COMPUTERIZATION OF LAB-TEST ANALYSIS, RESULT AND DIAGNOSIS

(A CASE STUDY OF MINNA GENERAL HOSPITAL)

BY
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CERTIFICATION

This project has been certified as having met the requirement of the Department of Mathematics, Statistic and Computer Science. Federal University of Technology, Minna for the award of post graduate Diploma in Computer Science.

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ACKNOWLEDGEMENT

My profound gratitude goes to my almighty God for seeing me peaceful throughout the course of this project.

My sincere gratitude goes to my project supervisor Mr Ezeako for his correction, inspiration and guidance till the completion of this project.

My appreciation also goes to prof. K.R. Adeboye and the entire lectures of the department for their motivation and to other friends and well wishers whom by their encouragement I was able complete this work.

DEDICATION

This project is dedicated to my parents Mr and Mrs O. ofor and to my brothers and sisters.

ABSTRACT

The need for computerization of Lab-test Analysis, Result
d Diagnosis arises from the fact that there is a huge demand
service in the country's health sector.

Data from administrative department in form of entry
ecords, test results are utilized by the computer to analyse the
ealth condition of a patient after which treatment can proceed.

The aim of the project is to develop a highly interactive
lexible and menu driven computer based information system for
ffective information storage, retrieval and processing of
atient data for fast diagnosis before procuring treatment, to
such patient.

It is abvious that in these instances, the quality and
timeliness of information obtained will go a long way to help in
saving life.

TABLE OF CONTENTS

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 WHAT IS A COMPUTER?

A computer is an electronic device that is capable of accepting data,processing it and producing information in a human readable form. there are two basic types of computer.

1. Analogue computer and
2. digital computer.

Analogue computer produes a computation by using operations as continuosly variable physical quantities to represent other operations on other physical quantities.In other words,analogue computer can perform operations on numbers, the numbers being represented by some physical quantities or electrical signal.A slide rule for example used the addition and substraction of length to represent the muliplication and division of numbers.

Many analogue computer are one -of- a kind devices constructed to do particular job and are never precisely duplicated.

Digital computers are designed to process discrete numerals or digits.All digital devices operates by performing one or more of the basic arithmatical operations namely addition, subtration, multiplication and division on pairs of numerals.

It takes sets of numerals,processes them as directed by the instruction and provides another sets of numerals as a results.

A digital computer is made up of five basic components

i. Input section :the means by which information and instructions are taken in.

CHAPTER ONE

1.0 INTRODUCTION

1.1 SIGNIFICANTS AND RELEVANCE OF COMPUTER TO THE STUDY

A hospital is an institution for treatment of sick or injured persons. Modern hospital consist of many dept. such as outpatients,casuality,inpatients,obsectrics,paediatrics, psychiaetry, radiology, pathology, pharmacy, medical records, engineering, cathering, laundry and linen, purchasing, operation theater dietry, laboratories and many more not mentioned here.The number of department available in a particular hospital depends on the size and availability of fund and trained personnel.

In this country,the modern hospital has become the victim of natioal trends that threaten to destory its effectiveness as a house of healing. on the other hand a huge increase in demand for service and huge incerase in paperwork have overloaded the health care delivery system making it look inefficient.it is therefore the belief of the author of this project that good management can alleviate these problems by better allocation of resources, better use of proffessional time and better availaility of medical information and technology.

Thus the application of management techniques could improve the quality and quantity of medical services and the computer is a vital tool to modern management techniques.

In both computers and medicine, techinology and equipment have become essential these years which did not exist ten years ago.Development in these areas have become inter dependent.

Automation has changed medical practice to a surprising degree. In view of the multiple funtions of hospital, the data involved in this information flow is highly variable in content and importance.Data arising from the climical laboratories pharmacy orders,x-ray result are very essential in treatment of diseases and the seurity of lives.

To keep up with this explosion of information,hospitals are turning increasingly to the use of automatic coputer-based methods of information storage, handling and retrievial.

collectively, we refer to such system as hospital information system (HIS).We define a hospital information system as a high speed computer- controlled multi-station. authorized access,information flow network for the hospital and it's aim is to simplify the handling of both administrative and medical information. With this, patients history can be taken by computer from a teletype or cathode ray tube terminal (CRT).Laboratory tests can be conduted,evaluated and presented to the doctor largely without human intervention. This forms the basis for the scope of work in this project.

ii. Memory Bank:-this is where data and instructions are stored.

iii. Control section:-it coordinates the activities of the other section in solving problems according to the information previously supplied

iv. Arithmatic and logic unit :-where all calculations are carried out.

v. Output devices:- where computational results and other data are displayed in a form that can be read by human or machine.

A computer system consists of the hardware and the software.

The hardware of a computer system are the mechanical and electronic components which include the various input and output media.

The term software refers to a computer programs in a written form without which the computer hardware would be useless.

Program is a set of logic instruction written in a given rule and which instructs the computer to perform a specific task.

2.2 PROBLEM FACING HOSPITAL ADMINISTRATION IN MINNA

A glance at some of the problem of minna general hospital provides insight into the strength of the demands and the force of their influence on the computer industry.As system study of the hospital was carried out I discovered that these are the problems facing the hospitals .

(a) Administrative load : The burden of paper work in the hospital has always been heavy. As a result of huge

increase in demand for service most of the workers were not able to attained to the service of all their patients. In addition,the extension of service offered by the hospital has made the administrative procedures more complex. All these factors are reflected in the flow of data within the hospital.

(b) patients care : More of our citizens than ever before are demanding for medical care . This is partly because the young ones and the aged with their increased medical problems make up a larger percentage of the population and partly because a better educated public is demanding more and better quality medical care than ever in our society. To meet these demands, in view of the shortage of personnel and facilities, the needs for better storage and retrieval of data is very necessary.

(c) Expenses : Most of the increase in the cost of medical care is due to higher labour cost and expensive new diagnostic and therpeutic equipments needed.The experience of other industry in cutting cost and increasing productivity by judicious application of automation suggests at least the possibility of similar benefits to be realised in hospital with medical computer applications. These expectations provides a unique opportunity for computer industry and the data processing professionals.

2.3 Revence of Computer to Test and Diagnosis in a Hospital

The use of computer in hospital for test and diagnosis are partly analogues to application in business and industry.

There has been a growing interest in the application of computer technique to clinical practice. A siginifant shift may be taking place in areas where these applications are being implemented .

According to POWILLS S. USA, "hospital- pysicians link generate $4 million". It all started at a strategic planning meeting in 1970.Little company of Mary hospital (LCM) Evergreen park, 11 determine that it needed a comprehensive hospital information system that in the future would be able to "move into "physicians offices. Today, that decision is paying off to the tune of about $4million in addition to the annual income.

"It is important to us to gain physicians royalties" comments Dennis Reilly,director of management information system at LCM.To enhance that royalty and build relationship,the hospital installed a computer linking system designed by Annson systems Division of Baxter Health care corp. Northbrook II and between 1984 and 1987,50 physicians offices consisting of about 100 physicians with priviledges at LCM began accessing the hospitals integrated information system from their offices to obtain data about their patients specifically. In additon,The hospital hired a co-ordinator to train the physicians staff in computer use. The hospital also publishes a newsletter that illustrates how to use the system effectively and that shows how changing reimbursement patterns affect physicians practices.

PHOENIX, an expert system for selecting diagnostic imaging procedures. It is a computer system that assists physicians in planning the use of dignostic imaging procedures. This system guides the user through a rational sequential work-up for a variety of common clinical problems. PHOENIX provides explanation of its reasoning, description of the imaging procedures and citations of relevant literature.

Information on the condition of a patient,details of test and clinical reports are stored on a computer system, these information could be used to provide ward and patients summary reports and where a terminal has been installed for the use of the ward nursing staff, the computer provides information and reminders concerning the care of individual patients.

In some clinics, computer is used in an experimental way to interview patients before or after they see a doctor in order to collect information for patients records and even to assist with the diagnostic process. Diagnosis itself is a complex process and the symptoms of a disease are not consistent in all patients. the consultent makes a human diagnosis on the basis of the information gathered from the patients condition.

The computer assists in prescribing the correct dosage and pattern of treatment for example.

In treating cancer by radiotherapy where it is vital that the correct dosage of radium is administered and only at the exact area required. Computer are being used to make these delicate calculation using data provided by the consultant. The computer also provides a treatment timemable complete with the calculated dosage for the indivdiual patients.

The computer can act as a vast encycolpadia of medical owledge, providing the doctor with acess to an ever increasing antity of information which could not possibly be memorized.

The different medical application are in variouse stages of velopment. From the explanation above .Enough has been achieved indicate that the potential benefits of the computer to both tient and to an understaffed and overworked madical profession considerable.

.4 THE NEED FOR COMPUTERIZATION OF TEST AND DIAGNOSIS

Why the need for computerization of lab test analysis result nd diagnos why it can be performed manually might be a raised uestion.

It is worthy to note that in saving of life one should not aste any time. As a result of shortage of clinical staff and ost of clerical work staff constitutes the constriants and ottleneck in the expansion and smooth running of the hospital. ome times fatique may lead to inaccuracy of clerical work which eads to unreliability of manual procedure.

But by the computerization, data from administrative form inform of entry records, test results are utilised by the computer to analise the health condition of the patients. The omputer in turn generates printed output which is then used in he case of critical ill patients. This is done by utilizing euristic programs which match symptoms and test result with orresponding patterns for types of disease. By means of this atching process, the computer can select likely diagnosis and resent them to the doctor within some minutes.

It seems noteworthy that so many hospital throughout the world have chosen to spend their funds to install computer systems to automate clinical laboratories procedure.

CHAPTER THREE

0 SYSTEM ANALYSIS AND DESIGN

A system is a set of components that act as an organic hole. In this case it is going to comprise of the analysis of he old system, why the need for change to a new system and also he design of the new system.

system design is a drawing or pattern showing how something s done. It can also be said to be an act developed for a certain urpose or use.

The need for system design in a project of any kind cannot e over emphasized. This is because all the processes involved in the achievement of the objectives, of that particular project would be explained there.

3.1 THE MANUAL SYSTEM

To provide the maximum health care possible consistent with its resoures is the goal of the hospital whether it is governed by a private,a voluntary,or a govermental body. Health care,as it is provided by hospital can be viwed as the result of six basic activites.Diagnosis, therapy, prevention, rehabilitation, education and research. The modern hospital is active to some degree in all these areas as it fulfills its role in community.

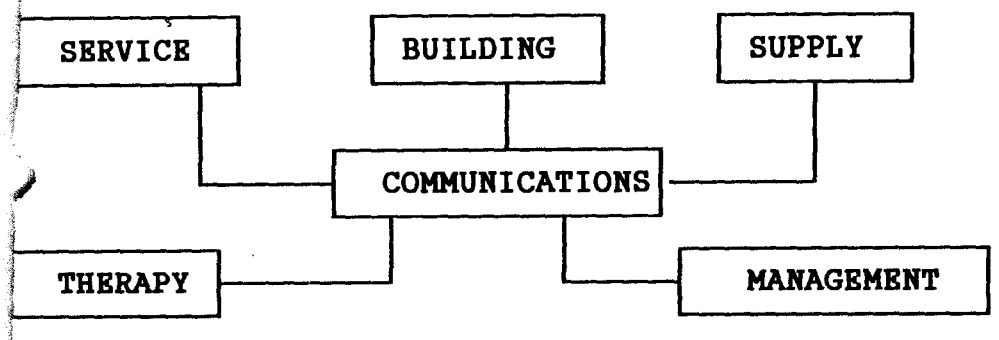


FIG 1 THE HOSPITAL SYSTEM

As a part of a community health care delivery system,the hospital is deeply involved in prevention of disease and detection and control of epidermic. A great deal of effort is expended to control contigous disease from outside sources and cross infection of patients in the hospital.It is also important to ensure against infection spreading from the hospital into the community.

Sometimes all preventive measures fail and the person becomes ill. The sick person can not be treated effectively untill the nature and cause of illness are known and the extent of damage is evaluated. Such diagnostic data are collected by many means. Some mechanical, some biochemical, some radiological and some manual. The exact procedures vary with the judgement of the physicians as he analyse his observation and the evidence provided by the test he has ordered for much of the diagnostic procedure, The doctor needs no equipment other than his hands,eyes and ears. Other more specialized procedure require complex and expensive apparatus. Few doctors can afford to maintain clinical laboatory equipments and x-ray machine for the small number of patients they treat. The work load of one or even

everal physicians would not justify such an expenses, nor will his be an effective use of community resources.

With hundreds of physicians and the thousands of patients o treat all coming to the same place for complicated diagnostic procedure. The utilisation of equipments remain high and the cost is relatively low. Most general hospitals maintain elaborate diagnostic department.

3.2 THE SERVICE SYSTEM

The service areas are those dedicated to performing the routine jobs necessary to the operation of the hospital.

It is now necessary at this point to become quite specific and quite detailed concerning the purpose of coming to the hospital.

The first stop for any patient coming into the hospital is the admit desk. Here the patient is required to pay and collect admission card. Basic data are collected concerning his complaint. The service to be given to him and his identification parameters. These basic data are used to build a skeletal medical record and start off of an accounting record for the patient is initiated.

Three general classes of data are maintained

(a) The patients admission data

(b) The test request data and

(c) The result data

In addition ,billing information ,pharmacy areas and medical records report are handled.

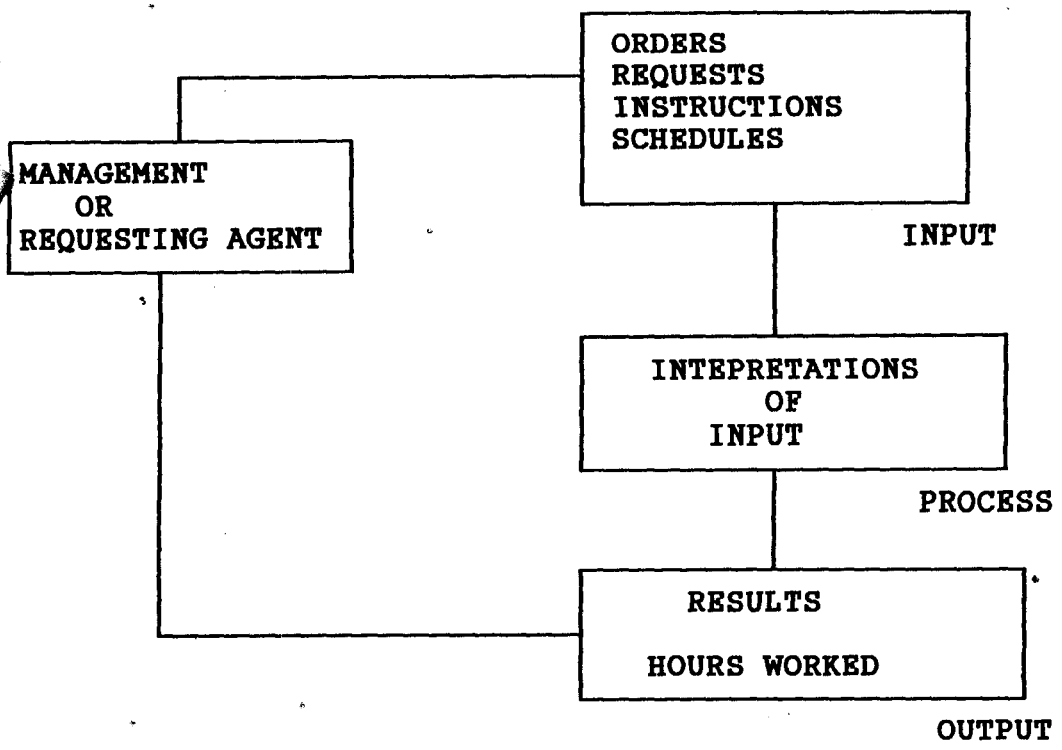


FIG 2 DATA FLOW IN SERVICE SYSTEM

3.3 THE LABORATORY SERVICE

The clinical laboratory receives test orders and samples from the wards, perform the indicated tests and prepare report on the result for the physicians and for conclusion in the medical record. In some cases, the specimen accompany the test request;at other times, laboratory personnel are sent round through the wards to collect or draw the specimens.A typical laboratory data flow diagram is shown below.

Information flow for the radiology department is very similar to that for the clinical laboratory. Input consist physicisian requests for service to be performed. Output consist of patients schedules and test results which is evaluated and reported back to the patients doctor.

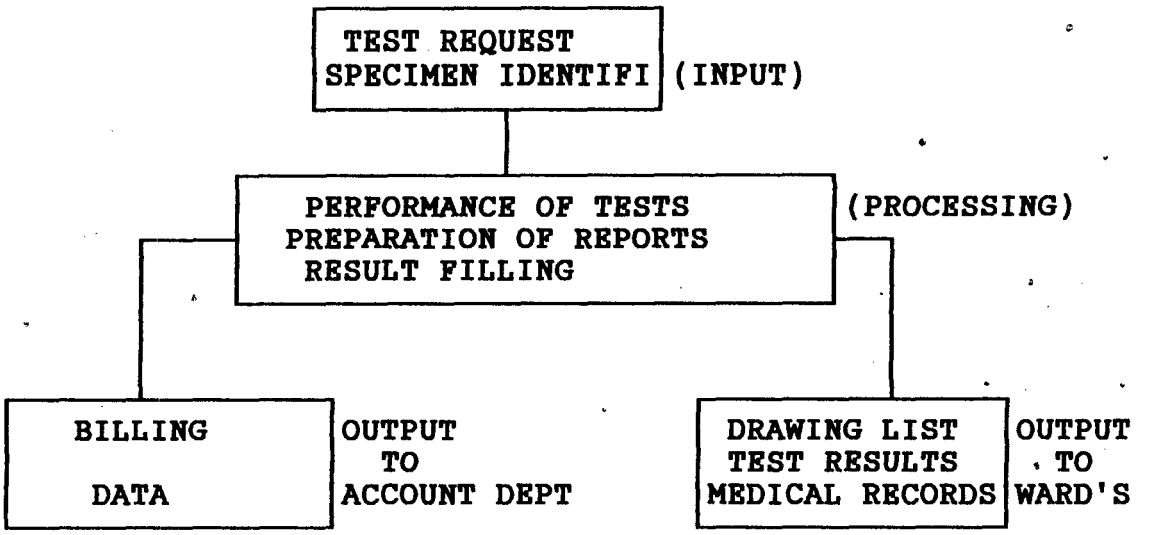


FIG 3 DATA FLOW IN THE LABORATORY

3.4 THE DIAGONOSTIIC AND THERAPITIC SERVIE

At this point after all the clinical investigation has been carried out and information relating to entire course of the patients illness are collected, the doctor then diagnosis the disease based on the observed symptoms.

The therapy activities may be classified into what is called diagnostic and rehabilitative funtions which include direct and indirect patient's care activities. Direct activities comprises of all drug administration and indirect activities comprises of the dòctor's advice and to maitain a healthy living so as to flee from these diseases.

Next is typical test request form as shown in fig 4.

3.5 THE THREE COMMON DISEASES IN REVIEW

Computerisation of lab test analysis,result and diagnosis will be based specifically on these three diseases explained below.

3.5.1 TYPHOID FEVER

A specific germ salmonella typhi of the typhoid bacillis, asuses this acute generalised infectious disease.

The germs of this disease are taken into the body through he food or drink contaminated with these germs. The agent by hich the germ is transfered to our food is the common housefly hich picked the germ from discharge of a typhoid fever patient r a carrier. When taken, the germs penetrate the blood system nd start to discharge its toxic waste which is harmful to the ody. This destabilizes the whole system and makes the individual sick.

Symptoms:

1. Tired feeling and general weakness
2. Pyrexial
3. aches and joint pain
4. loss of appetite
5. Abdominal upset

At extreme,there are reported cases of vomitting,anaemia and convulsion.

Treatment: full dosage of halfan could be administered in the case of an adult

Amoxyll capsule should also be taken based on the physician prescription.

3.5.2 PNEUMONIA

This is caused by the pnemococcus germ. The effect is the inflammation of the lungs resulting to pains in the thoracic cavity subsequently disturbing respiratory order.

SYMPTOMS:

Sudden onset of illness with violent chills accompanied by a rapidly mounting fever upto 105^0f or 40.6^0C.

There is pain on the abdomen.

Chest pain, shoulder pain.

Cough.

Spitting of rust-coloured sputum with rapid breathing which occur at extreme cases.

Treatment:

The patient should be sent to the laboratory to detect which antibiotics or sulfonamide that would eliminate the germs.The test is carried out with blood upon the detection of the germ, supportive drugs are given. Hence the administration of cough treatment, pain relieving tablets and vitamin tablets.

However the patient is on protein rich diet and adequate rest. precautionary measure should be taken which includes avoidance of cold weather and foods. This disease is more common in the tropic region.

3.5.3 MALARIA.

The signs and symptoms of ordinary malaria are too well known to need no extended description. The attacks of chills and fever for a few hours followed by drenching sweats, everyday or more often, every alternative or every third day make a typical case of the disease easily recognisable. It is generally known that malaria is caused by one or more of four types of parasites that are introduced into the blood by the bite of an anopheles

osquito which has previously bitten a person with malaria. A hronic case result in anaemia and an enlarged spleen.

It is wise for persons living in malaria region to learn as uch as to be able to detect its early presence. In such a region ny illness accompanied by fever whether characterized by ntermittent attacks or not, any tendency to increasing weakness r fatigue or any obscure malady, the nature of which is not nderstood should arouse suspicion of malaria and prompt the ndividual to seek professional help for diagnosis and prompt reatment.

Treatment:

In areas where malaria is widespread, it is advisable for reventive drugs to be taken continously based on hospital iagnosis.

Chloroquine and amodiquine can be administered.

3.6 THE DISADVANTAGES OF MANUAL SYSTEM

1. Shortage of clerical staff and cost of clerical work staff constitute a handicap and bottleneck in the expansion and smooth running of the hospitals.

2. Inaccuracy of clerical work lead to the unreliability of manual procedures.

3. The use of "medical jargons" by many physicians otherwise called technical language is a problem to most patients.

4. Slowness and difficult in attending to a patient causes the long waiting of many patients in queues.

5. In times of emergency, the patient is always in trouble if the doctor is not on seat.

6. Physicians demand for relaxation periods. Excuses from duties results to truancy and consequently risking the care of patients.

7. Clerical work, that is writing prescriptions for up to 100 patients is enough to weaken the physician.

8. Retrieval of records is always a problem , at times , it could get lost when it is being carried from consulting room to pharmacy department as a result of all these constraints,there is need for computerization so as to lessen these problems

3.7 DESIGN OF A NEW SYSTEM

Every functional part of a computer system, as well as the overall system itself, must be cost effective upon installation and must remain cost effective as long as it remains active. It is however, most important to recognise that the business of a hospital is to save lives and prevent sufferings. Therefore cost has many facets beyond the usual monetary considerations. In an economic sense, the whole practice of medicine is of doubtful cost effectiveness. It might well be cheaper to let sick people

ie rather than keep them alive at tremendous investment of time nd equipment. But medicine measures cost in terms of lives saved nd pains alleviated.

It should be clear from the previous experiences in an xisting computer environment that a computerized information ystem, to be truly beneficial to the hospital and the aboratory, must reduce errors or reduce clerical work load. This s accomplished by maintaining three general classes of data.

a. Patient admissions data.
b. Test request data and
c. Result data.

In addition, billing information, pharmacy areas and medical records reports may be handled by the new system. Entry of admissions and test request data is by keyboard, either teletype or CRT. These entries are in conversational mode with considerable editing and checking throughout under control of a sophisticated system monitor admission and test entry routines require about 30 seconds per patient with experienced data entry operators.

3.8 INPUT REQUIREMENT

The input to the new system would be the response of the patient when he/she anwsers the folliwing questions.

1. Card number. Date

2. what is your name?

3. sex?

4. what is your age?

5. what type of work do you do and where?

6. address?

7. what are your problems?

By these questions, the patient is expected to supply his name, sex, his profession and his age as his personal data .This information would help the hospital to indentify him in the hospital, make reference to his home if necessary. All these not withstanding a card number is issued to every patient as a code that should indentify each of them uniquely. Two persons could bear the same name but no two persons has the same card number, age and sex which help in the prescription guide for determining the dosage of each drug in addition. It also helps in billing.

3.8.1 KNOWLEDGE BASE FOR THE SYMPTOMS

INPUT DATA CAPTURE

WRITE 1, IF TRUE OR 0 IF FALSE

DO YOU HAVE FEVER _____ F

HEADACHE _____ H

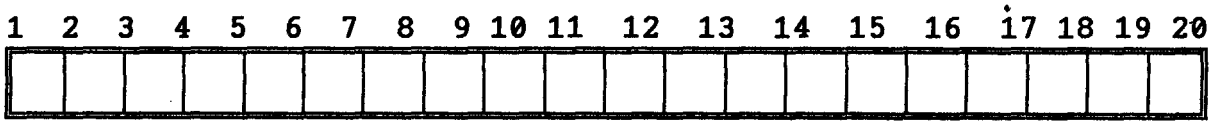
VOMITTING _____ V

YELLOW URINE	_____	U
ABDOMINAL PAIN	_____	A
SHIVERING	_____	S
LOSS OF APPETITE	_____	L
COUGH CONTAIN BLOOD	_____	B
COUGH	_____	C
CHEST PAIN	_____	P
YELLOW EYE	_____	Y
THICK RUSTY COUGH	_____	T
SLEEPING OFTEN	_____	O

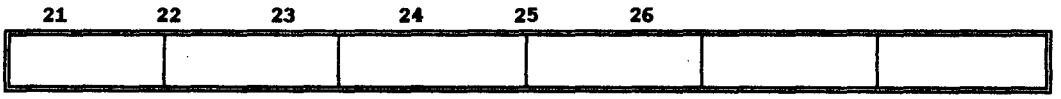
3.8.2 INPUT DESIGN REQUIREMENT

INPUT FORM DESIGN

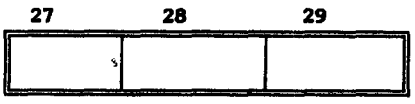
1. NAME



2. SEX

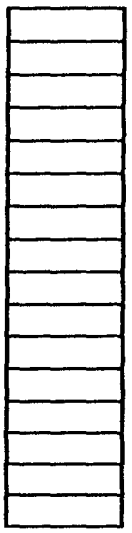


3. AGE



WRITE 1 IF TRUE AND 0 IF FALSE

1. DO YOU HAVE FEVER
2. HEADACHE
3. VOMITTING
4. YELLOW URINE
5. GENERAL WEAKNESS
6. WEAKNESS OF JOINTS
7. ABDOMINAL PAINS
8. SHIVERING
9. LOSS OF BLOOD
10. COUGH CONTAIN BLOOD
11. COUGH
12. CHEST PAIN
13. EYE RED
14. YELLOW EYE
15. THICK RUSTY COUGH
16. SLEEPING OFTEN



GUIDE TO PNEUMONIA DIAGNOSIS

1. Rusty cough is seen

2. Chest and abdominal pain

3. Pneumonia is confirmed

GUIDE TO TYPHOID DIAGNOSIS

1. Haemoglobin is slightly low

2. white blood corposcules slight low

3. serological test is positive

4. typhoid fever is confirmed

GUIDE TO MALARIA DIAGNOSIS

1. Haemoglobin is slightly low or normal

2. White blood corposcules slightly low

3. Serological test is not confirmed

4. Malaria fever is comfirmed

3.9 OUTPUT REQUIREMENT

The output consist of a variety of printed reports utilised by admissions, buildings, the physicians, the ward nurses and the laboratory technicians.

These reports include:

1. Directory of admission

2. Directory of specimen

3. Test summary and report

4. Collection list

5. Master worksheet

6. Individual report

. Prescription report

. Diagnosis report

A general flow data and sample through the laboratory as an xample using an automated system is as follows:

A list of admitted patients is sent to the laboratory once ach day for entry into the computer.

Throughout the day, test requests are received from the ward nd entered into the system. Before the morning collection ounnds up, a drawing list and sample labels are printed. The specimens are drawn and returned to laboratory with identifying labels. They are distributed to work station according to the work sheet.

Individual sheets are waiting at the laboratory where they are attached with specimens and test performed. Test result data are entered and the identification verified by the computer. Each patient test requests are completed, reports are printed and distributed to the requesting physician for prescription of drugs.

3.9.1. OUTPUT FORM DESIGNS

OUTPUT FORM DESIGNS FOR LABORATORY TEST

NAME:_____

SEX:_____

AGE:_____

LABORATORY TEST REQUEST

1. TEST FOR TYPHOID BACILLUS
2. TEST FOR PNEUMOCOCCUS PARASITE
3. TEST FOR MALARIA PARASITE

SPECIMEN: BLOOD

FIG. 6.

3.9.2. OUTPUT FORM DESIGNS FOR DIAGNOSIS

NAME:_____

SEX:_____

AGE:_____

DIAGNSIS

FIG. 7.

3.9.3. THE PROGRAM DESIGN AND TRANSLATION PROCESS

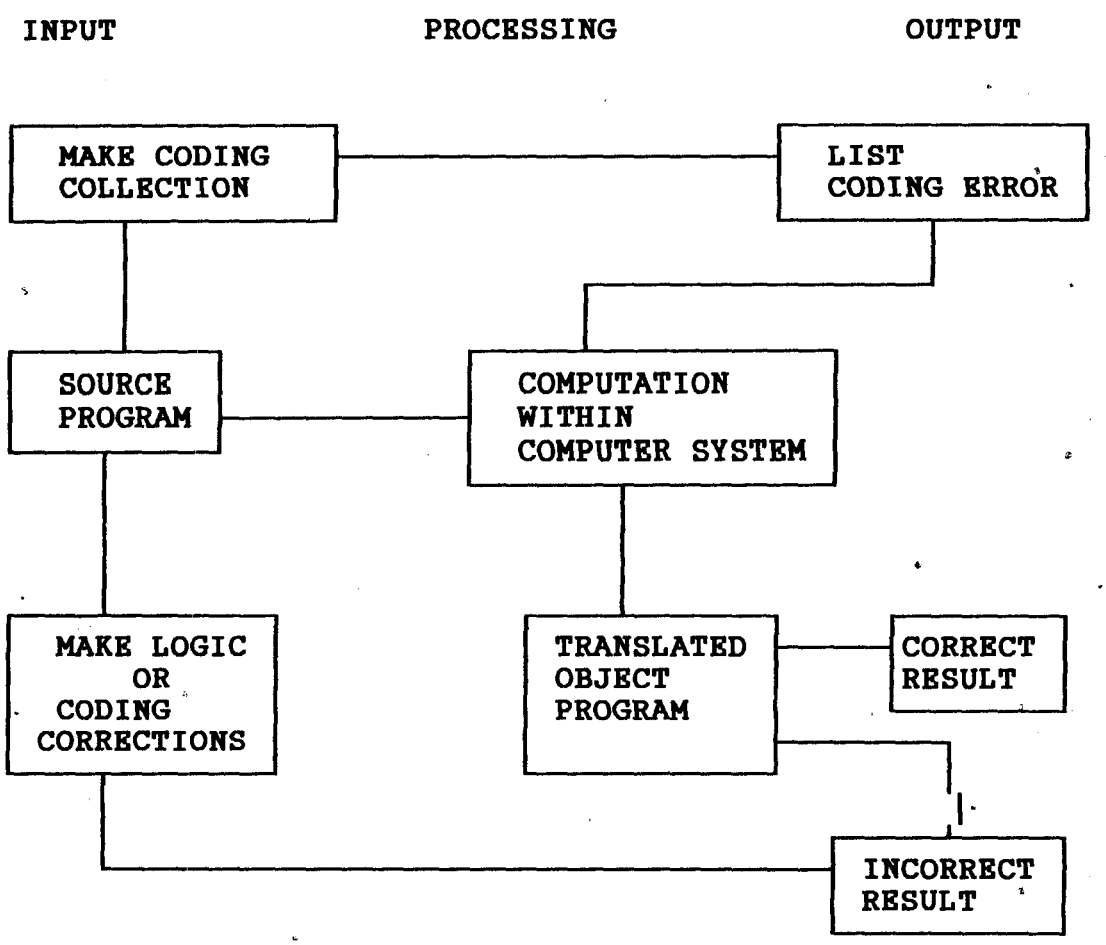


FIG 8 THE PROGRAM DESIGN AND TRANSLATORY PROCESS

The program and translation process begins with the source

program written in high level language. This is first compiled, translated into program . During compilation, coding errors (SYNTAX) could be detected. The translated object program, on the other hand may produce incorrect results. The incorrect results and coding errors are taken back for corrections. Whereas, if the translated object program and compilation is successful, correct results are produced to the users as the output.

3.9.4. THE ADVANTAGES OF THE NEW SYSTEM PROCESS

1. The resulting benefits may include the length of patient stay, providing better management reports and tools, reducing the possibility of transcription errors and establishing a data bank for teaching and research purpose.

2. The clerical staff would noolonger sit down scrathing their heads thinking of what to do rather the computer does it for them.

3. No more time wasting in searching for patients record when needed either for reference or for the patient's revisit to the hospital.

4. The quality and timelessness of information obtained will go a long way to help in saving lives and in management decision and control.

5. Security of individual records has therefore been

achieved, in addition the security of the hospital's confidential matters.

6. The information obtained from the system will be more reliable than when mistakes were always expected from each operation.

7. Doctors will have less clerical jobs that distract their professional attention from their patients.

8. Use of efficient decision rules for controls and more courses of action can now be compared, evaluated and simulated this is because assumptions and risky experiments could be simulated and quantified.

9. In case of emergency the patient is attended to even in the absence of a doctor.

3.9.5 LIMITATION AND CONSTRAINTS OF THE NEW SYSTEM

Computer is an aid to human control of his available resources as such considers no environmental factors or does not see a patient.

For this reason:

1. It could not correct error committed by the programmer, operator or analyst.

2. Rigidity in all processes and non flexibility in logic make

the workers redundant and gives no room for their own initiative to be considered.

3. Computer does not consider a deaf and dumb patient. For instance, it does not recognise an anaemic condition of a patient it could not see the colour of the patient eyes, body etc. as a result physicians help is indispensable.

4. Computer could not perform test, instead it uses the fed in result for analysis.

CHAPTER FOUR

4.0 SOFTWARE DEVELOPMENT AND IMPLEMENTATION

4.1 LANGUAGE USED

Dbase IV which is the advanced version of dbase is used. Dbase IV provides a full relational database environment to users. There is a significant improvement in the control center, indexing an improved command line editor, improved printer handling capabilities and also fast execution.

The most significant improvement of dbase Iv is the full relational database capabilities using structure querry language, (SQL).

Dbase IV provides two different method of processing data stored in its database files. They are interactive processing mode and batch processing mode.

In interactive mode two options are available namely:

- Control center mode where command are supplied to dbase IV by the selection of option available provided by the control center.
- Dot prompt mode, commands are supplied by the user by typing them from the key board.

In batch processing method the commands are stored in the form of a program and are executed in a group.

4.2 DATABASE STRUCTURE

A new database file can be created using the "create command". But the rules for the file names, field type and field size must be strictly adhered to for a good dbase file to be in

use.

A dbase file name may have upto eight characters with a letter as the first character. A field name may have upto ten characters with a letter as a first character. The type of data stored in a field is called field type. The field type has the following option:

1. Character (C) contain any printable character.

2. Logical (L) contains either true or false.

3. Numeric (N) only digit values stored as number to allow calculation.

4. Memo (M) free form character data

5. Date (D) contain date.

The field size is the field width and decimal for numeric

DATABASE STRUCTURE

NO	FIELD NAME	FIELD TYPE	WIDTH	FIELD NAME MEMORY VARIABLE
1.	HOSP-CARD	NUMERICS NUMBERS	10	HOSPITAL CARD M HOS-CARD
2.	NAME	CHARACTER	20	NAME M NAME
3.	SEX	CHARACTER	6	SEX M SEX
4.	AGE	CHARACTER	2	AGE M AGE
5.	FEVER	LOGIC		FEVER M FEVER
6.	HEAD AC	"		HEAD AC M HEAD AC
7.	Y-URINE	"		Y-URINE M Y-URINE
8.	G-WEAK	"		G-WEAKNESS M G-WEAK
9.	J-WEAK	"		J-WEAKNESS M J-WEAK
10.	ABD-PAIN	"		ABD-PAIN M ABD-PAIN
11.	SHIVE	"		SHERWING M SHERWING
12.	LOSS-APP	"		LOSS-APP M LOSS-APP
13.	C-BLOOD	"		BLOODYCOUGH M BLOODYCOUGH
14.	C	"		C M C
15.	CH-PAIN	"		CH-PAIN M CH-PAIN
16.	EYERED	"		REDEYE M REDEYE
17.	RUS-C	"		PUSTYCOUGH M R-C
18.	SLP	"		SLP-OFTEN M SLP
19.	HEA	"		HEA M HEA
20.	WEC	"		WEC M WBC
21.	SER	"		SER M SER
22.	VOM	"		VOM M VOM
23.	DGNOS	CHARACTER 15		DGNOS M DGNOS
24.	HDATE	DATE		DATE M DATE

4.3 KNOWLEDGE BASE FOR DIAGNOSIS

1. IF CHEST PAIN = 1 AND ABDOMINAL PAIN = 1 THEN PNEUMONIA IS SUSPECTED.

2. IF PNEUMONIA IS SUSPECTED AND COUGH = 1 OR PUSTY COUGH = 1 THEN PNEUMONIA IS COMFIRMED.

3. IF CHEST PAIN AND COUGH = 0 IF FEVER AND HEADACHE = 1 THEN EITHER MALARIA OR TYPHOID.

4. IF SLEEPING OFTEN = 1, OR VOMITTING = 1 THEN REQUEST FOR LAB TEST.

5. IF HAEMOGIOBIN AND WHITE BLOOD COPPOSCULTS = 0 AND SEROLOGIAL TEST = 1 THEN TYPHOID IS COMFIRMED.

6. IF HAEMOGIOBIN AND WHITE BLOOD COPPOSCULTS = 0 AND SEROLOGIAL TEST = 0 THEN MALARIA IS COMFIRMED ELSE.

7. REQUEST FOR OTHER TEST.

The rest of the symptoms presented here in the knowledge base lead to malaria, typhoid and pnenumoina diagnosis. The logic is made in such a way that a pateint who suffers from fever, headache, vomitting or sleeping often in addition to having loss of appetite, yellow colour of the eyes, passes yellow urine is seen as either a malaria or typhoid patient. But on request for

laboratory test, if the serological test confirms positive there is a typhoid patients. If serological test is not shown, malaria is confirmed.

However all these sysptoms may not mainfest at the same time as such for experimental purpose that leads to the need for laboratory confirmation.

4.4 ALGORITM

1. Open file

2. Define fields

3. Initialise file

4. Create record

5. Supply symptoms

6. If chest pain and abdominal pain, check if cough contain thick rusty sputum, if yes confirm pneumonia.

7. If not request for laboratory test

8. If haemogolbin and white blood corposule is reduced suspect typhoid or malaria.

If serological test is positive confirmed typhoid.

. If negative confirm malaria.

1. Print out the records so created.

12. Diagnosed disease.

13. Close file

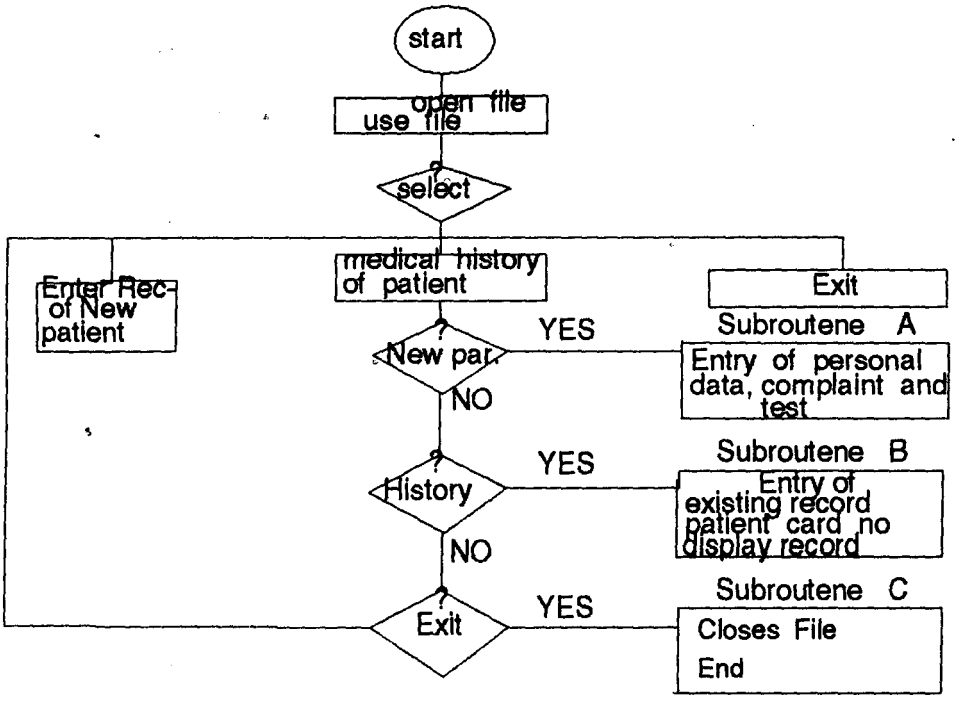
14. End.

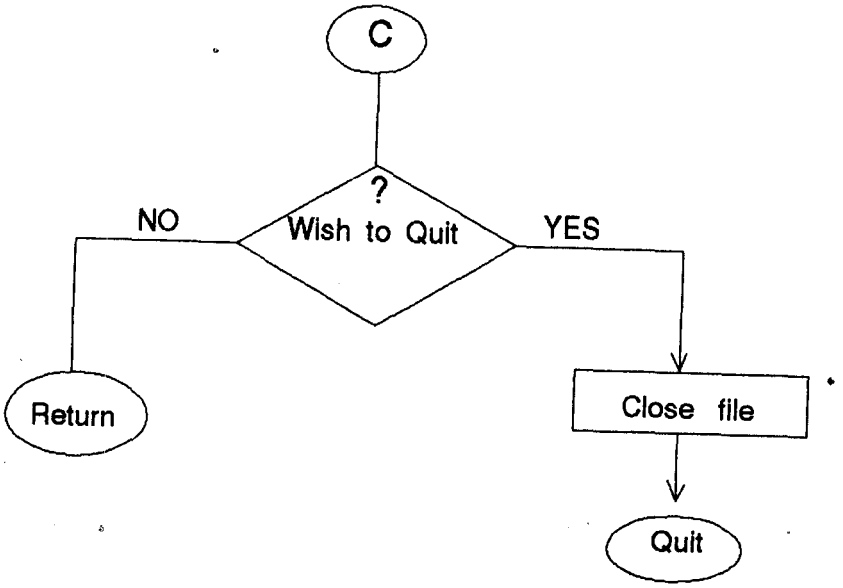
4.5 CREATION OF ADMISSION

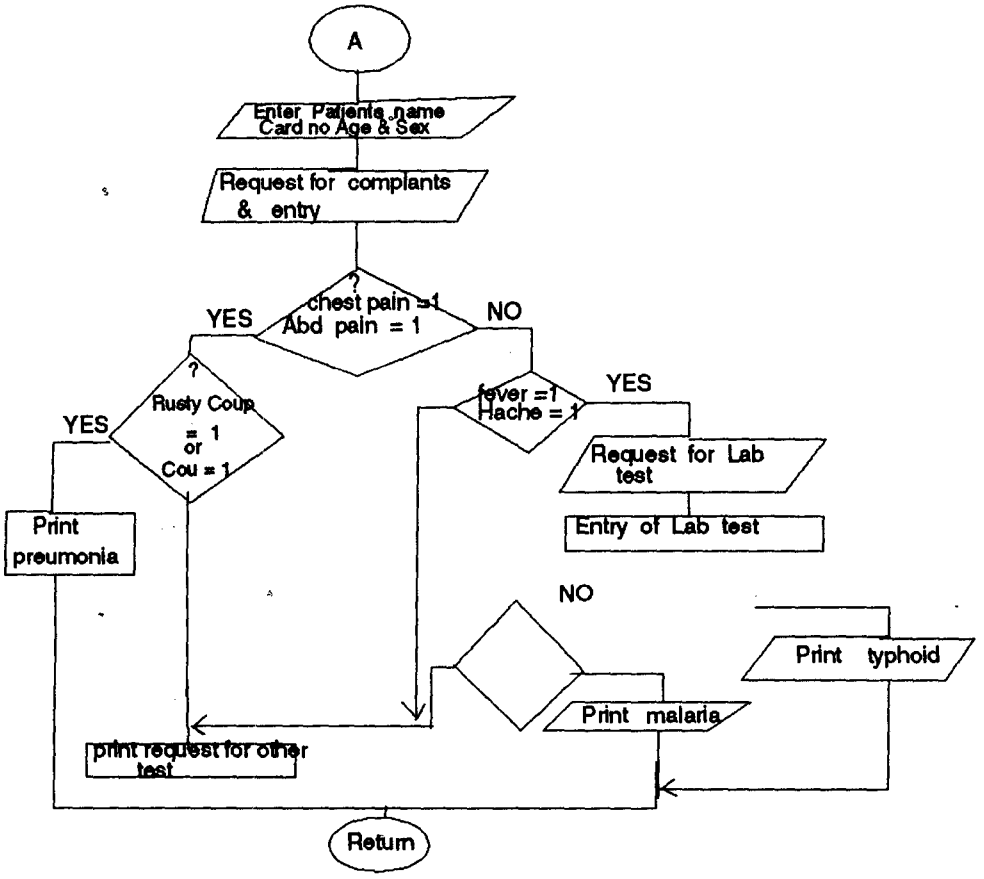
This is the databank file creation for the patient that visits the laboratory. Records of each patient is keyed into the system by the admission clerk on the first attendance to the hospital.

On the hand, if the patient visits the laboratory any other day. What is require of the patient is just to supply the card number and the system searches the databank records with the card number as the key to retrieve the record.

DIAGNOSIS LOGIC FLOW CHART




C
?
Wish to Quit
NO
YES
Return
Close file
Quit


A
Enter Patients name Card no Age & Sex
Request for complants & entry
chest pain =1 Abd pain = 1
YES
NO
Rusty Coup = 1 or Cou = 1
YES
Print preumonia
fever =1 Hache = 1
YES
Request for Lab test
Entry of Lab test
NO
Print typhoid
Print malaria
print request for other test
Return

CHAPTER FIVE

5.0 SUMMARY AND RECOMMENDATIONS

5.1 SUMMARY

In view of burden of paper work in our clinical laboratories and professional time consumed by technicians there is need for computerization.

Realising the value of life, it is necessary for hospital to provide adequate medical services to her patients. Though the cost of medical care is high probably because of the introduction of computer but the importance of this new system should not be over looked as it gives accurate and fast result for treatment of the patient to commence.

Finally, this project has attempted diagnosis in the absence of a medical expert. However, it could be adopted to reduce the total patient stay before being attended to by a doctor.

5.2 RECOMMENDATIONS

It seems noteworthy that so many hospitals throughout the world have chosen to spend their own funds to install computer system to automate business procedures and to a larger extent to assist in clinical laboratory. It is obvious that in these intances large sum of money have been utilized to achieve the goal. This illustrates that cost benefit must have been recognised and achieved.

The laboratory section of general hospital Minna uses such mputer service to my greatest surprise as I was thinking that h service would not be available in a hospital as small as at.

It is speculated that until other medical services are pable of recognising and demanding for more efficient ilization of computers things are going to work out fine in alth sector. It is recognised that the modern hospital is in ct not a single homogerous altivity, but rather a coglomeration f activities that from a functional view are only minimally elated. It is reasonable therefore that the needs for ncreased efficiency as well as the recognition of these needs ill develop at different rates.

No benefit arising from a computerized hospital the sole esponsibility of laboratory service to detect the ailment before rocuring treatment.

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M E D I C A L - D I A G O N I S E

INFORMATION SYSTEM

M A I N M E N U 13/12/99

CODE TASK

A ADD PATIENT

V VIEW PATIENT

S SYMPTOM DIAGNOSES

L LAB-TEST

Q QUIT

Please Enter Prog By : Ms NSOFOR IFEOMA Pgd/96/194

MINNA GENERAL HOSPITAL Today's Date
<--------> Test Analysis <--------- 13/12/99

Card No: 250

Name:NSOFOR IFEOMA,

Sex:F

Date Birth :07/03/80

Haemoglobin is slightly low
White blood corposules sligtly low :
serlogical test is positive :

MINNA GENERAL HOSPITAL Today's Date
<--------> Test Analysis <--------- 13/12/99

ard No: 0

Name:NSOFOR IFEOMA

Typhiod Positive
Sex:F

Date Birth :07/03/80

MINNA GENERAL HOSPITAL Today's Date
--------> Test Analysis <--------- 13/12/99

d No: 0

Name:NSOFOR IFEOMA

Typhiod Positive
Sex:F

Date Birth :07/03/80

aemoglobin is slightly low Y
hite blood corposules sligtly low : Y
serlogical test is positive : Y

MINNA GENERAL HOSPITAL Today's Date
--------> Test Analysis <--------- 13/12/99

rd No: 0

Name:NSOFOR IFEOMA

Maleria Present
Sex:F

Date Birth :07/03/80

Haemoglobin is slightly low N
White blood corposules sligtly low : N
serlogical test is positive : N

Enter (0000) To Quit

MINNA GENERAL HOSPITAL Today's Date
--------> symtom Analysis <--------- 13/12/99

Card No: 0

Name:NSOFOR IFEOMA

Suspect Typhiod/Malaria go for test
Sex:F

Date Birth :07/03/80

Do You have Fever : Y	loss of appetite : N
Headache : Y	cough with blood N
Vomitting : Y	cough N
Yellow Urine : Y	chest pain N
General Weakness : Y	Red eye N
Weakness of Joints: Y	Yellow eye N
Abdominal pains: N	Thick rusty cough N
Shivering : N	Sleeping often N

MINNA GENERAL HOSPITAL Today's Date
--------> symtom Analysis <--------- 13/12/99

Card No: 0

Name:NSOFOR IFEOMA

Pneumonia present
Sex:F

Date Birth :07/03/80

Do You have Fever : N	loss of appetite : Y
Headache : N	cough with blood Y
Vomitting : N	cough Y
Yellow Urine : N	chest pain Y
General Weakness : N	Red eye N
Weakness of Joints: N	Yellow eye N
Abdominal pains: N	Thick rusty cough N
Shivering : N	Sleeping often N

MINNA GENERAL HOSPITAL

--------> View <---------

Today's Date
13/12/99

d No: 0

Name:NSOFOR IFEOMA

Sex:F State :AN Date Birth :07/03/80

Occup: Address:

Enter (0000) To Quit

MINNA GENERAL HOSPITAL
--------> Adding Menu <---------

Today's Date
13/12/99

Card No: 250

Name: NSOFOR IFEOMA

Sex: F State : AN Date Birth : 07/03/80

Occup: STUDENT Address: BOSSO MINNA

Enter (0000) To Quit

MINNA GENERAL HOSPITAL
--------> View <---------

Today's Date
13/12/99

Card No: 0

Name:NSOFOR IFEOMA

```
LEAR
SET COLOR TO
SET TALK OFF
ET STATUS OFF
ET SCOREBOARD OFF
SET DATE BRITISH
O WHILE .T.
1,1 TO 22,75
 set color to  w+/G+r
=1
o while r<25
r 1 say repl(chr(115)+chr(245)+CHR(114),78)
r=
et color to
SET COLOR TO W+/B
3,26 SAY "M E D I C A L - D I A G O N I S E "
,26 SAY "      INFORMATION SYSTEM "
06,27 SAY "M A I N  M E N U"
05,55 say date()
3,27 SAY "      CODE     TASK"
10,27 SAY "       A       ADD PATIENT"
@12,27 SAY "      V       VIEW PATIENT"
14,27 SAY "       S       SYMPTOM DIAGNOSIS"
16,27 SAY "       L       LAB-TEST"
18,27 SAY "       Q       QUIT"
t color to
0
ET COLOR TO r+/BR
23,27 SAY "Please Enter Choice"
3,40 say "Prog By : Ms NSOFOR IFEOMA Pgd/96/194"
ET COLOR TO
O WHILE I=0
INKEY()
 UPPER(chr(I))$ "AVSLQ"
EXIT
ENDIF
0
DDO
 CASE
   CASE UPPER(CHR(I))= "A"
         clear
        do media
   CASE UPPER(CHR(I))= "V"
        do mediv
   CASE UPPER(CHR(I))= "S"
        do medisy
  CASE UPPER(CHR(I))= "L"
        do medite
SE UPPER(CHR(I))= "Q"
```

```
Set Date British
set Status Off
Set Safety On
Set Scoreboard Off
Set Talk Off
Clear All
Use TEACH
Do While .T.
STORE  0 TO MPSN,MSNUM,MCSCNUM,msal
store space(12)to MFNAM
store space(12) to mLNAM
store space(20) to moccup,madd
Store Space (3) to MQUAL
Store Space(1) to MSEX
Store CTOD("  \  \  ")  to MDATEB,MDATEA
STOR SPACE(2)  to MSTATE
store space(10) to MSSP,MRANK
Store Space(5) to MTCATE,mdept
@1,1 To 23,78 Double
set color to g+r
@2,25 Say "MINNA GENERAL HOSPITAL          Today's Date "
@3,15 Say " ---------> Adding Menu <----------"
@3,63 say date()
@4,2 to 4,77
set color to
@5,5 say "Card No:" get MPSN
                    READ
                IF  MPSN=0
                    RETURN
                ENDIF
    LOCATE FOR PSN=MPSN
           IF FOUND()
     @21,15 SAY "Duplicate Record is NOT Permitted..."
     @22,15
      WAIT
      CLEAR
       LOOP
        ENDIF

@7,45 Say "Name:" Get MFNAM
@7,65 get mlnam
@11,28 Say "Sex:" Get Msex
@11,35 SAY "State :" GET mSTATE
@11,55 say "Date Birth :" get mdateb
@13,10 SAY "Occup:" GET Moccup
@13,45 say "Address:" get madd
@21,19 SAY "Enter (0000) To Quit "
Read
Append Blank
repl psn with mpsn,fnam with mfnam,lnam with mlnam
repl qual with mqual, sex with msex,dateb with mdateb
repl datea with mdatea,ssp with mssp,tcate with mtcate
repl cscn with mcscnum,state with mstate,sal with msal
repl dept with mdept
```

```
Enddo

Set Date British
set Status Off
Set Safety On
Set Scoreboard Off
Set Talk Off
Clear All
Use TEACH
Do While .T.
STORE  0 TO MPSN
store space(35) to mblank
store space(12)to MFNAM
store space(12) to mLNAM
store space(20) to moccup,madd
Store Space(1) to MSEX
Store CTOD("  \  \  ")  to MDATEB,MDATEA
STOR SPACE(2)  to MSTATE
store "Y" to.k1
store " " to
s1,s2,s3,s4,s5,s6,s7,s8,s9,s10,s11,s12,s13,s14,s15,s16
@1,1 To 23,78 Double
set color to g+r
@2,25 Say "MINNA GENERAL HOSPITAL          Today's Date "
@3,15 Say " --------->  symtom Analysis <---------"
@3,63 say date()
@4,2 to 4,77
set color to
@5,5 say "Card No:" get MPSN
                READ
             IF  MPSN=0

                RETURN
             ENDIF
       LOCATE FOR PSN=MPSN

         IF .NOT.FOUND()
   @20,15 SAY " This Patient is NOT in the database file"
          ELSE
@7,45 Say "Name:" + FNAM +" "+ lnam
@11,28 Say "Sex:"  + sex +" "+ Occup
@13,10 say "Date Birth :"  + dtoc(dateb)
 @15,7 say "Do You have Fever :" get s1
 @16,7 say "Headache :" get s2
 @17,7 say "Vomitting :" get s3
 @18,7 say "Yellow Urine :" get s4
 @19,7 say "General Weakness : " get s5
 @20,7 say "Weakness of Joints:" get s6
 @21,7 say "Abdominal pains:" get s7
 @22,7 say "Shivering :" get s8
 @15,35  say "loss of appetite :" get s9
 @16,35 say "cough with blood" get s10
 @17,35 say "cough" get s11
 @18,35 say "chest pain" get s12
```

```
@19,35 say "Red eye" get s13
@20,35 say "Yellow eye" get s14
@21,35 say "Thick rusty cough" get s15
@22,35 say "Sleeping often" get s16
          read
         If s1=k1 .and. s2=k1 .and. s3=k1
         set color to r/g*
       @10,15 say "Suspect Typhiod/Malaria go for test"
        set color to
            endif
        If s10=k1 .and. s11=k1 .and. s12=k1
         @10,15 say mblank
        set color to b/g*
        @10,15 Say " Pneumonia present"
        set color to
         endif
@21,19 SAY "Enter (0000) To Quit "

       ENDIF
        set color to w*
 set color to
   ENDIF

  Enddo

et Date British
et Status Off
et Safety On
et Scoreboard Off
et Talk Off
lear All
se TEACH
o While .T.
TORE  0 TO MPSN
tore space(12)to MFNAM
tore space(12) to mLNAM
tore space(20) to moccup,madd
tore Space(1) to MSEX
tore CTOD("  \  \  ")  to MDATEB,MDATEA
TOR SPACE(2)  to MSTATE
tore "Y" to k1
tore " " to
1,s2,s3,s4,s5,s6,s7,s8,s9,s10,s11,s12,s13,s14,s15,s16
1,1 To 23,78 Double
et color to g+r
2,25 Say "MINNA GENERAL HOSPITAL          Today's Date "
3,15 Say " --------->  Test   Analysis <---------"
3,63 say date()
4,2 to 4,77
et color to
5,5 say "Card No:" get MPSN
                READ
            IF  MPSN=0
```

```
                    RETURN
                ENDIF
   LOCATE FOR PSN=MPSN
           IF .NOT.FOUND()
    @20,15 SAY " This Patient is NOT in the database file"
            ELSE
@7,45 Say "Name:" + FNAM +" "+ lnam
@11,28 Say "Sex:"  + sex +" "+ Occup
@13,10 say "Date Birth :"  + dtoc(dateb)
@15,10 say "Haemoglobin is slightly low" get s1
@16,10 say "White blood corposules sligtly low :" get s2
@17,10 say "serlogical test is positive :" get s3
                READ
           If s1=k1 .AND. s2=k1 .AND. s3=k1
              set color to r+b*
            @10,15 say "Typhiod Positive"
              set color to
              ELSE
         set color to g*
    @10,15 Say " Maleria Present"
          set color to
    @21,19 SAY "Enter (0000) To Quit "

             .*  clear
       ENDIF
         set color to w*
  set color to
    ENDIF
   Enddo

Set Date British
set Status Off
Set Safety On
Set Scoreboard Off
Set Talk Off
Clear All
Use TEACH
Do While .T.
STORE  0 TO MPSN
store space(12)to MFNAM
store space(12) to mLNAM
store space(20) to moccup,madd
Store Space(1) to MSEX
Store CTOD("  \  \  ")  to MDATEB,MDATEA
STOR SPACE(2)  to MSTATE
@1,1 To 23,78 Double
set color to g+r
@2,25 Say "MINNA GENERAL HOSPITAL          Today's Date "
@3,15 Say " ---------->  View <----------"
@3,63 say date()
@4,2 to 4,77
set color to
@5,5 say "Card No:" get MPSN
                  READ
```

```
            IF  MPSN=0
                RETURN
            ENDIF
 LOCATE FOR PSN=MPSN
        IF FOUND()

,45 Say "Name:" + FNAM +LNAM
1,28 Say "Sex:"  + sex
1,35 SAY "State :"  + STATE
1,55 say "Date Birth :"  + dtoc(dateb)
3,10 SAY "Occup:" +  occup
3,45 say "Address:" + add
1,19 SAY "Enter (0000) To Quit "
   Else
  clear
 set color to w*
 @10,15  say  "This Patient is NOT in the Data Base "
set color to
endif
ddo
```