beds. The Jonsson Hospital just opened in 1970 and is still in the process of staffing and opening nursing units. Administrative areas are primarily on the ground floors of all the hospitals, but administrative and ancillary services occupy a few other areas scattered throughout the hospitals.

The Laboratory Setting

The laboratory has grown with, and surpassed, the center's growth because of increasing demands. In 1962, the laboratory underwent a radical expansion with the formation of separate departments and a central collecting service. This expansion has led to more specialization of services in the laboratory and some polarization. The fifth floor of the "Y" building is devoted to anatomic pathology and administrative sections while the third and fourth floors contain the clinical laboratories. These clinical laboratories are able to perform a whole host of tests making this one of the most complete and modern hospital laboratories in the United States. The unwritten policy of the laboratory is, "to have the capability to perform expeditiously and accurately any and all tests requested without reliance on any outside laboratories."[3]

Since the third and fourth floors of the "Y" building contain the clinical laboratories which collect and analyze blood samples, they are primarily concerned with this study. On the third floor there is the night laboratory, central collecting service, hematology, routine chemistry, special chemistry, thyroid analysis, and urinalysis sections. The fourth floor has the bacteriology, Rh,

serology, and virology sections. Also there is a small laboratory annex on the fifth floor of the Women and Children's Hospital which is capable of only hematology tests, urinalyses, and blood collecting for that laboratory and the main laboratory.

Besides servicing the three active inpatient hospitals which provide the vast majority of the work, the laboratory also performs tests on outpatients referred from the center clinics, the emergency room, private physicians in the area, and the center personnel office for pre-employment examinations. The volume of procedures performed is reported in Table 1. This table indicates that the number of procedures performed has more than doubled in the last eleven years and will almost certainly top one million procedures this year. This extraordinary growth is due partially to the increase in total beds served, but primarily due to increasing physician and patient demands as pointed out earlier.

The laboratory employs about 180 full- and part-time personnel including physicians, chemists, bacteriologists, pathology residents, clerical personnel, laboratory technologists, student technologists, technicians, aides,

TABLE 1

TOTAL LABORATORY PROCEDURES, FISCAL YEARS
JULY 1, 1959-JUNE 30, 1970

Years	Total
1959-60	473,443
1960-61	515,093
1961-62*	-
1962-63	589,689
1963-64	629,549
1964-65	655,350
1965-66	690,497
1966-67**	656,809
1967-68	712,714
1968-69	931,328
1969-70	991,011

*Statistics not available.

**SMA 12-30 autoanalyzer installed on August 15, 1966.

Source: Baylor University Medical Center Laboratory, General Statistical Reports.

posters, and various other skilled and nonskilled people. The total salary expense for the laboratory this fiscal year will be about $1,007,000.[4] Because of the increasing work load, the laboratory has been expanding, and is presently relocating sections on the third and fourth floors of the "Y" building.

Conditions Which Prompted the Study

It has been noted by the laboratory administration that with the increase in the number of procedure requests, there has been a corresponding, or higher, increase in the amount of time devoted to collecting and reporting (posting) results. Often these somewhat menial and repetitive tasks are performed by highly trained and high-salaried personnel who could be performing more skilled tasks. Due to the increasing size of the center and distances involved in traveling from the laboratory to the unit and patient, the lost time of these highly trained individuals appears to be increasing. There is also a question of whether several trips to the same nursing unit are being made in a close time frame when possibly one trip might suffice. There is a question of whether patients are being subjected to

unnecessary "sticks" for blood samples, when one "stick" may have been sufficient if the request slips had been better consolidated. The above questions and their possible solution or amelioration prompted this study.

Statement of the Problem

The problem involves the conducting of a time-cost analysis of blood collecting and result-reporting at Baylor University Medical Center, Dallas, Texas, to include alternatives and recommendations for an efficient and economical method of collecting blood samples and reporting the results of laboratory testing.

Limitations to Solving the Problem

It is clear that the most efficient and economical solution to the problem may not be attainable or acceptable to patients, nursing unit personnel, physicians, laboratory personnel, and administration. No patient wants to have blood drawn more than once during any given day. The drawing of blood, if not done at appropriate times, can be disruptive to unit routines; and, if not done shortly after request, can be aggravating to nursing personnel and possibly injurious to the continuing care of the patient.

Physicians want results of requested tests as soon as possible in order to prescribe therapy. Many laboratory personnel desire to maintain some patient contact through blood collecting to lend meaning to the tests they are performing. Administration assumes a "patient first" policy and does not want any procedures, such as blood collecting, done unnecessarily or to the discomfort of the patient. Everyone involved wants to hold costs down. To solve the problem efficiently and economically, and yet meet all the limitations of these various groups is difficult, if not impossible.

Obstacles to Optimum Research

Because of the large number of blood collections, it is not possible for one person with limited time to analyze all aspects of this problem. Also, no one person could accompany every request and report through the entire system. Therefore, a questionnaire was used, and is subsequently discussed under Research Methodology.

Definitions of Laboratory Personnel Titles

The following definitions represent the meanings of the terms used at the Baylor University Medical Center

laboratory and practically all other laboratories in the United States:

The Medical Technologist (M.T. or technologist) has been defined as:

> The technologist is an individual who has met the requirements of a society sponsored by the American Society of Clinical Pathology, the American Society of Medical Technologists, or eligible to be certified. To become eligible requires a Bachelor of Arts degree in medical technology or another degree with three years' experience. The medical technology degree comprises three years of college plus one year of training in an accepted school of medical technology leading to a Bachelor of Science degree in medical technology.[5]

The Baylor laboratory operates an accredited school of medical technology.

Laboratory Technician.--"The technician is able to perform the technical tasks in clinical laboratories, but has less training than a medical technologist."[6] There exists some confusion between the terms "technologist" and "technician," and frequently the term "technologist" is used to refer to nearly anyone performing the technical tasks in the laboratory.

Laboratory Aide ("aide").--This term is often used interchangeable with technician and has essentially the same definition. Usually, it refers to the least-trained

individual working in a clinical laboratory. For the purposes of this study, the terms "technician" and "aide" are used synonymously.

Poster.--The poster "posts," transcribes, or places results of laboratory tests in patients' charts. Frequently, as at BUMC, the poster has additional duties of filing, collecting blood, and receiving, consolidating, and delivering laboratory request slips throughout the laboratory.

Review of the Literature

There is much written regarding the technique and equipment required for collecting blood from patients, but very little has been written regarding present-day ordering, collecting, and reporting. Recently, several articles have appeared concerning the use of computers, but this is outside the realm of this study because there presently is no computer or automation which can physically collect blood. As far as could be found in the current literature, there has not been a time or cost analysis of blood collecting and result reporting.

In a recent journal article it was pointed out that:

> The cost involved in the collection of blood samples on a piecemeal basis, all over an institution covering several acres of ground, is very substantial. This cost is fast approaching the real cost of analysis.[7]

It has also been noted that the expanding size of hospitals and increasing complexity of tests have magnified the problem of collecting blood, especially in those tests requiring timed and/or repeated venipunctures, such as a glucose tolerance test.[8] Therefore, laboratory administrators have recognized the increasing importance of the time and money involved in collecting blood samples, but no in-depth study has been performed. One author, Dr. Gambino, foresees a day in which the patient will order his own laboratory tests, self-collect the blood, have it automatically transported to the laboratory, analyzed, reported, and acted upon.[9]

A few authors have suggested other more immediately implementable proposals to increase the efficiency of blood collecting and reporting the results. In many hospitals, blood samples are collected in the admitting office, or the ambulatory patients are brought directly to the laboratory after admission--thus eliminating the need for laboratory personnel to go to the wards. Also, patients having

protracted examinations requiring collection of multiple specimens can frequently be brought to a special collecting unit in the laboratory similar to a small ward, and wait there until the tests are completed.[10] One large center has developed a team composed of nurses and laboratory technicians to collect all blood samples and start intravenous fluids. A team concept has the advantages of specialized knowledge in collecting, familiarity with procedures and patients, and ability to get the collecting done at the proper time lest they interfere with ward routines.[11]

It has also been suggested that blood samples be collected by ward personnel and transported to the laboratory via the pneumatic tube system.[12] But, other articles have pointed out that acceleration, rapid turns, and deceleration of the pneumatic tube carrier causes rupture of the red blood cells leading to erroneous laboratory results.[13]

At a large Canadian hospital, a study was undertaken wherein all patients over the age of three years, except for maternity patients, had blood drawn in the admissions office. This blood was run through the SMA-4 Technicon hematology analyzer and the SMA-12 chemical survey analyzer.

After monitoring this procedure for several months, it was noted that the number of all hematology and blood chemistry test requests decreased except for repeat fasting blood sugars and glucose tolerance tests. Therefore, these unsolicited, comprehensive hematologic and chemistry admission profiles reduced both the total number of procedures and the total work load for the laboratory for those tests included in the screen. It is pointed out that: ". . . many patients remember their hospital stay in terms of the number of times they have been assaulted with a big needle," and "The ability to obtain a large portion of the samples in an admitting laboratory saves discomfort and apprehension for patients, and time and dollars in the laboratory operation."[14]

In considering the problem of reporting the results of blood tests back to the ward, it is found that several hospitals have gone to the use of a continuously up-dated master form.[15] Blood tests are ordered in the usual method utilizing several different request slips to direct the blood to various sections of the laboratory and the results are recorded on these slips. The results are then transcribed to a master flow sheet in the laboratory which is

photocopied, with the original being retained in the laboratory while the copy is sent to the ward for insertion in the patient's chart. When further tests are performed on the same patient, the results are transcribed to the original master flow sheet, which is again photocopied, and the new photocopy is sent to the ward via pneumatic tube to be placed in the patient's chart by the ward clerk after discarding any previous photocopies. This system eliminates the necessity of sending a poster to the ward to transcribe results to a flow sheet in the chart. Until automation takes over these tedious chores, this system seems to be the most efficient, economical, and accurate. In summary, laboratory data should ideally be reported so that:

1. The number of transcriptions is reduced to a minimum.
2. The accuracy of transcription is insured.
3. The chronology of data is insured.
4. The clinical pathology information is promptly incorporated into the patient's medical record.[16]

Problem-solving Methodology

In order to analyze the size of the problem, it appeared necessary to record the number of trips made daily

to the w[illegible] by laboratory personnel. This analysis would have t[illegible]lude the job category of the person collecting the [illegible], where he went, what he collected, and how much ti[illegible]ook. Because of the large number of trips outside the laboratory, it was not possible for one person to record all these details, so a questionnaire was used. This is enclosed as Appendix B. The questionnaire was designed to be as simple as possible, and yet record all the necessary information. Problems, of course, arose in enlisting the cooperation of all the laboratory personnel and having them remember to fill out a questionnaire for each trip. This was somewhat alleviated by the support of the laboratory section supervisors and constant support and reminders by this investigator. It was decided to conduct the survey for seven consecutive days, as to conduct a shorter survey would not be valid due to varying work loads on different days of the week. To conduct a longer survey would consume too much time and cost to the laboratory. At the end of each twenty-four-hour period the questionnaires were collected, consolidated, and evaluated.

Besides the questionnaire, the problem was studied in the routine manner of personal observations, numerous

personal interviews, review of past performances, and evaluation of similar problems in other institutions and the literature. An attempt was made to confine this study to the problem of blood collecting but it is very difficult not to include requesting and reporting of blood tests as they are all integral parts.

Footnotes

[1]"A Total Communications/Information System Designed Exclusively for Hospitals" (Dallas, Tex.: Reach Corp., 1971); Miscellaneous Information Brochures, Addressograph Multigraph Corporation, 1971; Wilma L. White, et al., "Low Cost Laboratory Reporting System Uses Business Computers," Hospitals, XLIII (July, 1969), 83-86; B. J. Poletti, et al., "Computer Control in the Clinical Laboratory," American Journal of Clinical Pathology, LIII (May, 1970), 731-38.

[2]"Guide Issue," Hospitals, XXVI (August, 1970).

[3]Personal communication with George J. Race, M.D., Ph.D., Director of Laboratories, BUMC, Dallas, Texas, March 17, 1971.

[4]Ibid.

[5]Albert G. Smith, "Relationship of the Pathologist, the Chemist, the Microbiologist and the Technologist and Their Organizations," in The Clinical Laboratory, ed. by George J. Race, Director of Laboratories, Baylor University Medical Center, Dallas, Texas, p. 9. (Unpublished book.)

[6]Ibid., p. 10.

[7]P. W. Davey, "Experience with a Hospital Laboratory Admission Screen," Canadian Medical Association Journal, CIII (July, 1970), 140-46.

[8]S. D. Kobernick, "Specimen Unit Saves Laboratory Expense," Modern Hospital, CII (April, 1964), 124-26.

[9]Raymond S. Cambino, "Met and Unmet Needs of the Automated Clinical Laboratory," Analytical Chemistry, XLIII (January, 1971), 24A-25A.

[10]Kobernick, pp. 124-26; Davey, p. 141; Arthur E. Rappoport, Manual for Laboratory Planning and Design (Chicago: College of American Pathologists, 1960), p. 42.

[11]A. C. Whittaker, "Specimen Collection and Service Team," Hospital Management, CIII (June, 1967), 75.

[12]Rappoport, p. 76.

[13]Eugene K. McClellan, et al., "Effect of Pneumatic Tube Transport System on the Validity of Determinations in Blood Chemistry," American Journal of Clinical Pathology, XLII (August, 1964), 152-55; Robert M. Nakamura, et al., "Use of Hospital Pneumatic Tube System for Transport of Blood Chemistry Specimens," Hospital Management, XCIX (February, 1965), 122+.

[14]Davey, pp. 142, 144.

[15]"Master Form Eliminates Small Slips for Laboratory Reports," Hospitals, XL (June, 1966), 57; John B. Henry, et al., "This Report System Reduces Laboratory Errors," Modern Hospital, CIV (February, 1965), 118+.

[16]Henry, et al., p. 118+.

CHAPTER II

DISCUSSION

The Present System

In order to fully evaluate the results of the questionnaires and any recommendations, the present system at BUMC of ordering laboratory tests, collecting blood, and reporting results must be clarified. This system will be broken down into descriptions of the day laboratory, the night laboratory, Woman and Children's laboratory, and the central collecting service.

The day laboratory

This includes the whole clinical laboratory on the third and fourth floors of the "Y" building. It is open and functioning six days a week, Monday through Saturday, from 8:00 A.M. to 5:00 P.M., and performs the vast majority of the tests. On Saturdays the laboratory functions at about half normal capacity.

When a physician decides that he wants a particular blood test on a patient, he writes the order on an order sheet. This order is transcribed by one of the nursing unit

personnel to an appropriate laboratory slip. There are ten different slips with an original and one or two carbon copies as shown in Appendix C. These slips are usually sent to the central collecting service (CCS) by pneumatic tube carrier, although they are sometimes hand carried. If the slip requests a morning blood sample, it is held in the central collecting service until the next day. If it is an immediate ("stat") request, the appropriate section of the laboratory is notified by an intercom system. If it is a routine request, the slip is usually placed in the section's slot in the central collecting service for pickup when someone from that section is available. During the regular working day, whoever is free first in the various sections of the laboratory, will take the stat or routine slip(s) and a blood-collecting tray which includes all the necessary equipment, and go to the unit to collect the blood. The person collecting may be a technologist, technician, poster, or student technologist. There is no set pattern as to who collects the samples. After the blood is collected, a division notice, if included with the slip, is left at the nurses' station so the unit nurse will know that the proper test is being performed. The blood sample

is hand-carried back to the laboratory and the requested test performed. Upon completion, the results are written on the original slip and it is forwarded to the central collecting service where the business office copy is removed and sent to a secretary on the fifth floor of the laboratory for corroboration and forwarding to the central business office for billing to the patient. If it is a stat request, the results are telephoned to the appropriate division before the slip is sent to the central collecting service.

Each weekday morning, a semiretired technician reports to the central collecting service at about 6:15 A.M. and consolidates all the slips by hospital and nursing unit for morning blood collection. Shortly before 7:00 A.M., a team arrives to collect this large number of samples. The composition of the team varies, but recently has been composed of one medical technologist, one dental student, and twelve student technologists. Each member of the team receives eight to twelve laboratory request slips, depending on his speed at blood collecting, and spends about one hour collecting. Between 7:30 and 8:00 A.M., three more medical technologists arrive to collect any samples not collected by the earlier team. And finally,

at 8:30 A.M., one of the posters from central collecting service collects any leftover morning requests. There is an average of 140 patients throughout the center requiring blood collection each weekday, about half this on Saturday, and only a few on Sunday. After returning to the laboratory, the collectors place the blood samples in the preparation room.

Night laboratory

The night laboratory, located on the third floor next to central collecting, is a complete laboratory unto itself, and has the capability to perform a large number of tests which might be considered emergencies. It is open from 5:00 P.M. to 7:00 A.M., seven days a week and all day on Sunday. This is a busy laboratory in the early evening and is staffed with eight technologists and technicians, and a clerk until 11:00 P.M. From 11:00 P.M. to 7:00 A.M., the night laboratory is staffed with two people to perform emergency requests, and at 7:00 A.M. they assist the morning collecting team if they are free of work.

Women and Children's Hospital laboratory

This is a small laboratory which operates from

8:00 A.M. to 5:00 P.M., Monday through Saturday with five technologists and technicians, and one part-time poster. When the Women and Children's Hospital first opened, this laboratory was included in the original plans for some unknown reason. Thought has been given to closing this ancillary laboratory, and combining the equipment and personnel with the main laboratory but no action has been taken. One advantage of this laboratory is its quick response to requests in the Women and Children's Hospital which the division nurses like. Theoretically, this laboratory should collect only hematology blood samples for the Women and Children's Hospital, but they frequently are asked to collect blood for other tests and this blood is sent by pneumatic tube carrier to the main laboratory. Also, personnel from the main laboratory frequently collect hematology specimens in the Women and Children's Hospital along with other samples and send the hematology work back to the Women and Children's Hospital laboratory in the pneumatic tube. As pointed out in the Review of the Literature, the trauma to blood cells generated in the tube system can alter test results.

It does happen occasionally that duplicate request slips are sent to the main laboratory and the Women and Children's laboratory. This may cause an extra collection trip to the ward, but usually the patient is spared being punctured twice because the collectors are aware of this possibility and usually check with the nurse or patient before collecting blood.

The personnel in the Women and Children's laboratory not only go to the nursing units to collect blood but make several trips per day to post their results in patients' charts. The part-time poster comes late in the afternoon and posts whatever results are left by the regular staff. After posting, the original slips are filed in the Women and Children's laboratory, and the business office carbons are sent to the main laboratory administration section.

The central collecting service

As noted earlier, the central collecting service was established in 1961 and is now centrally located in a small, glass-enclosed room on the third floor of the "Y" building. This service is staffed by five women who are primarily posters rather than blood collectors. Again, as noted earlier, all incoming laboratory slips arrive at the

central collecting service for distribution, and all completed laboratory slips are sent there, except those that go to the Women and Children's laboratory. Several times a day, the posters go out to the various wards throughout the hospital with a handful of slips and post the results on flow sheets in the charts. Appendix D illustrates the flow sheets. After returning to central collecting, the posters file the original slips and retain them for three months when they are destroyed. Some of the results are sent to the Women and Children's laboratory for posting. To avoid errors in spelling and terminology, the bacteriology service has its own poster who does all the posting for that service.

Outpatient blood collections are quite small, averaging about twenty patients per day. The term "central collecting" applies primarily to these, while the bulk of the time in the central collecting service is spent receiving laboratory request slips, notifying the appropriate sections of the laboratory for stat requests, and posting and filing results.

Results of the Questionnaire

The questionnaire was designed to find out: the number of trips made daily outside the laboratory to collect blood, the time involved for different categories of personnel, the time lost on "wasted trips," the time involved in posting, and what the total cost is to the laboratory. "Wasted trips" occur when someone from the laboratory goes to a ward and is unable to collect blood for a variety of reasons, such as: the patient has left the ward for other studies, is in the bathtub, eating, being examined, or any number of other causes. Several of the laboratory personnel complain frequently about the number of wasted trips, but this figure and the time consumed has never been documented.

Questionnaires were not used for the large, early-morning collections, as described earlier, for a number of reasons. Primarily, the morning collecting team performs one long trip outside the laboratory to collect several samples. The make-up of the team, the total time spent, and the average number of patients getting morning blood work are all known. Lastly, it would be very time-consuming to fill out the questionnaire for this large number of patients.

The hospital census for the week of the study is representative of an average weekly census and is shown in Table 2. During the one-week study, 1,044 questionnaires were completed by the laboratory personnel, representing at least 1,044 trips made outside of the laboratory

TABLE 2

CENSUS FIGURES FOR BAYLOR UNIVERSITY MEDICAL CENTER FOR THE PERIOD OF MARCH 17-23, 1971

March	Admissions	Discharges	Total Census
17, Wed.	134	98	825
18, Thurs.	112	96	841
19, Fri.	93	127	807
20, Sat.	53	133	727
21, Sun.	105	84	748
22, Mon.	144	82	810
23, Tues.	127	111	826

Source: Medical Records Office, Baylor University Medical Center

area to collect blood or post results. Unquestionably, there were some trips made without filling out a

questionnaire, but the number is felt to be small because of the excellent cooperation of almost everyone concerned, and the enthusiasm and interest generated to see what the results of the study would demonstrate.

Table 3 shows the total number of trips made and the time involved for collecting blood and posting during the one week of the study. As can be seen in the table, the total man-hours spent collecting blood and posting results is considerable, and is almost the equivalent of eight employees working a forty-hour week. The average trip outside the laboratory took eighteen minutes, but this figure is somewhat skewed when looking only at blood collecting. In reviewing the questionnaires, it is seen that posters are frequently out of the laboratory for up to an hour, while trips for individual blood collections often take only five to ten minutes. Also, the amount of time spent posting seems small for the number of personnel involved. This phenomenon was personally observed at Baylor, and it was noted that the posters in central collecting were not as religious in filling out questionnaires as the people in the various laboratory sections. This is possibly due to their different status in the laboratory, because they

TABLE 3

TOTAL NUMBER OF TRIPS AND TIME SPENT COLLECTING BLOOD AND POSTING,

MARCH 17-23, 1971

	Total Number of Trips	Blood Collecting Time (Hours)	Posting* (Hours)	Total Time (Hours)
March				
17, Wed.	203	45:12	11:04	56:16
18, Thurs.	208	47:32	16:52	64:24
19, Fri.	175	37:48	13:21	51:09
20, Sat.	103	24:18	8:54	33:12
21, Sun.	43	15:33	-	15:33
22, Mon.	153	32:36	12:40	45:16
23, Tues.	159	42:31	7:21	49:52
Totals	1,044	245:30	70:12	315:42

*This includes posting by the central collecting service, bacteriology, and the Women and Children's laboratory.

are not competing with any other section of the laboratory to see who does the most work. Since the amount of posting time is suspect, these figures will not be further considered in this study.

Table 4 shows the number of personnel in each category and how much time they spent collecting blood, or lost time due to the patient not being available. It is interesting to note that fully trained technologists seem to lose less time proportionately than student technologists. Time lost due to inability to "hit" a vein for blood collecting is not included in these tables. In the questionnaires it was noted several times that a student would not collect the blood sample because the student could not "find a vein." A trained technologist usually went back with the student and drew the blood. This should not be considered "lost time," because it is part of the training program, even though patients may not appreciate it.

Table 5 illustrates the total cost of collecting blood for seven consecutive days exclusive of the Monday through Saturday morning team collections. Table 6 shows the percentage of total work time spent collecting blood.

TABLE 4

TIME FOR LABORATORY PERSONNEL COLLECTING BLOOD,

MARCH 17-23, 1971

Personnel Category	Number of Personnel	Time Collecting (Hours)	Time Lost (Hours)	Total Time (Hours)	Time Lost (Per cent of Total Time)
Medical Technologists	62	120:27	3:33	124:00	2.9
Student Technologists	21	81:36	3:07	84:43	3.7
Technicians	50	43:20	1:18	44:38	2.9
Totals	133	245:23	7:58	253:21	3.1

TABLE 5

TIME-COST RELATIONSHIP FOR BLOOD COLLECTING, EXCLUSIVE OF MORNING COLLECTING, MARCH 17-23, 1971

Personnel Category	Number of Personnel	Average Wage/Hour*	Time Collecting Blood (Hours)***	Total Cost
Medical Technologists	62	$ 4.16	124:00	$ 515.84
Student Technologists	21	0.47**	84:43	39.82
Technicians	50	2.54	44:38	113.37
Totals	133		253:21	$ 669.03

*Computer print-out from payroll office for February, 1971.

**Computed from a forty-hour week at a $75/month stipend.

***Includes lost time.

TABLE 6

PER CENT OF TOTAL TIME BLOOD COLLECTING,

MARCH 17-23, 1971

Personnel Category	Number of Personnel	Total Hours Working Time/ Week	Total Time Collecting Blood (Hours)/Week	Per cent of Total Working Time Spent Collecting Blood
Medical Technologists	62	2480:00	124:00	5.0
Student Technologists	21	840:00	84:43	10.1
Technicians	50	2000:00	44:38	2.2
Totals	133	5320:00	253:21	4.8

The students spend the largest percentage of their time, 10.1 per cent, as this is part of their training; while, the higher-salaried medical technologists spend over twice as much time collecting blood, 5.0 per cent, as the technicians, 2.2 per cent. This statistic may be partly due to training students, but is also probably due to the increased skills and amount of interest exhibited by the technologists.

Table 7 outlines the total cost per week of morning blood collecting. This cost, $248.60 per week, may vary slightly from week to week because of changes in the composition of the morning collecting team, but the average cost should be close to the computed cost.

Table 8 gives the total cost per week of blood collecting, $917.60, and projects this to an annual cost of $47,717. Using the total personnel budget, it is found that about 4.7 per cent of the budget is spent on blood collecting. It should be pointed out that the total personnel budget includes salaries of some other laboratory workers such as posters, chemists, janitors, clerks, and secretaries.

TABLE 7

COST OF MORNING BLOOD COLLECTING,
MARCH 17-23, 1971

4 Medical Technologists at	$4.16/hour	=	$ 16.84
1 Dental Student at	2.76/hour	=	2.76
12 Medical Technology students at	2.15/hour*	=	25.80
Total per day		=	$ 45.20
$45.20 X 5-1/2 days/wk.**		=	$248.60/wk.

*Technology students receive a higher wage for morning collections.

**The morning collection team is at half-strength on Saturdays.

TABLE 8

PROJECTED ANNUAL COST FOR BLOOD COLLECTING

Cost of daily blood collecting per week exclusive of morning collecting	=	$ 669.03
Cost of morning blood collecting per week	=	248.60
Total cost per week	=	$ 917.60
Projected annual cost:		
$ 917.60 X 52	=	$ 47,716.76
Total laboratory personnel budget this year	=	$ 1,006,550.00*
Per cent of total personnel budget spent on blood collecting:		
$47,717/$1,006,550	=	4.7%

*BUMC laboratory budget

If one were to look only at technologists' and technicians' salaries, the percentage of that budget would be somewhat higher, although their salaries comprise the large bulk of the budget. Obviously, the amount of time and money spent collecting blood is large and even a small change or improvement could result in substantial savings to the laboratory and indirectly to the patient.

In reviewing the questionnaires, and interviewing laboratory personnel, it was noted that--a few times each day--more than one collector was on a given ward simultaneously. This happens, for example, when a hematology slip arrives at central collecting from a particular ward shortly before a chemistry slip. Someone from the hematology section goes out to collect blood and is shortly followed by someone from the chemistry section. This is not to imply that the same patient is being "stuck" twice, but that there may be two patients on this particular ward requiring blood tests, and the slips are not sent together. Since there is little delay in getting the slips to the various laboratory sections, there is no chance for consolidation. It is not possible to estimate how often this occurs, or the amount of time that could be saved by

sending specified time. However, it does happen and, again, a change in policy might help cut costs.

The hospital and laboratory administration have heard complaints from patients who have had blood collected two or more times in one day. This has brought up the question of a lack of coordination, either on the ward or in the laboratory. After discussing this with hospital physicians and laboratory personnel, it appears that this is not a major problem. A few patients do get "stuck" for blood repeatedly, but this is most often due to physicians' updating orders or attempting to follow the patient's clinical course more closely through the use of repeated laboratory tests.

Alternatives

Since the present method of blood collecting and result reporting at BUMC is so complex and presents so many problems, several alternatives can be found to apply to certain parts of the system without completely changing or disrupting the present system. Application of one or more of these alternatives should materially enhance efficiency, reduce costs, and, most importantly, satisfy the needs of

the patient, the laboratory, and the administration, in that order. Possible alternatives are:

Routine admission screen of tests

As pointed out earlier, a routine admission screening of laboratory tests to include chemistries and hematology has been implemented elsewhere with proven decrease in costs of time and money to the laboratory. The blood for this admission screen could be drawn by a representative of the laboratory assigned to the admissions department. The blood could be picked up and transported to the laboratory by nontechnical personnel. This alternative has been proposed by laboratory management in the past but rejected by the hospital administration. The reason given for this rejection is that a patient being admitted to the hospital is often anxious and uncomfortable, and the introduction of a needle into his vein before comfortably settling him into his room, may only increase his apprehension. This reasoning may have some validity, but has not been objectively evaluated.

Routine ward collections

This could be accomplished by sending one or two collectors to each hospital ward at predetermined times

during the day. Laboratory request slips could be held on the ward until the collectors arrived. This would eliminate some duplicate trips being made in a short time span to the same ward. The numerous "stat" or immediate requests would possibly negate this system. Obviously, this system would require frequent trips to almost all wards throughout the day.

Central collecting point in each hospital

A central collecting point could be established in each hospital. This could be manned by one or two people who would go out to the wards in that hospital upon request to collect blood, and also collect blood from ambulatory patients sent to this collecting point. Disadvantages are that this would necessitate the hiring of more personnel who would probably not be continuously working but have frequent slack periods. Also, it would require the laboratory to take over much-needed space in each hospital.

Central collecting

The people working in central collecting are primarily involved in posting and only collect blood on a small number of outpatients. This service could be

expanded in physical size and personnel to become a true collecting service for both inpatients and outpatients. This would severely curtail the number of trips outside the laboratory highly trained personnel, such as medical technologists. It should lead to more consolidation of laboratory slips so that fewer trips to the same wards are necessary. In general, service would be faster on "stat" requests, as the slips come to central collecting first and the collector could immediately go out rather than try to find someone from one of the specialty sections of the laboratory.

To satisfy the training requirements of the medical technology students, they could be assigned to the central collecting service on a rotational basis. Some posting could be combined with blood collecting. This alternative would require the hiring of more personnel, but this cost would be offset by increased productivity of medical technologists. The major obstacle to this alternative is that most of the medical technologists have expressed a personal interest in collecting blood as this breaks the laboratory routine and gives them patient contact which lends more meaning to their work. Unquestionably, the technologist

who meets the patient and knows something of the disease process becomes more interested in reporting the most accurate results possible.

Collection by ward personnel

All registered nurses have been trained to draw blood and do so in some hospitals. This possibility was explored at BUMC by presenting it to supervisory and staff nurses. The response was uniformly negative. All of the nurses feel that they are too busy to take on this added responsibility, especially when they have not had to do it in the past. Nurses are amongst the highest paid professionals in the center, and this rather mundane task would take them away from more important patient care duties.

Laboratory ward

There are several laboratory tests which demand repeated, exactly timed blood collections in one day. The most common of these is the four-hour glucose tolerance test which requires six blood samples over a four-hour period. At BUMC, this means six trips to a given ward to collect blood. The establishment of a small four-to-six-bed ward in or near the laboratory would eliminate the need for these trips. Patients who are not seriously ill could

be brought to this ward in the morning and remain there until the end of the test period. If this small laboratory ward were part of a nearby larger hospital ward, it could be supervised by the normal ward personnel. The center already has a transportation service for moving patients and this temporary move should not prove to be too great an inconvenience to the patients. The primary problem would be allocation of space for this laboratory ward; but, as pointed out earlier, space could probably be obtained from a nearby large ward which would not require any expensive construction or structural changes.

Ambulatory inpatients

In many hospitals, especially in the federal system, ambulatory patients report to the laboratory in the morning to have blood drawn. This, of course, cuts down on the number of morning blood collections on the ward. Because of the size and complexity of BUMC, this alternative does not seem feasible. Patients would undoubtedly get lost unless individually escorted.

Permanent morning-collection team

Since blood collecting can be performed by lesser skilled individuals, a group could be hired to perform this

task at a lower salary than that paid to technologists. The morning collectors could be a permanent team hired by the laboratory, or this work could be contracted out to a private group. As there are only four technologists working on morning collections for one hour, the savings would not be significant. Again, this alternative would deprive the technologists of patient contact and the students of needed experience.

Reproducible master flow sheets

In the present system, completed laboratory slips are taken to the wards and the results are copied onto master flow sheets in the patients' records. This system is cumbersome and could, conceivably, lead to errors in either transcription or putting the results in the wrong chart. An alternative would be to establish permanent master flow sheets in the laboratory on each patient. When collected blood is brought to the laboratory, the master flow sheet could be retrieved from the files to accompany the sample. As results are obtained, they would be directly transcribed onto the flow sheet by the laboratory worker. This flow sheet could be reproduced by any one of several

types of copying machines, and the copy sent to the ward by pneumatic tube for filing in the patient's record by the ward secretary. Previous copies in the patient's record would be discarded. This system would lead to less chance for error and would make it easier to retrieve laboratory results on discharged patients. Also, it would eliminate the need for posters to travel to the various wards. The initial expense of the copying machine and the continuing expense of copy paper are drawbacks, but the savings in personnel should more than compensate for this over a period of time.

CHAPTER III

CONCLUSION

Summary

The purpose of this study was to evaluate the blood collecting and laboratory result-reporting systems at BUMC. After evaluation, alternatives were considered which may improve efficiency, reduce costs, and satisfy the desires of the patient, laboratory, and hospital administration.

In order to understand the magnitude of blood collecting at BUMC, a questionnaire was devised and proved to be quite effective and informative. This questionnaire revealed that in an average seven-day week, exclusive of early morning collections, at least 1,044 trips were made by laboratory personnel to the wards to collect blood or post results. This amounts to a predicted annual personnel expenditure of almost $50,000, or 4.7 per cent, of the annual laboratory personnel budget. It became apparent that any significant improvement could result in large savings to the center and, most important of all, to the patient.

All pertinent literature was reviewed and contrasted with the present system. It was kept in mind that

systems which work well at one hospital often are not applicable to another due to differences in size, type of patients, and demands of patients, hospital personnel, and administration.

Due to the complexity of this broad problem, there is no single change which will solve all problems and please all concerned. Many alternatives which could be incorporated were considered from the positive and negative viewpoints. Some of these alternatives are obviously not acceptable, while others have merit and should be considered for at least a possible trial within the present system.

Recommendations

The list of recommendations is taken from the list of alternatives and represents the most feasible additions or changes to the present system of blood collecting and result reporting at BUMC. It is recognized that these recommendations may not be immediately acceptable to all, but it is proposed that they are changes which should improve the present system. There is obvious difficulty in appraising the amount of savings in time and money to be gained by following these recommendations; therefore, it is further

recommended that future studies be undertaken to evaluate their validity. Recommendations are as follows:

1. Collect blood in the admissions office for an admission screen of tests, to include the SMA-4 Technicon hematology analyzer and the SMA-12 chemical survey analyzer, on all patients over the age of three years, except for maternity patients. Admission collection would be a time and money-saving procedure in that it should markedly decrease the number of trips to wards. This blood collection could be accomplished in a small room in the admissions office by a permanently assigned collector, or on a rotational basis to give experience to students or other laboratory personnel. The discomfort and time involved for the patient should be minimal. A decided advantage would be the rapid return of results to the patient's record on the ward. If the admitting physician desired, he could send a note or write an order to have further blood tests performed on the admission blood sample. Once physicians have become familiar with this system, it is predicted that they would accept it because of the completeness and early return.

2. Convert the central collecting service into a true collection service for collecting blood during weekday hours on a scheduled basis. The procedure would help to eliminate duplicate trips to various wards and would cut down on the number of "stat" requests when the ward personnel know that a collector is coming at a certain time. Scheduled collections would not entail the hiring of additional personnel as interested medical technologists and all medical technology students could rotate through the central collecting service on an assigned basis. An alternative would be to have technologists and students report to the central collecting service at assigned times during the day for blood collecting, while the rest of their time could be spent performing tests in the laboratory. The personnel assigned to the central collecting service would become primarily collectors rather than routers and posters.

3. Develop a small ward in or near the laboratory to temporarily house patients requiring prolonged or repeated tests. This has many obvious advantages as previously discussed and could easily be done by assigning four to six beds from the adjoining wings of Jonsson or Truett hospitals

to the laboratory. It would save numerous trips outside the immediate laboratory area and would lend itself to more exact schedules for this type of tests.

4. Develop a system for copying the master flow sheets in the laboratory and sending these copies via pneumatic tube to the wards for filing in the patients' records. The implementation of this system has already been discussed and should prove to be economical and accurate. The present system of hand-copying is obsolete and lends itself to error. This should allow the posters to have more time for blood collecting as recommended in recommendation 2.

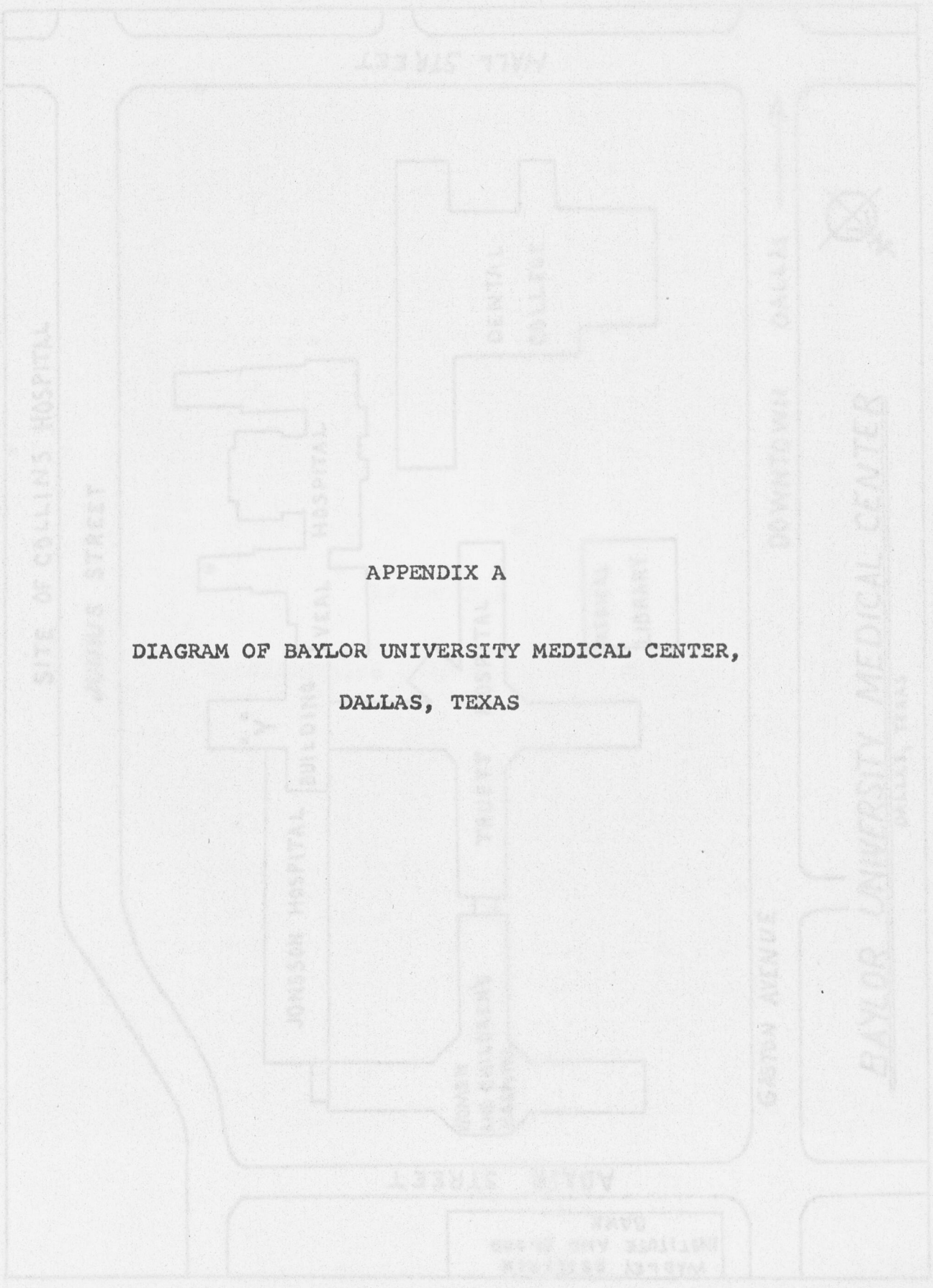
5. Eliminate the Women and Children's Hospital laboratory. This laboratory performs only a limited number of tests and requires duplication of equipment and personnel. The reasons for the establishment of this sublaboratory are unclear, but the diversification of effort is obviously not economical. The admission laboratory screen and the use of scheduled teams from the central collecting service would negate even further any justification of this laboratory.

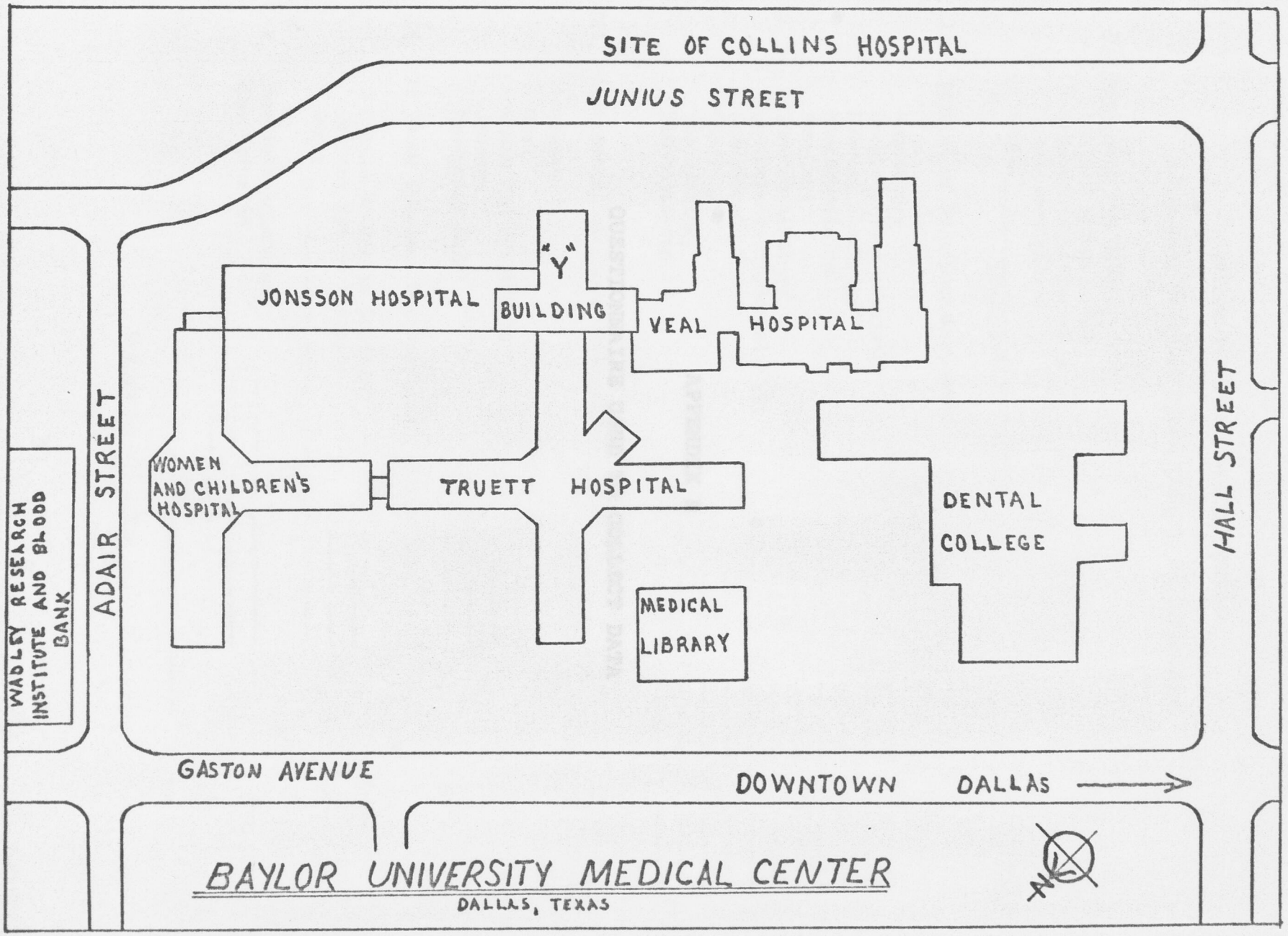
The above recommendations do not portend to be the

ultimate solution in efficiency and economy for the BUMC laboratory, but they can be easily implemented at this time. For the laboratory to remain a progressive and vital part of this large institution, it must continuously be re-evaluated and never accept a status quo. No mention of computer technology has been made in the recommendations as BUMC is not that sophisticated at this time. Advances in computers and other technological aspects will undoubtedly play an important role in future changes in blood collecting and result-reporting at this institution.

APPENDIX A

DIAGRAM OF BAYLOR UNIVERSITY MEDICAL CENTER, DALLAS, TEXAS




SITE OF COLLINS HOSPITAL
JUNIUS STREET
"Y"
JONSSON HOSPITAL
BUILDING
VEAL
HOSPITAL
WOMEN AND CHILDREN'S HOSPITAL
TRUETT HOSPITAL
DENTAL COLLEGE
MEDICAL LIBRARY
WADLEY RESEARCH INSTITUTE AND BLOOD BANK
ADAIR STREET
HALL STREET
GASTON AVENUE
DOWNTOWN DALLAS
BAYLOR UNIVERSITY MEDICAL CENTER
DALLAS, TEXAS

APPENDIX B

QUESTIONNAIRE USED TO COLLECT DATA

BAYLOR UNIVERSITY MEDICAL CENTER

A One Week Study of Time - Cost Blood Collection

I. Personnel Job Category

Medical technologist	_____
Student technologist	_____
Laboratory aide	_____
Other _____ (Specify)	

II. Type(s) of Specimens Requested

	Number	Stat	Routine
Hematology	_____	_____	_____
Routine blood chemistry	_____	_____	_____
Special chemistry	_____	_____	_____
Microchemistry	_____	_____	_____
Serology	_____	_____	_____
Immunohematology	_____	_____	_____
Radiochemistry-Coagulation	_____	_____	_____
Endocrinology	_____	_____	_____
Virology	_____	_____	_____
Bacteriology	_____	_____	_____
Miscellaneous	_____	_____	_____

III. Location(s) of Blood Collection

	Division(s)
Truett	_____
Veal	_____
Women and Children's	_____
Johsson	_____
Emergency Room	_____

IV. If Blood Specimen Not Collected, Reason Why:

Unable to Obtain Specimen	_____
Patient Not on Division	_____
Other _____	

V. Time Left Laboratory _____

Time Returned _____

DATE _____

PLEASE DO NOT SIGN

APPENDIX C

LABORATORY SLIPS

BACTERIOLOGY

DOT INDICATES AVAILABILITY
NIGHTS • SUNDAYS • HOLIDAYS

DIV. _____ ROOM NO. _____

CASE NUMBER _____ DATE

PATIENT NAME _____

DOCTORS NAME _____

TODAY BY _____ HRS. ☐ EMERGENCY STAT

BAYLOR UNIVERSITY MEDICAL CENTER
18 BACTERIOLOGY

TENTATIVE DIAGNOSIS

SOURCE OF SPECIMEN

REQUISITIONED BY

SPECIAL TEST ☐

- ● ☐ ROUTINE AEROBIC CULTURE AND SMEAR 2424
- ● ☐ ANAEROBIC CULTURE 2445
- ● ☐ FUNGUS SMEAR AND CULTURE 2425
- ● ☐ ACID-FAST SMEAR AND CULTURE 2450
- ☐ ON PATHOGENS IF GROWN
- ☐ SENSITIVITY TEST ON URINE IF LESS THAN 100,000/ML 2441

AREA BELOW THIS LINE FOR LAB USE ONLY

SMEAR ☐ NO BACTERIA SEEN ☐ NO ACID FAST FORMS SEEN (DIRECT) ☐ NO ACID FAST FORMS SEEN (CONCENTRATE)

GRAM _____

AFB &/or AFB CONC. _____

CULTURE _____

MEDIUM
- ☐ PETRAGNANI
- ☐ SABOURAUD & PAGANO
- ☐ THIOGLYCOLLATE

☐ NO GROWTH 24 HRS. ☐ NO GROWTH 48 HRS. ☐ NO GROWTH 72 HRS. ☐ NO GROWTH 5 DAYS ☐ NO GROWTH 10 DAYS
☐ NOTHING OF SIGNIFICANCE IN 24 HRS. ☐ NOTHING OF SIGNIFICANCE IN 48 HRS.

MISC ☐ COAGULASE POSITIVE _____ TYPE _____ ☐ COAGULASE NEGATIVE

☐ CANCEL CHG. ☐ ADD CHG. $

BACTERIOLOGY LAB

24 HOUR REPORT
48 HOUR REPORT

FORM L32-U (8-70) Ⓤ

FORM L32-U (8-70) Ⓤ

SPECIAL CHEMISTRY

DIV. _____ ROOM NO. _____

CASE NUMBER _____ DATE

PATIENT NAME _____

DOCTORS NAME _____

☐ ROUTINE TODAY BY _____ HRS. ☐ EMERGENCY STAT

BAYLOR UNIVERSITY MEDICAL CENTER
SPECIAL CHEMISTRY

DIAGNOSIS

Thyroid Chemistry (ORDER PBI & BEI ON SEPARATE FORMS WITH NO OTHER PROCEDURE)

☐ PBI 2777 _____ mcg% ☐ BEI 2778 _____ mcg%

X	TEST	CODE	RESULT	X	TEST	CODE	RESULT	X	TEST	CODE	RESULT
	ALDOLASE	2740	UNITS		LEAD URINE	2911	mcg./24 hr.		QUANTATIVE PORPHYRINS		
	AMMONIA BLOOD	2809	mcg %		MAGNESIUM	2863	mEq/L		COPRO I & III	2915	mcg. 24 hr.
	ARSENIC URINE	2950	mcg/24 hr.		QUINIDINE	2940	mcg/ml.		URO	2916	mcg./24 hr.
	BARBITURATE	2942	mg %		SALICYLATES	2946	mg %		LIPIDS - FASTING REQUIRED		
	HAPTOGLOBIN	2923	mg % Hbg BC		SGPT	2753	UNITS		TOTAL	2879	mg %
	ICDH	2745	UNITS		SHBD	2748	UNITS		FREE FAT ACIDS	2881	mg %
	IRON SERUM	2810	mcg %		VMA	2780	mg/24 hr.		TRIGLYCERIDES	2882	mg %
	IRON TIBC	2811	____ mcg% ____ % SAT.		XYLOSE ABSORPTION	2910	gm/5 hr.	REQ. BY			
	LAP	2746	UNITS		5-HIAA	2779	mg/24 hr.				

SPECIAL CHEMISTRY LAB — A — B

DIVISION NOTICE — C

FORM NO. L408-U (5-68) Ⓤ

ORM NO. L408-U (5/68) Ⓒ

ROUTINE BLOOD CHEMISTRY

0746 DOT INDICATES AVAILABILITY NIGHTS • SUNDAYS • HOLIDAYS

© = COLLECTION ONLY

DIV. _____ ROOM NO. _____ DATE

CASE NUMBER _____

PATIENT NAME _____

DOCTOR NAME _____

COLLECT AT _____ HRS. | TODAY BY _____ HRS. | ☐ EMERGENCY STAT

BAYLOR UNIVERSITY MEDICAL CENTER

18 ROUTINE BLOOD CHEMISTRY

DIAGNOSIS

* MORNING OF TEST NO FOOD, LIQUID, MEDICINE

• BLOOD GLUCOSE

* ☐ FASTING 2460 _____ MG%

☐ 2 HR. PP 2460 _____ MG%

* ☐ GLUCOSE TOLERANCE 2461 ☐ 3 HR. ☐ 5 HR. ☐ I.V.

PAST _____ 1 HR. _____ 2 HR. _____

3 HR. _____ 4 HR. _____ 5 HR. _____

X	TEST	CODE	RESULTS	X	TEST	CODE	RESULTS	X	TEST	CODE	RESULTS	X	TEST	CODE	RESULTS
	SERUM GLUCOSE	2460	mg%		• AMYLASE	2491	SACC UNITS		BILIRUB. TOTAL	2497	mg%		• CALCIUM	2483	mEq/L
	• BUN	2471	mg%		PROTEIN TOTAL	2466	GM%		BILIRUB. DIRECT	2498	mg%		PHOSPH. INORG.	2485	mg%
	• CO_2 C.P.	2465	mEq/L		ALBUMIN	2468	GM%		ALK. PHOSP.	2495	K.A. U.		ACID PHOSP.	2493	BOD.U.
	• CHLORIDE	2484	mEq/L		GLOBULIN		GM%		• SGOT	2752			L.D.H.	2747	T. UNITS
	• SODIUM	2488	mEq/L		PROTEIN ELECTRO	2814			THYMOL TURBIDITY	2500	UNITS		C.P.K.	2742	HUGHES UNITS
	• POTASSIUM	2487	mEq/L		CHOL. TOTAL	2478	mg%		CEPH. FLOC.	2499	24 HR 48 HR		5'NUCLEO	2751	
	• SODIUM AND POTASSIUM	2489	mEq/L		CHOL. ESTER	2479	mg%		CREATININE	2472	mg%		PATIENT WEIGHT	2904	% RETEN.
			mEq/L		© SMA 12	2800	INCLUDES ALL SHADED TESTS		URIC ACID	2473	mg%	IN LBS. FOR B.S.P. →			

PHYSICIAN

FOR LAB USE ONLY

ROUTINE BLOOD CHEMISTRY LAB. - A

FORM NO. L-52-U (12-49)

DIVISION NOTICE - C

FORM NO. L-52-U (12-65)

09

01353 VIROLOGY

BAYLOR UNIVERSITY MEDICAL CENTER

DEPT. OF VIROLOGY

DATE OF ONSET OF ILLNESS

EXAMINATION TO BE MADE

PAIRED SERA REQUIRED ON ALL VIRUS STUDIES

REQ. BY

AREA BELOW THIS LINE FOR DEPT. OF VIROLOGY ONLY

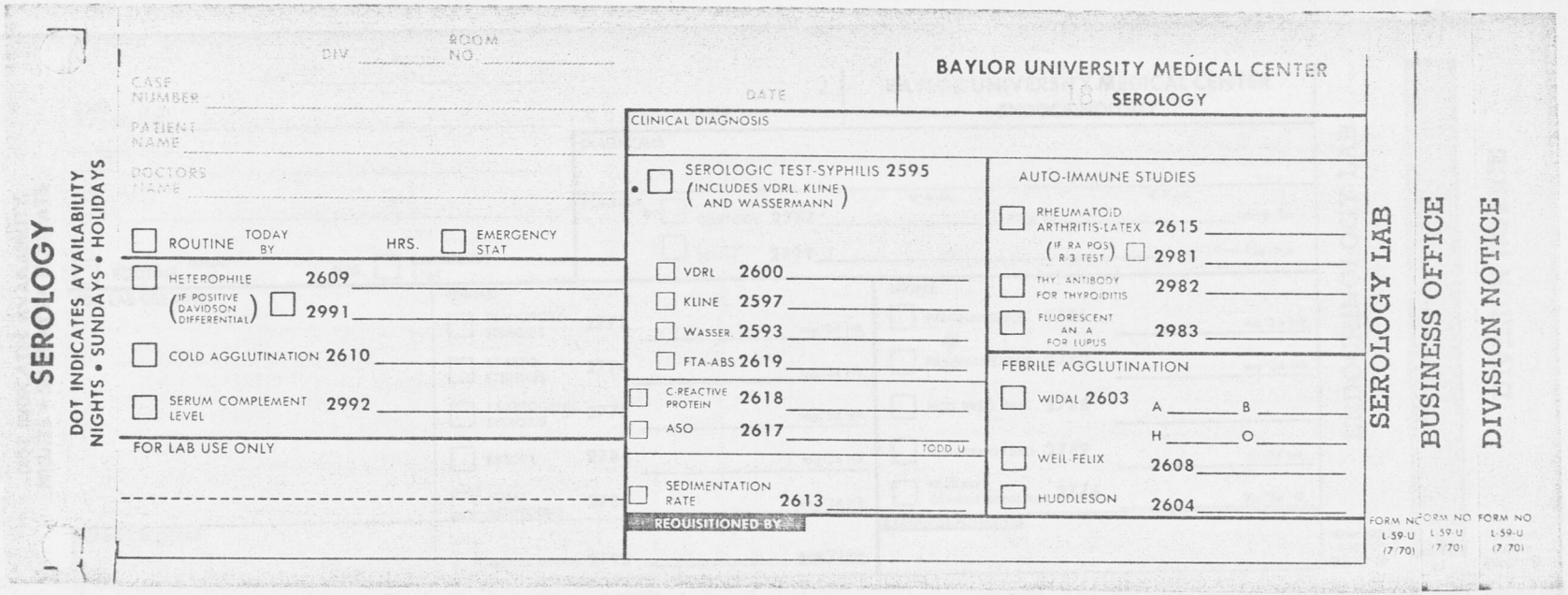
WORKING CLINICAL DIAGNOSIS	DESCRIPTION OF CHARGE	NO. OF SPEC.	CODE	PRICE
				$
				$
				$
				$
				$
				$

BUSINESS OFFICE

FORM NO. L-330-U

VIROLOGY LAB

FORM NO. L-330-U



SEROLOGY

DOT INDICATES AVAILABILITY
NIGHTS • SUNDAYS • HOLIDAYS

DIV _____ ROOM NO _____

CASE NUMBER _____

PATIENT NAME _____

DOCTORS NAME _____

DATE 19

BAYLOR UNIVERSITY MEDICAL CENTER
SEROLOGY

CLINICAL DIAGNOSIS

☐ ROUTINE TODAY BY _____ HRS. ☐ EMERGENCY STAT

☐ HETEROPHILE 2609 _____
(IF POSITIVE DAVIDSON DIFFERENTIAL) ☐ 2991 _____

☐ COLD AGGLUTINATION 2610 _____

☐ SERUM COMPLEMENT LEVEL 2992 _____

FOR LAB USE ONLY

• ☐ SEROLOGIC TEST-SYPHILIS 2595
(INCLUDES VDRL, KLINE AND WASSERMANN)

☐ VDRL 2600 _____
☐ KLINE 2597 _____
☐ WASSER. 2593 _____
☐ FTA-ABS 2619 _____

☐ C-REACTIVE PROTEIN 2618 _____
☐ ASO 2617 _____ TODD U

☐ SEDIMENTATION RATE 2613 _____

REQUISITIONED BY

AUTO-IMMUNE STUDIES

☐ RHEUMATOID ARTHRITIS-LATEX 2615 _____
(IF RA POS) ☐ R-3 TEST 2981 _____

☐ THY. ANTIBODY FOR THYROIDITIS 2982 _____

☐ FLUORESCENT AN A FOR LUPUS 2983 _____

FEBRILE AGGLUTINATION

☐ WIDAL 2603 A _____ B _____ H _____ O _____

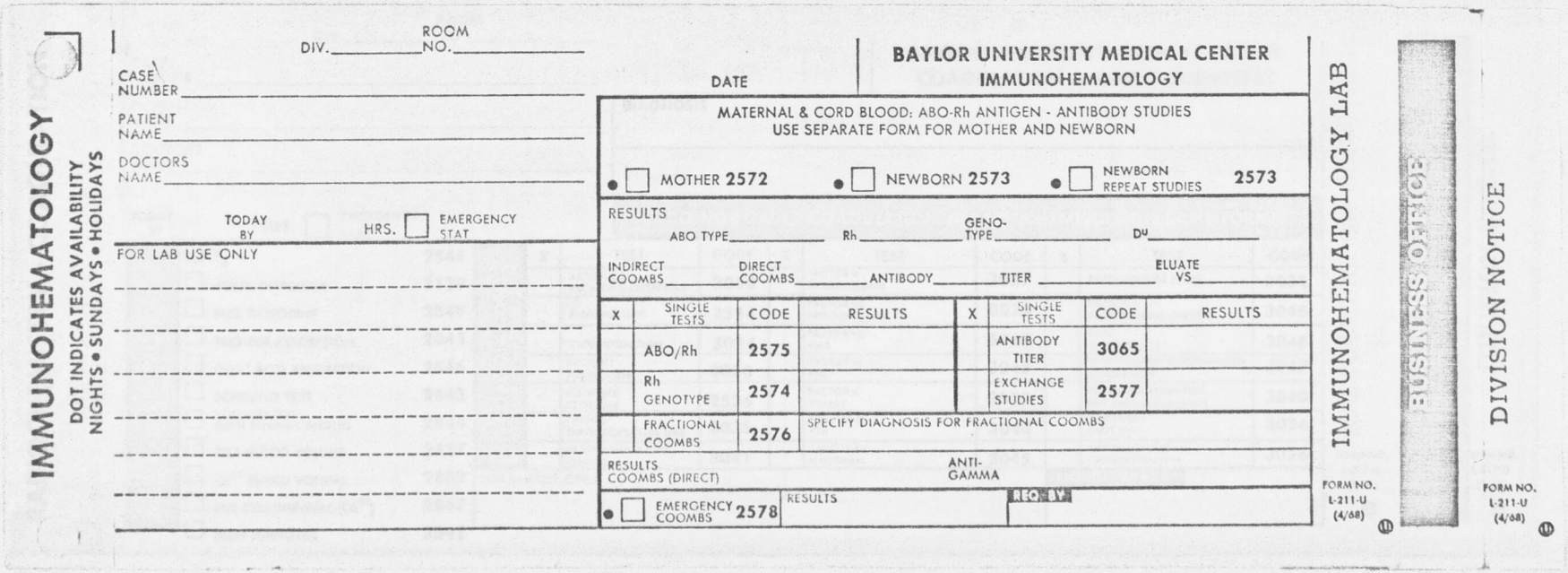
☐ WEIL-FELIX 2608 _____

☐ HUDDLESON 2604 _____

SEROLOGY LAB
FORM NO L-59-U (7-70)

BUSINESS OFFICE
FORM NO L-59-U (7-70)

DIVISION NOTICE
FORM NO L-59-U (7-70)



IMMUNOHEMATOLOGY

DOT INDICATES AVAILABILITY
NIGHTS • SUNDAYS • HOLIDAYS

DIV. _____ ROOM NO. _____

CASE NUMBER _____

PATIENT NAME _____

DOCTORS NAME _____

DATE

BAYLOR UNIVERSITY MEDICAL CENTER
IMMUNOHEMATOLOGY

MATERNAL & CORD BLOOD: ABO-Rh ANTIGEN - ANTIBODY STUDIES
USE SEPARATE FORM FOR MOTHER AND NEWBORN

• ☐ MOTHER 2572 • ☐ NEWBORN 2573 • ☐ NEWBORN REPEAT STUDIES 2573

TODAY BY _____ HRS. ☐ EMERGENCY STAT

FOR LAB USE ONLY

RESULTS
ABO TYPE _____ Rh _____ GENO-TYPE _____ DU _____

INDIRECT COOMBS _____ DIRECT COOMBS _____ ANTIBODY _____ TITER _____ ELUATE VS _____

X	SINGLE TESTS	CODE	RESULTS	X	SINGLE TESTS	CODE	RESULTS
	ABO/Rh	2575			ANTIBODY TITER	3065	
	Rh GENOTYPE	2574			EXCHANGE STUDIES	2577	
	FRACTIONAL COOMBS	2576	SPECIFY DIAGNOSIS FOR FRACTIONAL COOMBS				

RESULTS COOMBS (DIRECT) _____ ANTI-GAMMA _____

• ☐ EMERGENCY COOMBS 2578 RESULTS _____ REQUISITIONED BY _____

IMMUNOHEMATOLOGY LAB
FORM NO. L-211-U (4/68)

BUSINESS OFFICE

DIVISION NOTICE
FORM NO. L-211-U (4/68)

ENDOCRINOLOGY

DOT INDICATES AVAILABILITY
NIGHTS • SUNDAYS • HOLIDAYS

DIV. _____ ROOM NO. _____

CASE NUMBER _____

PATIENT NAME _____

DOCTORS NAME _____

DATE

BAYLOR UNIVERSITY MEDICAL CENTER
ENDOCRINOLOGY

DIAGNOSIS

☐ ROUTINE TODAY BY _____ HRS. ☐ EMERGENCY STAT

PLASMA ● ☐ CORTISOL 2773 _____ 8 A.M. _____ mcg % _____ 4 P.M. _____ mcg %

☐ RENIN 2791 _____ ng/10ml Plasma

FOR LAB USE ONLY

URINE

☐	17-HYDROXY-STEROIDS	2772	_____ mg/24 HR.
☐	17-KETO-STEROIDS	2774	_____ mg/24 HR.
☐	17-KETOGENIC STEROIDS	2775	_____ mg/24 HR.
☐	ESTRIOL	2784	_____ mg/24 HR.
☐	TOTAL ESTROGENS	2785	_____ mcg/24 HR.

URINE

☐	PREGNANEDIOL	2781	_____ mg/24 HR.
☐	PREGNANETRIOL	2782	_____ mg/24 HR.
☐	HCG PREG. TEST	2788	_____
☐	QUANTITATIVE HCG	2789	_____ IU/24 HR.
☐	PITUITARY GONADOTROPIN (FSH)	2776	_____ RU/24 HR.

WHEN COLLECTED
BEGIN _____ END _____ DATE _____

☐ ALDOSTERONE 2790 _____ mcg/24 HR.

REQUISITIONED BY

ENDOCRINOLOGY LAB

DIVISION NOTICE

FORM NO. L-407-U (12/67) ⓑ

ORM NO. L-407-U 12/67 ⓑ

RADIOCHEMISTRY - COAGULATION

DIV. _____ ROOM NO. _____

CASE NUMBER _____

PATIENT NAME _____

DOCTORS NAME _____

DATE

BAYLOR UNIVERSITY MEDICAL CENTER
COAGULATION & RADIO CHEMISTRY

DIAGNOSIS

TODAY BY _____ HRS. ☐ EMERGENCY STAT

DO NOT ORDER COAGULATION & RADIOCHEMISTRY ON SAME FORM

RADIOCHEMISTRY

☐	T_3	2848
☐	TOTAL THYROXINE	3129
☐	FREE THYROXINE	2849
☐	TRIOLEIN ABSORPTION	2845
☐	OLEIC ACID ABSORPTION	2846
☐	SCHILLING TEST	2843
☐	SCHILLING TEST (WITH INTRINSIC FACTOR)	2844
☐	RISA BLOOD VOLUME	2837
☐	CR^{51} BLOOD VOLUME	2839
☐	RED CELL SURVIVAL (CR^{51})	2847
☐	IRON TURNOVER	2841

COAGULATION

X	TEST	CODE	X	TEST	CODE	X	TEST	CODE
	ACTIVATED RECALCIFICATION TIME	3054		FACTOR V PROACCELERIN	3027		EUGLOBULIN LYSIS	3031
	BLEEDING TIME	2534		FACTOR VII PROCONVERTIN	3028		FACTOR II PROTHROMBIN (OWREN)	3046
	CLOT RETRACTION	3034		FACTOR VIII AHG	3042		FDPT (FIBRINOLYSIS)	3048
	FACTOR I FIBRINOGEN	3030		FACTOR IX PTC	3043		PROTHROMBIN CONSUMPTION (UTILIZATION)	3047
	LEE-WHITE CLOT TIME	2536		FACTOR X STUART	3029		RECALCIFICATION TEST FOR ANTICOAGULANTS	3040
	PARTIAL THROMBOPLASTIN TIME	3035		FACTOR XI PTA	3044		THROMBIN CLOT TIME	3026
	PROTHROMBIN TIME (QUICK)	3041		FACTOR XII HAGEMAN	3045		THROMBOPLASTIN GENERATION TEST	3036

FOR LAB USE ONLY

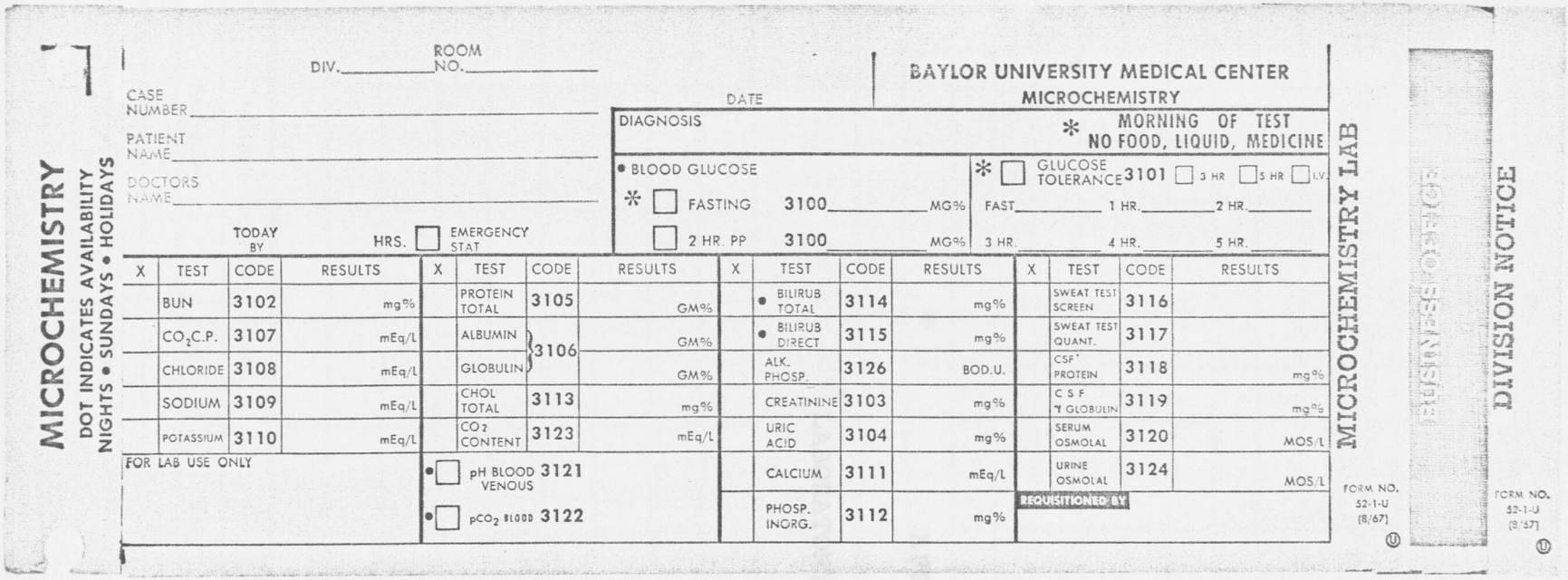
REQUISITIONED BY

RADIOCHEM. OR COAG. LAB

DIVISION NOTICE

FORM NO. L-317-U (5/68) ⓑ

ORM NO. L-317-U (5/68) ⓑ



MICROCHEMISTRY

DOT INDICATES AVAILABILITY
NIGHTS • SUNDAYS • HOLIDAYS

DIV. _____ ROOM NO. _____

CASE NUMBER _____

PATIENT NAME _____

DOCTORS NAME _____

TODAY BY _____ HRS. ☐ EMERGENCY STAT

DATE

BAYLOR UNIVERSITY MEDICAL CENTER
MICROCHEMISTRY

DIAGNOSIS

* MORNING OF TEST NO FOOD, LIQUID, MEDICINE

• BLOOD GLUCOSE
* ☐ FASTING 3100 _____ MG%
☐ 2 HR. PP 3100 _____ MG%

* ☐ GLUCOSE TOLERANCE 3101 ☐ 3 HR ☐ 5 HR ☐ I.V.
FAST _____ 1 HR. _____ 2 HR. _____
3 HR. _____ 4 HR. _____ 5 HR. _____

X	TEST	CODE	RESULTS
	BUN	3102	mg%
	CO_2C.P.	3107	mEq/L
	CHLORIDE	3108	mEq/L
	SODIUM	3109	mEq/L
	POTASSIUM	3110	mEq/L
	FOR LAB USE ONLY		

X	TEST	CODE	RESULTS
	PROTEIN TOTAL	3105	GM%
	ALBUMIN } 3106		GM%
	GLOBULIN }		GM%
	CHOL TOTAL	3113	mg%
	CO_2 CONTENT	3123	mEq/L
• ☐	pH BLOOD VENOUS 3121		
• ☐	pCO_2 BLOOD 3122		

X	TEST	CODE	RESULTS
	• BILIRUB TOTAL	3114	mg%
	• BILIRUB DIRECT	3115	mg%
	ALK. PHOSP.	3126	BOD.U.
	CREATININE	3103	mg%
	URIC ACID	3104	mg%
	CALCIUM	3111	mEq/L
	PHOSP. INORG.	3112	mg%

X	TEST	CODE	RESULTS
	SWEAT TEST SCREEN	3116	
	SWEAT TEST QUANT.	3117	
	CSF* PROTEIN	3118	mg%
	C S F % GLOBULIN	3119	mg%
	SERUM OSMOLAL	3120	MOS/L
	URINE OSMOLAL	3124	MOS/L

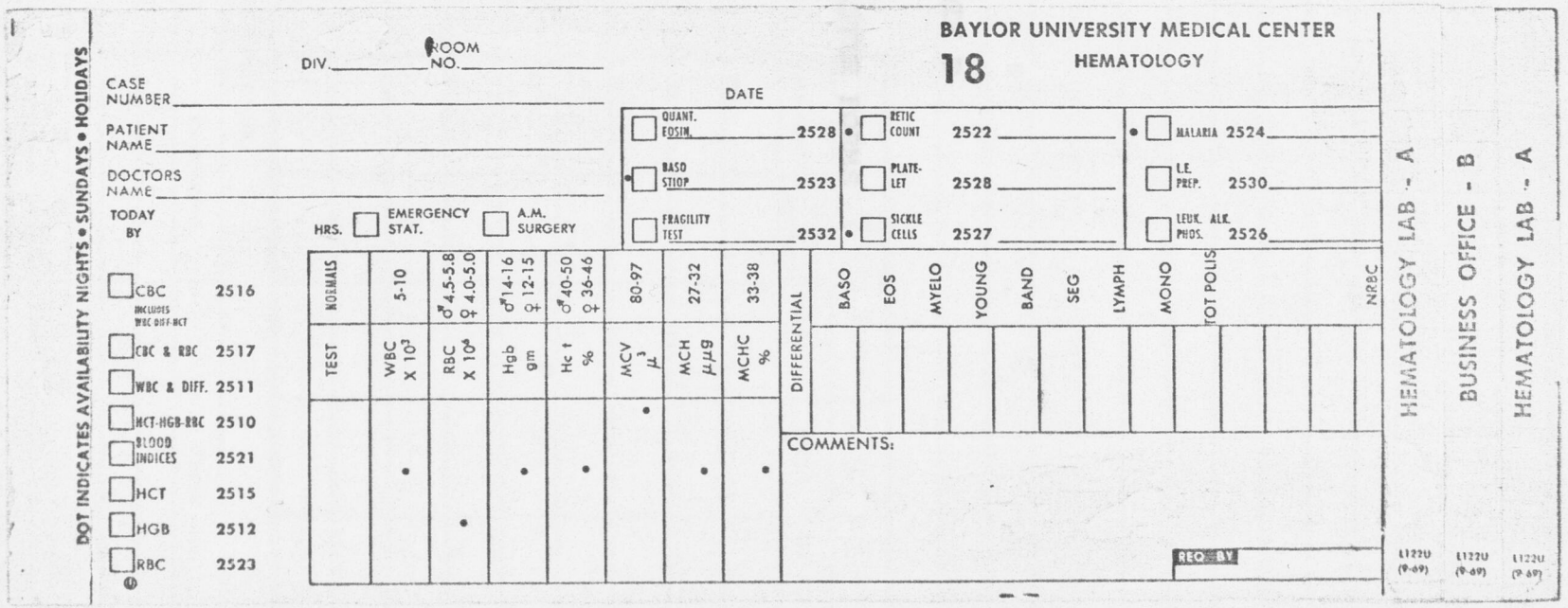
REQUISITIONED BY

MICROCHEMISTRY LAB

DIVISION NOTICE

FORM NO. 52-1-U (8/67) U

FORM NO. 52-1-U (8/67) U



DOT INDICATES AVAILABILITY NIGHTS • SUNDAYS • HOLIDAYS

DIV. _____ ROOM NO. _____

CASE NUMBER _____

PATIENT NAME _____

DOCTORS NAME _____

TODAY BY _____ HRS. ☐ EMERGENCY STAT. ☐ A.M. SURGERY

DATE

BAYLOR UNIVERSITY MEDICAL CENTER
18 HEMATOLOGY

☐ CBC 2516 INCLUDES WBC DIFF-HCT
☐ CBC & RBC 2517
☐ WBC & DIFF. 2511
☐ HCT-HGB-RBC 2510
☐ BLOOD INDICES 2521
☐ HCT 2515
☐ HGB 2512
☐ RBC 2523 U

☐ QUANT. EOSIN. 2528
• ☐ BASO STIOP 2523
☐ FRAGILITY TEST 2532

• ☐ RETIC COUNT 2522 _____
☐ PLATE-LET 2528 _____
• ☐ SICKLE CELLS 2527 _____

• ☐ MALARIA 2524 _____
☐ L.E. PREP. 2530 _____
☐ LEUK. ALK. PHOS. 2526 _____

TEST	WBC X 10^3	RBC X 10^6	Hgb gm	Hct %	MCV μ^3	MCH $\mu\mu g$	MCHC %
NORMALS	5-10	♂4.5-5.8 ♀4.0-5.0	♂14-16 ♀12-15	♂40-50 ♀36-46	80-97	27-32	33-38
	•	•	•	•	•	•	•

DIFFERENTIAL	BASO	EOS	MYELO	YOUNG	BAND	SEG	LYMPH	MONO	TOT POLIS			NRBC

COMMENTS:

REQ BY

HEMATOLOGY LAB - A

BUSINESS OFFICE - B

HEMATOLOGY LAB - A

L122U (9-69) L122U (9-69) L122U (9-69)

APPENDIX D

LABORATORY MASTER FORMS

DATE

BAYLOR UNIVERSITY MEDICAL CENTER

DALLAS, TEXAS

LABORATORY CHART I

BACTERIOLOGY

		DIFFERENTIAL									COMMENTS
mal ues	5,000 to 10,000	0–1	1–3	0	0–2	3–5	58-66	20-25	3–8	60-70	
te	White Count	Bas.	Eos.	Myel.	Yng.	Bnd.	Seg.	Lym.	Mono.	Tot. Poly.	By:

mal ues	F 12-14.5 M 14-16 GMS.	F 4-5 M 4.5-5.5 MILLION	.5-1.5%	100,000 300,000	1-4 Min.	Cap. 2-6 Min. L-W 10-15 Min.	%	F 36-42 M 40-49	80-95 ^{3}	27-32 √√ Gms.	32-38%	
te	Hemoglobin	Red Count	Retic.	Platelets	Bleed T.	Clotting T.	Prothrombin	Micro Hematocrit	M.C.V.	M.C.H.	M.C.H.C.	

BLOOD TRANSFUSIONS

te	Donor's Name	Blood Group	Cross Match	Kline

MISCELLANEOUS:

Date	Examination	Result

193-W

BAYLOR UNIVERSITY MEDICAL CENTER

NAME	FIRST NAME	MIDDLE INITIAL	(HUSBAND'S NAME)	ROOM	CASE NO.

TOR	INTERNE	ADMITTED	DISCHARGED

URINE ANALYSIS

dity					
Gravity					
ein mg. %					
ose oxidase					
cing Agents					
one					
a. Test					
/HPF					
C/HPF					
s/LPF					
tals					
helial					
us					
ers					

STOOL ANALYSIS

acter			
r			
us			
d			
C's			
sites — Ova			

GASTRIC ANALYSIS

Date—

Time						
Quantity						
Free Acid						
Total Acid						
Remarks:						
Date						
Stool Urobil.						
Urine Urobil.						

STOOL FOR BLOOD

Date	Blood	Date	Blood

P: Date— Date

	Vol.	%			
min.			Porphyrins		
hr.			Porphobilinogen		
hr.			Bence Jones		

Miscellaneous:

LABORATORY CHART II

DATE

BAYLOR UNIVERSITY MEDICAL CENTER

DALLAS, TEXAS

LABORATORY CHART III

DATE:

BLOOD GLUCOSE FASTING											
BLOOD GLUCOSE 2 HR. P.P.											
BLOOD UREA NITROGEN											
CO_2 COMB. POWER											
CHLORIDE											
SODIUM											
POTASSIUM											
AMYLASE											
PROTEIN, TOTAL											
ALBUMIN											
GLOBULIN											
PROTEIN ELECTROPHORESIS											
CHOLESTEROL, TOTAL											
CHOLESTEROL, ESTERS											
BILIRUBIN, TOTAL											
BILIRUBIN, DIRECT											
ALK. PHOSPHATASE											
S.G.O.T.											
THYMOL TURBIDITY											
CEPH. FLOC. 24 hrs.											
CEPH. FLOC. 48 hrs.											
CREATININE											
URIC ACID											
CALCIUM											
PHOSPH. INORGANIC											
ACID PHOSPHATASE											
B.S.P. 45 MIN.											

GLUCOSE TOLERANCE DATE:

	Fasting	1 HR.	2 HRS.	3 HRS.	4 HRS.	5 HRS.
BLOOD SUGAR						
URINE SUGAR						

GLUCOSE TOLERANCE DATE:

	Fasting	1 HR.	2 HRS.	3 HRS.	4 HRS.	5 HRS.
BLOOD SUGAR						
URINE SUGAR						

MR – 195 (2)
REV. 6-66

"NORMAL" VALUES IN CLINICAL CHEMISTRY

TEST/CONSTITUENT	BAYLOR VALUES			
	Literature	± 1 S.D.	± 2 S.D.	
WHOLE BLOOD				
Ammonia	100 - 300		20 - 340	ugm %
Creatinine	0.7 - 1.3	0.9 - 2.0		mgm %
Glucose	65 - 110	60 - 90		mgm %
pH	7.27 - 7.39	7.31 - 7.57		
Urea Nitrogen	10 - 18	6 - 15		mgm %
PLASMA AND/OR SERUM				
Amylase	25 - 250	57 - 276	35 - 374	turbid. units
Bilirubin, Total	0.3 - 1.2	0.4 - 1.3	0.4 - 2.2	mgm %
Bilirubin, Direct	0 - 0.4	0 - 0.4	0 - 0.7	mgm %
BSP Test	0 - 4			% retention
Calcium	4.5 - 5.5	4.3 - 5.2		mEq/L
Carotene	50 - 250			ugm %
Ceph. Flocculation - 24 hr.	0 - 1 +	0 - 1 +		
48 hr.	0 - 2 +	0 - 2 +		
Chloride	98 - 105	93 - 100	88 - 110	mEq/L
Cholesterol, Total	160 - 270	180 - 290		mgm %
Cholesterol, Esters	100 - 180	100 - 190		mgm %
CO_2 Combining Power	23 - 31	23 - 29	20 - 30	mEq/L
Cortisol 8:00 A.M.	9 - 32			ugm %
4:00 P.M.	2 - 18			ugm %
Creatine Phosphokinase				
Female	0.4 - 2.9			units
Male	0.3 - 4.5			units
Fibrinogen	200 - 400			mgm %
IC Dehydrogenase	47 - 164			units
Iron	75 - 135			ugm %
Iron Binding Capacity	20 - 40			% saturation
HB Dehydrogenase	114 - 260			units
Lactic Dehydrogenase	200 - 680	160 - 420		units/ml
LA Peptidase	3500 - 10,000			units
LDH - Vallee	40 - 78			units/ml
Lipase	0 - 1.0			units/ml
5' Nucleotidase	0 - 1.6			units/ml
Phosphatase, Alkaline	1 - 6	1 - 4	0 - 5	Bod. units
Phosphatase, Acid	0 - 0.6	0 - 0.6		Bod. units
Phosphorus	3.2 - 4.3	2.9 - 4.2	2.5 - 5.0	mgm %
Potassium	3.9 - 5.0	3.8 - 5.0		mEq/L
Protein, Total	6.5 - 7.7	6.7 - 7.3	6.3 - 7.6	gm %
Albumin	3.9 - 4.6	2.7 - 4.2		gm %
Globulin	2.3 - 3.5			gm %
Protein-Bound Iodine	3.4 - 8.0	3.3 - 8.0		ugm %
Sodium	131 - 144	134 - 146.5		mEq/L
Taymol Turbidity	0 - 5			units
G - O Transaminase	0 - 30	0 - 30		units/ml
G - P Transaminase	0 - 40	0 - 40		units/ml
Uric Acid	2.4 - 5.9	4.5 - 7.4	3.1 - 8.8	mgm %
URINE				
Amylase		11,000		units/day
Calcium	200 - 500			mgm/day
Chlorides	171 - 256			mEq/day
Creatinine	1.0 - 1.5			gm/day
5-Hydroxyindoleacetic Acid	0 - 13		0 - 13	mgm/24 hr
17 Hydroxysteroids	3 - 10			mgm/24 hr
17 Ketosteroids - Male	8 - 20, 10 - 30	5.4 - 20.6		mgm/24 hr
Female	5 - 14	3.8 - 14.6		mgm/24 hr
Porphyrins, Copro.	81 - 222			ugm/24 hr
Porphyrins, Uro.	28 - 63			ugm/24 hr
Potassium	20 - 64			mEq/day
Sodium	150 - 197			mEq/day
Vanillylmandelic Acid	1 - 7		0 - 8	mgm/24 hr
RADIOISOTOPE PROCEDURES				
Blood Volume	64 - 80	62 - 78		ml/kg
Iodine Uptake	10 - 35, 15 - 45	11 - 44		%
Oleic A. & Triolein Absorpt.	8.0 +			%
Schilling Test	9.0 +			%
T_3 Uptake	24 - 34	25 - 34		%

RM. NO. _____ DATE _____

_____ BER _____

_____ ENT _____

_____ TORS _____

BAYLOR UNIVERSITY MEDICAL CENTER

DALLAS, TEXAS

LABORATORY CHART IV.

BACTERIOLOGY

Date	SPECIMEN:	Collected:	Post. Date	SPECIMEN:	Collected:

Date	SPECIMEN:	Collected:	Post Date	SPECIMEN:	Collected:

Date	SPECIMEN:	Collected:	Post Date	SPECIMEN:	Collected:

SEROLOGY

CIAL TESTS:			
:			
eactive Protein:			
ophil (Paul-Bunnell):			
et.positive-Davidsohn Differential:			
. Latex:			
A. Positive-R 3 Test:			
Latex (Thyroiditis):			
Latex (DNA):			
remia:			
ospira:			
Titer (Todd Units):			
mentation Rate MM 1 hr:			

TEST FOR SYPHILIS:

Date	VDRL	KLINE	WASSERMANN

Agglutination Tests:				
Date:				
Widal-A				
B				
H				
O				
Weil-Felix (Rickettsia)				
Huddleson (Brucellosis)				
FTA-ABS				
Reiter Protein				

BAYLOR UNIVERSITY MEDICAL CENTER

LAST NAME	FIRST NAME	MIDDLE INITIAL	(HUSBAND'S NAME)	ROOM	CASE NO.
ATTENDING DOCTOR(S)		RESIDENT - INTERN		ADMITTED	DISCHARGED

PROTHROMBIN TIME

Date	%	Seconds	Control	Drug	Done	Date	%	Seconds	Control	Drug	Done

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BIBLIOGRAPHY

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BIOGRAPHICAL SKETCH

Thomas C. Birk, Jr. [redacted] and received his primary and secondary education in Aberdeen, Washington. Premedical education included two years at the University of Washington, Seattle, Washington, and two years at Whitman College, Walla Walla, Washington, where he graduated in 1953 with a Bachelor of Arts in biology. After graduating from the University of Washington Medical School, Seattle, Washington, in June, 1957, a one-year internship was served at Milwaukee County General Hospital, Milwaukee, Wisconsin.

In July, 1958, Dr. Birk entered the U. S. Army and was assigned to Germany, followed by a three-year residency in internal medicine at William Beaumont General Hospital, El Paso, Texas. Prior to entering the U. S. Army-Baylor Program in Health Care Administration, LTC Birk held positions as Chief of Medicine and Chief, Professional Services at the U. S. Army Hospital, Okinawa; and Chief of Medicine at the U. S. Army Hospital, Ft. Ord, California.

LTC Birk is a member of the American Medical Association, student associate of the American College of Hospital Administrators, and American Hospital Association and has been a Clinical Instructor in Medicine, University of Hawaii Medical School.

He has been awarded the Army Commendation medal with Oak Leaf Cluster.

Following completion of the course in Health Care Administration, he will be assigned as educational coordinator and Associate Professor at Baylor University for the new Physicians' Assistant Program at the Medical Field Service School, Ft. Sam Houston, Texas.

LTC Birk [redacted]