Neurology Clinic Report Generation and Retrieval System:
Suggestions and Improvements

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Roffee's P.2 Little use of quant. Res. report
Report well written
EXECUTIVE SUMMARY

The purpose of this project was to improve the report generation and retrieval system currently in use in the Neurology Clinic's Electrodiagnostics Laboratory. At this time, the report retrieval system used in the lab requires a great deal of manual cross-referencing of a card catalogue containing patient information and/or a day book containing information on tests performed recently to retrieve the trace number\(^1\) necessary to print the report. This process made the report retrieval process unnecessarily cumbersome to its users, and thus this project was undertaken. After evaluating the current system, a more efficient method for retrieving the reports was devised. This system involves the use of an application developed using the database management system Paradox 3.0 to track not only the trace numbers of a given patient, but also several other pieces of information such as the name of the referring physician and clinic, the type of test performed, etc. The fact that this information will be stored within a database will make it possible for the Lab to analyze the data contained in their patient records, something that is not currently possible. Use of this software application will require the purchase of an IBM PS/2 Model 50z Computer System at a maximum cost of $2,745.40. Also required is the consolidation of the EEG and EMG terminals connected to HIS in order to provide space for the new computer system, as well as the installation of the Paradox 3.0 application on one of the existing IBM PC AT's at the transcriptionist's desk.

\(^1\)Note: Throughout this report, the terms trace number, report number and test number are used interchangeably.
Introduction

The purpose of this project was to improve the clinical report retrieval and generation system used by the Neurology Clinic's Electrodiagnostic Laboratory. This lab performs EEG and evoked potential studies for inpatient and outpatient care. In addition to Electrodiagnostic tests, this lab is concerned with Epilepsy and Sleep disorders. The function of the lab is to test and record the status of the central nervous system of patients with suspected impairments through a variety of electrophysiologic procedures.

During the fiscal year approximately 3,400 studies were performed by the lab. After these tests are performed, the results are interpreted by a physician and a detailed report of test results is prepared by the transcriptionist. This report is reviewed a final time, and then a copy of the report is sent to the requesting physician and medical records. Approximately one month later, the tracings and a hard copy of the report are microfilmed. The report is also maintained on the hard drive of the computer on which it was prepared for approximately one month. In order to track these tests, a card catalogue is kept that includes the patient name, age, record number, registration number and date. A day book is also maintained and used to track tests that have been performed more recently.

Presently, to retrieve an individual report the staff must consult the card catalogue or daybook to determine the report number, which is then used to retrieve the report from the IBM PC AT located in the back area of the office. The use of this separate card catalogue and daybook makes the retrieval
process unnecessarily cumbersome, and this project was undertaken in an effort to improve this system.

**METHODS TAKEN IN DETERMINING SOLUTION TO PROJECT**

Three primary sources of information were used in determining a more efficient method of retrieving the trace number and thus the report. The three methods were: 1) conducting interviews, 2) flow charting the processes and, 3) examining computer hardware/software alternatives.

Interviews were conducted with two physicians, the front desk staff, and the transcriptionist in the back office. Through these interviews we were able to obtain a better understanding of how the current system was being used and what aspects needed improvement.

Flow charting the processes of appointment scheduling, report generation, and report retrieval enabled us to see the processes step by step. This gave us the necessary information to look into alternatives to improve the overall process.

The various computer alternatives that we examined were: utilizing a text field in the existing HIS Patient Scheduling System; developing a separate database for either a Macintosh (written in one of the database management systems); or an IBM PS/2 (written in Condor or Paradox 3.0).

The HIS alternative was quickly discarded, due mainly to the fact that the text field is not referenced or modified solely by the Neurology Department. Another reason was that combining information elements into one field would not allow for searching on specific data items.
The Macintosh option was passed over because the department currently has several IBM computers and it would thus be considerably cheaper to implement any software package using the existing system. Also, they already have two database management system software packages, Condor and Paradox 3.0, which are both well suited to this type of application and which run on the IBM PCs. The department computer specialist noted that there are plans for networking the personal computers in the near future. Since Condor cannot accommodate a networking environment Paradox 3.0 was chosen. An application has been developed in Paradox 3.0 on an IBM PS/2 system that allows the Department to track the trace number of the test as well as several other important pieces of information on the patient.

**Current Situation**

This project encompasses three aspects of the operation of the Electrodiagnostic Laboratory: the scheduling of individual tests and report generation and retrieval. The problem with these systems is that they are unnecessarily cumbersome due to the necessity of performing manual tasks to retrieve or record desired information.

Currently, the scheduling process starts with the patient or physician calling the front desk for an appointment. Appointments are scheduled through the use of a large desk blotter (appointment calendar). Each page of this blotter represents a day of the month and each day is divided up into blocks of time that represents the amount of time required to perform the designated test. The front desk receptionist will search the appointment calendar for an open slot which is convenient for the patient. When found, this time
block is marked out as being filled. The receptionist will then grab an Appointment Schedule Information Sheet and fill it out accordingly. At the end of the day, the front desk receptionist accesses HIS through the IBM PS/2 computer and enters appointment information, for all patients given an appointment on that day, using the Appointment Schedule Information Sheet. An appointment Notice is then printed with special instructions for the patient to follow. These are mailed to the patient a few weeks prior to the test date.

The current process of the report generation starts with the patient arriving on the day of the appointment. The front desk receptionist logs the patient in the day book and assigns him/her a trace number. This implies that the day book will be in trace number and date order. It should be noted here that any time after the trace number is assigned, the cards for the catalogue can be typed up. This can vary somewhat. Usually it is done at the end of the day if the front desk receptionist has any spare time or whenever they get to be an exceeding amount. The card catalogue is kept alphabetically by name. A technician then performs the designated test on the patient and sends the results to the physician. The physician analyzes the test results and precedes to write a report on his/her analyzes. The report is then sent to the transcriptionist in the back office of the lab to be typed on a IBM PC AT computer. After this, the physician reviews the report and the transcriptionist makes corrections as needed. The report is then signed by the physician for approval. The reports are stored on the hard drive for about two months and then are down loaded to floppy disks and also eventually microfilmed.
The current report retrieval process starts with a phone call to the transcriptionist requesting a report. In order to retrieve an individual report, the trace number for that report must be known for the reports are stored by trace number. The trace number is seldom known by the requesting person. Given a name, sometimes a date, the transcriptionist must contact the from desk receptionist and have him/her look for the trace number. This requires the receptionist to consult the card catalogue or the day book to determine the trace number, which is then used to retrieve the report from the PC AT by the transcriptionist. The report is then printed and sent to the requesting person.

After examining the system currently in use, it seemed that most of the problems could be solved through the increased use of existing computer systems and the use of a database management system to store the patient data, rather than keeping this information in the card catalogue or the day book. This option was explored for two reasons: first, the use of a database to track the test numbers would speed the retrieval of the reports, for it would eliminate the manual cross-referencing of the current system; and second, because the use of a database would allow the department to track and analyze the data they have on their patients, something that is not currently possible.

Having decided to use a database management system, the next question to be answered was which one of the many systems available should be used. After conducting the interviews, it became apparent that two major points were important. First, the system should be easy to use so as to allow first time users to feel comfortable with it. Second, it should be networkable. The Neurology Clinic's computer expert,
Rameesh Kushwaha, informed us that the Clinic had just purchased Paradox 3.0, a commercially available database management system, and that it was both networkable and easy to use. Thus, the Paradox 3.0 system was chosen and the Neuro application was developed. This application allows the user to enter the patient information directly into the computer system and database while the patient is on the phone, thus eliminating the need to fill out the patient information forms or the card catalogue. Also, the clinic may now use this program to analyze the patient data they have collected, meaning that it is now possible to sort the data and determine how many tests of a particular type have been performed, or how many patients a particular clinic has referred to the Lab, etc. This type of analysis is not currently available.

**Recommendations**

The specific recommendations for implementing the Neuro application are as follows. First, the Department should use the money allocated for updating the PC AT in the back office for purchasing an IBM PS/2 Model 50z computer system at a maximum cost of $2,745.40 (see appendix for specific details). This system should be installed at the front desk for use in entering in the patient information as the tests are scheduled. A second recommendation is that the Department should consolidate the EEG and EMG HIS terminals currently in the front office into one terminal. This action will provide the space necessary to put in the newly purchased PS/2 Model 50z.
As for the computers in the back office, one of the IBM AT's should have both the Neuro Application and Display Write III installed on it. The main purpose of this computer will be to track the patient information and trace numbers, but the staff will also be able to type reports on it in periods of high usage. The second AT should only have Display Write III on it, and it's sole purpose should be the typing and retrieval of reports.

It should be noted that the patient information is entered into the database on the terminal in the front office, and that this information is also used in the back office. Since these computers are not linked, the patient data must be transfered to the computer in the back by down loading the new files to a disk and then up loading them onto the other system. This will also provide a back up database in the event of a system failure of one of the machines. Depending upon the size of the database table where the patient information is stored, it may be advisable to save this information on a floppy disk as well.

The remaining IBM PC ATs should be updated as the funds become available.

Implementation of this system will decrease the amount of time necessary to retrieve a report by making the trace number readily available. Also, this system allows analysis of data that the current system does not possess. It should be noted that the main objective of this system is to present the trace numbers of the tests in a readily accessible manner, and that if analysis of the data is the ultimate goal it may be more beneficial to either develop another application for this purpose or to use the Paradox 3.0 system itself for this purpose.
Appendices

A. Plan of Action
B. PS/2 System Specifications
C. Miscellaneous
Appendix A. Plan of Action

1. Purchase IBM PS/2 Model 50z
   - 20 Megabyte internal Hard Drive
   - 5 1/4" External Drive
   - Color Monitor
   - Cost:
     -- Max: $2,745.40
     -- Min: $2,577.97

2. Install Neuro Application on IBM PC AT in Back Office and begin inputting information stored in card catalogue.

3. Contact HIS and consolidate the EEG and EMG terminals

4. Update remaining computer systems as funds become available.
## Appendix B. IBM PS/2 System Specifications

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Contact Jill Olsen at University Stores, 998-7070 for purchasing information.
Neurology Clinic Scheduling Process

Start Scheduling Process

Patient/MD Calls Front Desk For Appointment

Front Desk Checks Appointment Calendar For Open Slots

Front Desk
- Assigns Appt. Slot
- Fills Out Appt. Sched. Info. Sheet

At End Of Day, Front Desk Accesses HIS Computer
- Enters Appt. Info.
- Prints Appt. Notice
- Mails Notice To Patient

End of Scheduling Process
Neurology Clinic Report Generation Process

Start Generation Process

On Day Of Appointment, Patient Arrives

Front Desk Logs Patient In Day Book And Assigns Tracing #

Front Desk Receptionist Types Up Cards For Catalogue

Technician Performs Test On Patient Sends Test Results To MD

MD Analyzes Test Results Writes Report Sends Report To Transcriptionist

Transcriptionist Types Report

MD Reviews Report Sends Back To Transcriptionist

Transcriptionist Makes Corrections As Needed And Gets MD's Signature

End of Generation Process
Neurology Clinic Report Retrieval Process

Start Retrieval Process

Patient/MD Calls Transcriptionist Requesting Report

Transcriptionist Contacts Front Desk For Trace Number

Is Info In Card Catalogue? No

Trace Number Is Found In Day Book

Yes

Trace Number Is Found In Card Catalogue

Trace Number Is Sent To Transcriptionist


End of Retrieval Process
**DOCUMENTATION OF SCHEDULING APPOINTMENTS FOR TESTS and CATALOGUING AND RETRIEVING REPORTS**

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