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## **NOMIS: A Computerized Information and Communications System for a Statewide Medicolegal Investigative System**

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The New Mexico Office of the Medical Investigator was created by the New Mexico State Legislature in a series of statutes which became effective on 1 July 1973. The comprehensive nature of this legislation and its subsequent statewide implementation created a unique opportunity for the effective use of electronic data processing for augmenting the functions of the office. Accordingly, preliminary planning was begun early in 1975 with the employment of two part-time programmers and the placement of equipment orders. Preliminary system development and programming was accomplished before the delivery of the equipment in June, 1976.

### **Data Processing System**

NOMIS consists of two elements, the computer hardware and the software operating system. It was important to choose the elements together to insure compatibility and support of the entire system by a single source, the manufacturer.

### **Operating System**

The choice of the operating system software for this application was more critical than the choice of computer hardware. The system had to be optimal for data base operations that involved records of various sizes. It was also necessary to have the capability for the records to grow after their initial entry into the computer. The operating system also had to lend itself to handling strings of characters because reports of death are primarily textual. In addition, it was also necessary to perform multiple, simultaneous operations such as receiving data from the state police network, editing reports of death, and querying a gross specimen museum data base.

To accomplish these ends, the MUMPS operating system was chosen. MUMPS (Massachusetts General Hospital Utility Multiprogramming System) was created at Massachusetts General Hospital as a patient record system [1]. The creation and subsequent editing and printing of a report of death are quite similar to maintaining a patient record. The initial information is usually incomplete. Data are added to the record as autopsy findings, toxicological reports, and histological findings become available. An accounting system is required to disburse payment to deputy medical investigators, district medical investigators, and designated pathologists throughout the state as services are rendered on behalf of the central office.

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MUMPS was designed for these operations. Its most salient feature is a data base management system that uses a tree structure to allow rapid storage and retrieval of information. A language processor optimized for data base operations is an integral part of the operating system. Data items in mass storage (disks) can be accessed through MUMPS as readily as data items stored in the memory of the central processing unit. Special functions allow extremely convenient, rapid manipulation of character data. For example, substrings can be extracted, strings can be concatenated, and strings can be searched for patterns. Other functions permit recognition of various character types such as numeric characters, punctuation marks, or upper or lower case.

Since the language processor is an interpreter, program development and checkout is simplified and expedited. Statements can be tested individually by inserting programmed pauses in the body of the program. Program variables and items in the data base can then be examined or changed during program execution.

The flexibility and ease of MUMPS allow a rapid implementation of the various application programs. The choice of MUMPS as the operating system also simplified the selection of the computer hardware under the constraint that single vendor maintenance was required.

## Hardware

High reliability was the primary concern in the selection of the computer hardware. Once the system was operational, it was known that additional demands would be made on it. New projects would be started that would be possible only with the aid of a computer. A computer failure would require reverting to time-consuming manual methods. Continuous system operation was required to monitor the communication link with the state police network 24 h per day, seven days per week. With these requirements in mind and with MUMPS as the preferred operating system, a PDP 11/34 (Digital Equipment Corporation, Maynard, Mass.) was chosen. Figure 1 depicts the configuration of the hardware.

The central processing unit includes a bootstrap loader to initialize the system, 64 000 bytes (characters) of parity core memory, integral hardware memory protection to afford privacy to users, and an integral extended instruction set.

The mass storage system consists of two removable disk cartridge drives, each containing 2.4 million characters of information. Average access time for information on the disk is 70 ms.

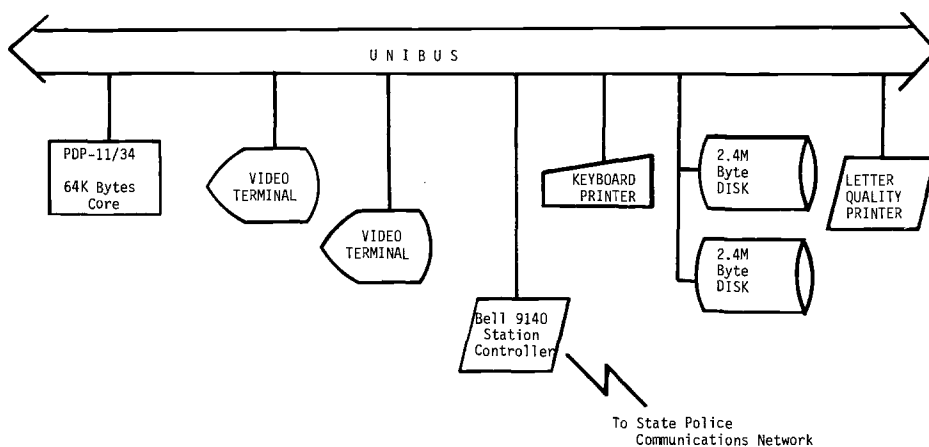


FIG. 1—Hardware configuration.

The system has four terminals: two video terminals, one 30 character per second keyboard printer, and one letter-quality printer for producing final reports.

The system is connected to the state police communications network through a 120 character per second serial asynchronous interface with modulator-demodulator (modem) control. Modem control allows the network to know if the computer is not receiving messages. The messages can then be stored and transmitted at a later time.

### **Staff**

The only full-time staff required is the programmer. He is responsible for programming backup, operation, and management of the system. He is primarily a high-level language programmer with medical application experience. It is more important that he be able to communicate effectively with the users of the system than to be familiar with the internal mechanics of the operating system.

From time to time it is necessary to have expertise applied in the intricacies of the operating system. Specifically, when the system was first installed, assistance was needed in data base and program design. It was also necessary to modify the operating system slightly so that it would recognize the line and message terminators of reports received from the communications network. The computer manufacturer provided a consultant in those instances that required operating system expertise.

### **Programming**

The most important consideration when applications programs for a system such as this are written is the proper design of the data base. Consideration was given to efficient use of storage, speed of access, and the indexing method to be used. Inefficient programs can be rewritten, but an improperly designed data base is difficult to modify because all of the programs that use it must then be changed. Each element of the data base was carefully examined to insure that the goals set for the system would be met.

The applications programs written for NOMIS can be categorized according to the following major functional components (subsystems):

- (1) report of death processing;
- (2) accounting and voucher preparation;
- (3) autopsy report generation;
- (4) specimen museum retrieval and cataloging;
- (5) word processing;
- (6) statistical calculations;
- (7) forensic anthropological facial restoration, and
- (8) renal biopsy case files.

### **Report of Death Processing**

The primary report created by the Office of the Medical Investigator is the report of death. A typical, completed report of death is shown in Fig. 2. The overall flow of information which results in this report of death is depicted in Fig. 3. The detailed item by item account of the actual record stored on the disk is given in Table 1.

As depicted in Fig. 3, a report of death may originate in one of two ways. For those cases handled directly by the central office, a preliminary report of death is manually entered into the file via a cathode-ray tube terminal by a data entry clerk. For those cases originating outside the area directly served by the central office, the report of death is originated via a teletype sent to the central office over the state police network. These tele-

Date <u>12-1-77</u> Case No. OMI- <u>2253-77-9C</u>		<b>REPORT OF DEATH</b> OFFICE OF THE MEDICAL INVESTIGATOR STATE OF NEW MEXICO School of Medicine, University of New Mexico Albuquerque, New Mexico 87131	
1 Name <u>ROE</u> <u>JANE</u> <u>A.</u>	First	Middle	
2 Address <u>Rm 355</u>			
3 City <u>Albuquerque</u> State <u>New Mexico</u>			
4 Age <u>42</u> Sex <u>F</u> Race <u>Cau</u> DOB <u>1-23-35</u>	Mo.	Day	Year
Reported By <u>dispatcher</u> Date <u>5-26-77</u> Time <u>5:00 PM</u> Agency <u>APD</u>	Mo.	Day	Year
5 Identified By <u>John Roe</u> Method <u>visual</u>			
6 Pronounced By <u>Dr. Peat Jones</u> Date <u>5-26-77</u> Time <u>5:00 PM</u> Place <u>Memorial Hosp./ER</u>	Mo.	Day	Year
7 Mortuary Preference <u>Jones Funeral Home</u> Reported by <u>ambulance rotation</u>			
8 Circumstances <u>Deceased and companion were accosted by sub-wielding husband as she left her place of employment. Both women ran back toward the factory. Deceased's companion was shot in the back but not seriously injured. Deceased ran into factory office pursued by her husband. Deceased was cornered inside the factory's offices and was shot at a</u> 9 Past Medical History (if any) <u>close range by her husband. Her husband was arrested by police at the factory entrance.</u>			
MEDICAL PHOTOGRAPHY <input type="checkbox"/> IDENT. <input type="checkbox"/> ON SCENE <input type="checkbox"/> EXTERNAL <input type="checkbox"/> INTERNAL <input type="checkbox"/> X-RAY			
Next of Kin <u>Adam Roe</u> Relationship <u>son</u>		Address <u>Green Arts, Lubbock, TX</u> Telephone <u>(806) 797-9175</u>	
Private Physician <u>Dr. Brown, Bovina, TX</u> Telephone _____		Hospital Post-Mortem Exam by Dr. _____ Consent by _____	
10 CONDITIONS, IF ANY, WHICH GAVE RISE TO IMMEDIATE CAUSE(a) <u>IMMEDIATE CAUSE</u> (a) <u>Multiple gunshot wounds</u> DUE TO, OR AS A CONSEQUENCE OF: _____ 11 STATING THE UNDERLYING CAUSE LAST. (b) DUE TO, OR AS A CONSEQUENCE OF: _____ (c) _____ 12 OTHER SIGNIFICANT CONDITIONS: Conditions contributing to DEATH but not related to cause given in part (a). _____			
13 _____		AUTOPSY (yes or no) <u>Yes</u> Location (city) where autopsy conducted <u>Albuquerque</u>	
14 Autopsy conducted by: <u>P. J. Doe</u> M.D. DATE: <u>5-27-77</u> TIME: _____		15 Death Certificate completed by Dr.: <u>P. J. Doe</u> DATE: <u>6-1-77</u>	
ACCIDENT, SUICIDE, HOMICIDE, OR UNDETERMINED (Specify) _____		DATE OF INJURY HOUR _____ HOW INJURY OCCURRED _____	
16 <u>Homicide</u>		17 <u>5-26-77</u> 18 <u>3:30</u> P. 19 _____	
INJURY AT WORK (Specify if Yes or No) _____		PLACE OF INJURY At Home, Farm, Street, Factory, Office Bldg., Etc. (Specify) _____	
20 <u>No</u>		21 <u>Factory</u> 22 <u>Albuquerque Bernalillo New Mexico</u>	
Reports To: _____ Address: _____			
District Attorney <u>Bill Black</u>			
23 Law Enforcement <u>Albuquerque Police Dept.</u>			
24 Physician Attending _____			
Hospital _____			
Other _____			
26 <u>Yes</u> No. The above certification of death was provided by the District Medical Investigator.		27 COMMENTS _____	
_____ Date _____		28. Investigator <u>I.C. Smith</u> _____ N _____	

UNM-OMI-128

CASE FOLDER

FIG. 2—A typical, completed report of death.

types are stored on the computer and are printed at intervals. An example of one of these teletypes is given in Table 2. The numbered lines correspond to the numbered lines on the final report of death. In addition to serving as a case-opening device, these teletypes allow the chief deputy medical investigator to monitor the activities of the deputy medical investigators throughout the state and to institute promptly any remedial action that might be required.

Following origination of the report of death, the information available at that time is reviewed by the appropriate members of the central office staff and corrected as necessary.

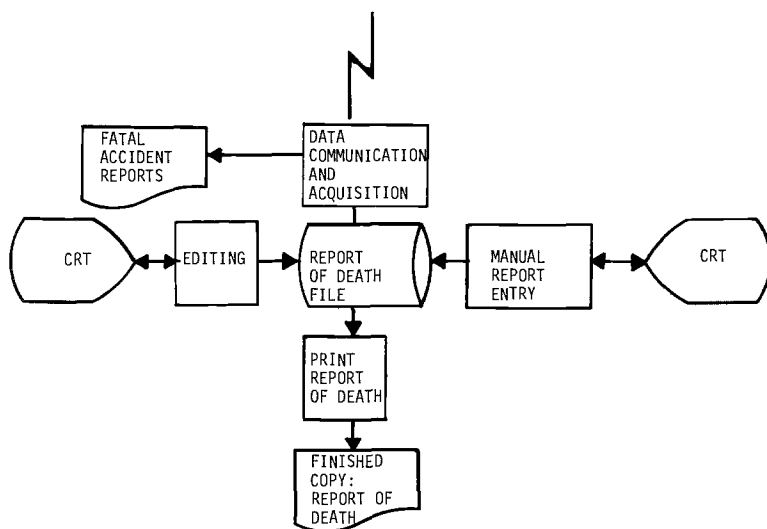


FIG. 3—*Report of death subsystem.*

This information is then edited by the data entry clerk. When all of the necessary information has been assembled, a final report of death is printed. This final report is prepared in five copies with the following distribution:

- (1) original—case folder in the central office;
- (2) blue copy—district attorney for the jurisdiction in which the death occurred;
- (3) green copy—law enforcement agency for the jurisdiction in which the death occurred;
- (4) gold copy—district medical investigator; and
- (5) yellow copy—deputy medical investigator who handled the case.

#### **Accounting and Voucher Preparation**

Figure 4 depicts the overall information flow within the accounting and voucher preparation subsystem. At the time a case is opened, the deputy medical investigator, district medical investigator, and, if an autopsy is to be performed, the designated pathologist are identified and this information, with an automatic accounting code indicating that they have not been paid for their services, is entered on lines .29 and .30 of the disk file for that case. At the end of the accounting period, the file is reviewed for those cases for which payment has not been made and a voucher is prepared for the various payees. The requirements for being paid for a case vary from individual to individual. Consequently, a payee profile file is scanned for the individual requirements, the payee's address, and voucher number.

In general, payment is made only for "completed" cases. Most deputy medical investigators are responsible for completion of the report of death, the external examination form, and for seeing that the death certificate is executed by the appropriate district medical investigator. If these items are not completed by the end of the accounting period, the voucher indicates which of these cases are incomplete and which documents are missing. Figure 5 depicts a finished voucher. In the example, payment was withheld because the external examination form had not been received in the central office.

If the case documents have not been received in the central office by the end of the next accounting period, the investigator forfeits remuneration for that investigation.

TABLE 1—Detailed item by item account of the report of death.

Line No.	Item No.	Contents
Name of File: ^ ROD		
Location of Last Record in File: ^ LST		
.01	1	case number
	2	date of report
	3	last name
	4	first name
	5	middle name
	6	street address
	7	city
	8	age
	9	sex
	10	race
	11	date of birth
	12	jurisdiction terminated (undefined if not)
.02	1	reported by
	2	date reported
	3	time reported
	4	reporting agency
	5	identified by
	6	method of identification
.03	1	pronounced by
	2	date pronounced
	3	time pronounced
	4	place pronounced
	5	mortuary preference
	6	preference reported by
.04	1	circumstances—Line 1
.05	1	circumstances—Line 2
.06	1	circumstances—Line 3
.07	1	circumstances—Line 4
.08	1	circumstances—Line 5
.09	1	past medical history—Line 1
.10	1	past medical history—Line 2
.11	1	past medical history—Line 3
.12	1	past medical history—Line 4
.13	1	photo-identification (Y or N)
	2	photo-on scene (Y or N)
	3	photo-external (Y or N)
	4	photo-internal (Y or N)
	5	X-ray (Y or N)
	6	next of kin
	7	relationship
	8	address
	9	telephone

TABLE 1—Continued.

Name of File: ^ROD		
Location of Last Record in File: ^LST		
Line No.	Item No.	Contents
.14	1	private physician
	2	physician's telephone
	3	hospital postmortem by
	4	consent by
.15	1	immediate cause of death
	2	due to or as a consequence of (B)
.16	1	due to or as a consequence of (C)
.17	1	other significant conditions
	2	autopsy (yes or no)
.18	1	location of autopsy
	2	autopsy conducted by
	3	date of autopsy
	4	time of autopsy
	5	is cause of death undetermined (Y = yes)
	6	is hour of death an approximate time (Y = yes)
	7	is date of death an approximate date (Y = yes)
.19	1	death certificate by
	2	date death certified
	3	accident, suicide, homicide, etc.
	4	date of injury
	5	time of injury
	6	how injury occurred—Line 1
	7	how injury occurred—Line 2
.20	1	did injury occur at work (yes or no)
	2	place of injury
	3	location of injury—city, county, state
.21	1	reports to district attorney and address
.22	1	reports to law enforcement and address
.23	1	reports to attending physician and address
.24	1	reports to hospital and address
.25	1	reports to other individuals and address
.26	1	certification by district MI (Y or N)
	2	date of certification by district MI
	3	comments or special procedures—Line 1
	4	comments or special procedures—Line 2
.27	1	comments or special procedures—Line 3
	2	comments or special procedures—Line 4
.28	1	deputy medical investigator

TABLE 1—Continued.

Name of File: ^ROD

Location of Last Record in File: ^LST

Line No.	Item No.	Contents
.29	1	investigator's mileage
	2	toxicology—blood sample (Y or N)
	3	toxicology—urine sample (Y or N)
	4	toxicology—vitreous fluid sample (Y or N)
	5	toxicology—bile sample (Y or N)
	6	toxicology—stomach contents (Y or N)
	7	toxicology—other (Y or N)
	8	data entry clerk's initials
	9	deputy medical investigator's number
	10	autopsy report complete (Y or N)
	11	external exam complete (Y or N)
	12	death certificate complete (Y or N)
	13	district medical investigator's number
	14	designated pathologist's number
.30	1	Line 10 statistical code
	2	Line 11 statistical code
	3	Line 12 statistical code
	4	Line 13 statistical code
	5	Line 16 statistical code
	6	was autopsy a family request (Y or N)
	7	accounting code—deputy medical investigator
	8	date of update of accounting code
	9	amount of transaction
	10	accounting code—district medical investigator
	11	date of update of accounting code
	12	amount of transaction
	13	accounting code—designated pathologist
	14	date of update of accounting code
	15	amount of transaction

After the vouchers have been prepared, the accounting information in the file is updated in one of three ways. An accounting code is entered indicating whether the individual has been paid for the case, whether the case documents were incomplete, or whether remuneration will no longer be paid because of the expiration of the time limit. For those individuals who are paid, the date of payment and the amount paid are also entered into the file. This updating is done automatically, and the additional information for paid cases allows an audit for statistical and accounting purposes.

### Autopsy Report Preparation

A computer-assisted autopsy report generation subsystem is currently under development. This subsystem incorporates both dictation and a cathode-ray tube terminal for the acquisition of autopsy data. The terminal is used for the entry of multiple-choice data and for prompting the prosector. A diagram of the information flow within this system is depicted in Fig. 6.

The initial step in this procedure is the selection of the correct autopsy protocol for the



TABLE 2—*Example of a teletype sent over state police network.*


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VN0019 1152 06/22/77 MI0002  
0810 06/23/77

1252VN NMNSP0200 062277  
MEDICAL INVESTIGATORS OFFICE

DEATH REPORT

1. JOHN ROE
2. P. O. BOX 174
3. CLEVELAND, NEW MEXICO
4. AGE/29 SEX/M RACE/CAUC DOB/ 12/18/1947
5. FAMILY MEMBERS & DRIVERS LICENSE
6. JAMES CLARK 6/21/77 AT 1212 A.M. AT SCENE OF ACCIDENT
7. SMITH FUNERAL HOME
8. VICTIM WAS DRIVING A LATE MODEL MAZDA WITH NO PASSENGERS. HE HAD SUCCESSFULLY DRIVEN THROUGH AN AREA OF CONSTRUCTION AND DETOURS AND AFTER LEAVING THE CONSTRUCTION AREA AND ONCE AGAIN DRIVING ON WELL SURFACED PAVEMENT HE LOST CONTROL OF THE VEHICLE. MR. ROE WAS PROBABLY EXCEEDING THE SPEED LIMIT WHEN HE APPARENTLY FELL ASLEEP. THE VEHICLE ROLLED 4 COMPLETE TIMES AND THREW THE DECEASED OUT ON THE LAST ROLL. SEAT BELTS WERE NOT IN USE.
9. NONE
10. MULTIPLE HEAD & INTERNAL INJURIES
- 11.
- 12.
13. NONE
14. NONE
15. THOMAS RICHARDSON M. D. ON 6/21/77
16. ACCIDENT
17. 6/20/77
18. 11:15 P. M.
19. PRESUMABLY FELL ASLEEP WHILE DRIVING
20. NO
21. PAVED HIGHWAY
22. BUENA VISTA, MORA, NEW MEXICO /RURAL AREA/
23. NONE
24. NONE
25. BLOOD, URINE AND VITREOUS
26. YES
27. TOX REQUESTED ON ALL SAMPLES FOR ALCOHOL DUE TO THE FACT THAT THIS FATALITY MIGHT BE ALCOHOL RELATED.
28. 24

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CAPT. J. D. WHITE JR., NMSP LAS VEGAS 1151 RM

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case. The protocol selected will depend on the nature of the case: operative death, child abuse, gunshot wound, and so forth. These protocols have been developed and tested on a manual basis [2]. If the prosecutor wishes to review the circumstances surrounding the case before performing the autopsy, he may recall the relevant information from the report of death file.

The prosecutor initially enters the case number, and the demographic and identification data from the report of death file are transferred to the autopsy file. A series of questions then follows. If the questions can be answered by the selection from a multiple-choice list, the prosecutor would make his choice by pressing a number key (0-9). In the event dictation was deemed necessary, the prosecutor, after dictating the case identification, would enter a

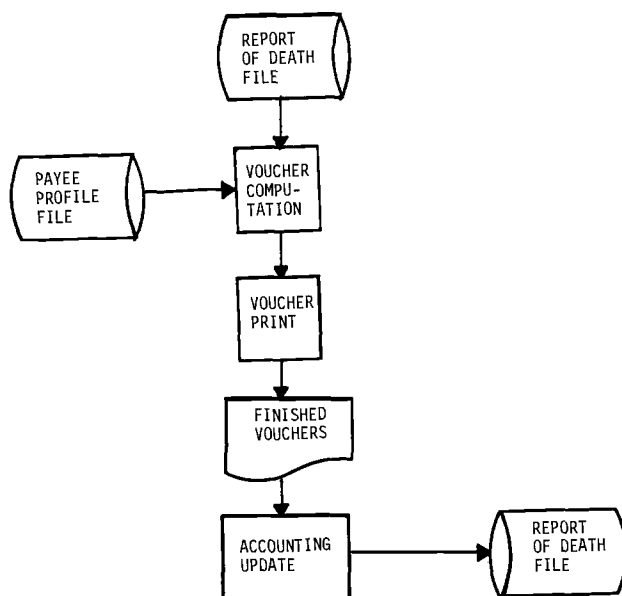


FIG. 4—Accounting and voucher subsystem.

“99” into the computer terminal and then proceed to dictate. The “99” code is stored in the computer as an indication to the transcriptionist that dictation should be inserted at that point. The terminal being used to edit the autopsy data pauses until such time as the transcriptionist has indicated that he has inserted the dictation into the report.

The use of a tree-structured logic gives the prosector complete control of the data acquisition process. He may, at any time, review and edit whatever has been entered up to that point and he may enter the data in any order he chooses; for example, he may dictate his summary prior to recording organ weights or dictating the external examination.

Transcription of the autopsy report becomes primarily an editing process with the only actual transcription being that which is necessary for those exceptions dictated by the prosector. Like the prosector, the transcriptionist has complete control over the order in which he chooses to edit the data. Upon completion of the editing process, a complete, ordered autopsy report is printed out by the computer.

Additional refinements to the system will include the necessary prompting and data entry programs to encourage the use of the problem-oriented autopsy for forensic cases as well as for hospital cases.

### Specimen Museum Retrieval and Cataloging

The New Mexico Office of the Medical Investigator is an integral part of the Department of Pathology, School of Medicine, The University of New Mexico and, as such, has teaching responsibilities at both the undergraduate and graduate medical levels. In fulfilling part of that responsibility, a gross specimen museum is maintained on an ongoing basis. A subsystem has been created to facilitate the specimen collection process and the retrieval of specimens from the collection. Figure 7 depicts the relationships and functions of the programs within this subsystem.

An example of the type of information contained in the museum data file is depicted in Fig. 8. In addition to the case number and a SNOMED [3] diagnostic code, the file contains the grade of the specimen. Specimens are graded on a scale ranging from 1 to 5,

INVOICE

OFFICE of the MEDICAL INVESTIGATOR  
 STATE OF NEW MEXICO  
 School of Medicine, University of New Mexico  
 Albuquerque, New Mexico

06-17-77

VOUCHER NO. 800529

THIS INVOICE INCLUDES ALL CASE FORMS RECEIVED BY 06-10-77

A. R. Clarke  
 Box 218  
 Ruidoso  
 NM 88345

Cases Completed and Processed for Payment.

DATE	CASE NO.	NAME	MILEAGE	CHARGES
5-27-77	2337-77-12L	WARD, JOHN HENRY	40	44.00
5-7-77	2111-77-12L	GONZALES, JUAN MANUEL	40	44.00
PAY THIS AMOUNT →				88.00

Cases Incomplete - Payment Withheld\*

DATE	CASE NO.	NAME	MISSING REPORTS
4-26-77	2207-77-12L	SHANNON, ANNA FLORENCE	EXT

\* Cases not completed within 30 days following the date of this statement will not be paid.  
 Refer to Chapter 11 (Payments of Services) Section C of the OMI Handbook.  
 UNM-OMI-02-3

FIG. 5—A finished voucher.

with 5 being reserved for the best possible specimens. As duplicate specimens become available, they are graded and checked against the file. If a better specimen is obtained, the inferior specimen is replaced with the better grade of specimen.

The museum subsystem is run entirely by the morphology technicians in consultation with the pathologists. The interactive data entry and data editing programs require no programmer intervention. A feature of MUMPS, the indirect syntax operator, allows one program to accommodate any retrieval request. The individual making the request responds to the computer with a retrieval request of virtually arbitrary complexity and the system evaluates each record in the file to determine if the particular specimen corresponding to that record meets the retrieval specifications.

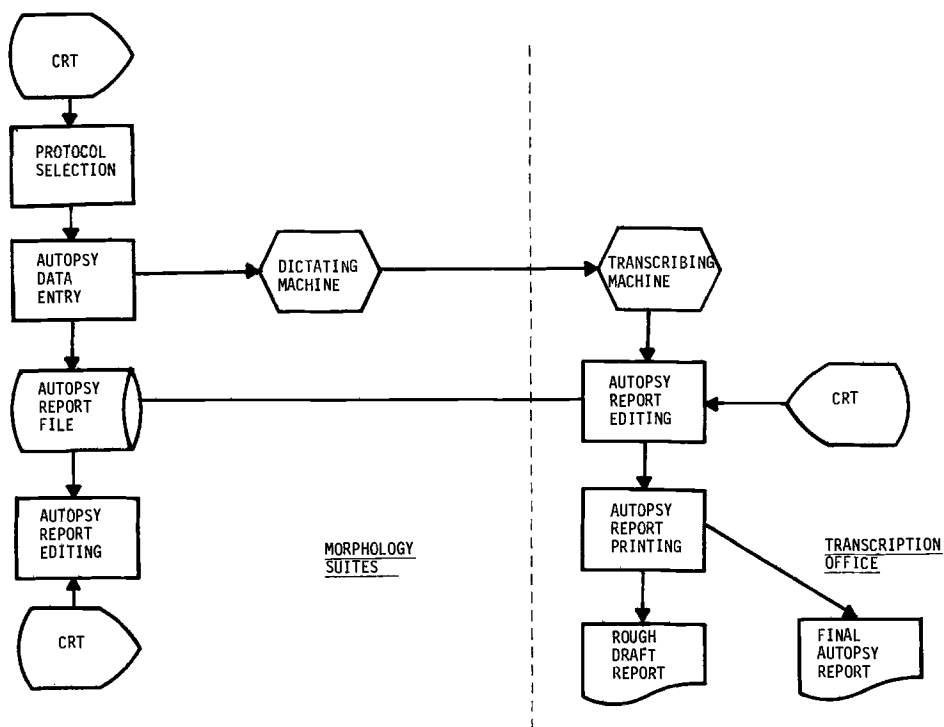


FIG. 6—Information flow diagram for the autopsy report subsystem.

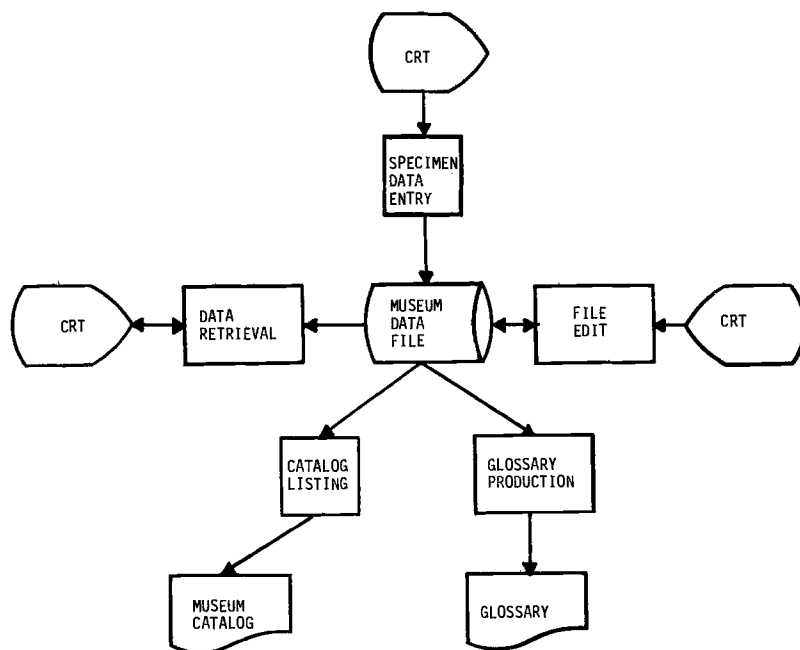


FIG. 7—Relationships and functions of programs in the museum subsystem.

OMI OR SURGICAL PATH NUMBER	075-2762
SPECIMEN ACCESSION NUMBER	HEM-001
ORGAN SYSTEM NUMBER	08
ORGAN SYSTEM NAME	LYMPH NODES
DEFINITIVE DIAGNOSIS,	
PERIAORTIC LEUKEMIC LYMPH NODES	
GRADE OF SPECIMEN	4
SNOMED CODE	08-9803
PATHOLOGICAL PROCESS CODE	98

OMI OR SURGICAL PATH NUMBER	075-2762
SPECIMEN ACCESSION NUMBER	HEM-002
ORGAN SYSTEM NUMBER	08
ORGAN SYSTEM NAME	LYMPH NODES
DEFINITIVE DIAGNOSIS,	
CERVICAL LEUKEMIC LYMPH NODES	
GRADE OF SPECIMEN	4
SNOMED CODE	08-9803
PATHOLOGICAL PROCESS CODE	98

OMI OR SURGICAL PATH NUMBER	075-2043
SPECIMEN ACCESSION NUMBER	HEM-003
ORGAN SYSTEM NUMBER	07
ORGAN SYSTEM NAME	SPLEEN
DEFINITIVE DIAGNOSIS,	
HYALINE MEMBRANE DISEASE	
GRADE OF SPECIMEN	4
SNOMED CODE	07-5110
PATHOLOGICAL PROCESS CODE	51

OMI OR SURGICAL PATH NUMBER	A75-0016
SPECIMEN ACCESSION NUMBER	HEM-004
ORGAN SYSTEM NUMBER	07
ORGAN SYSTEM NAME	SPLEEN
DEFINITIVE DIAGNOSIS,	
ACCESSORY SPLEEN IN TAIL OF PANCREAS	
GRADE OF SPECIMEN	5
SNOMED CODE	07-2235
PATHOLOGICAL PROCESS CODE	22

FIG. 8—Examples of type of information contained in the museum data file.

### Word Processing

The initial job performed with the assistance of the computer was the entry, editing, and production of camera-ready copy for the second edition of *The Medicolegal Investigation of Death in New Mexico* [2]. This book was subsequently revised and a third edition relied solely on the computer-stored manuscript of the second edition. The relationships among the files and programs of this subsystem are shown in Fig. 9. The entire system is a line-oriented text editor, which is not generally applicable to such items as routine correspondence and mailing list types of applications.

### Statistical Calculations

The report of death file and the ease of data manipulation afforded by MUMPS give us great simplicity in performing routine statistical calculations. It is possible to specify, in a general manner, the functions to be performed and the fields which compose the data for the functions. MUMPS does not readily lend itself to heavy statistical computations

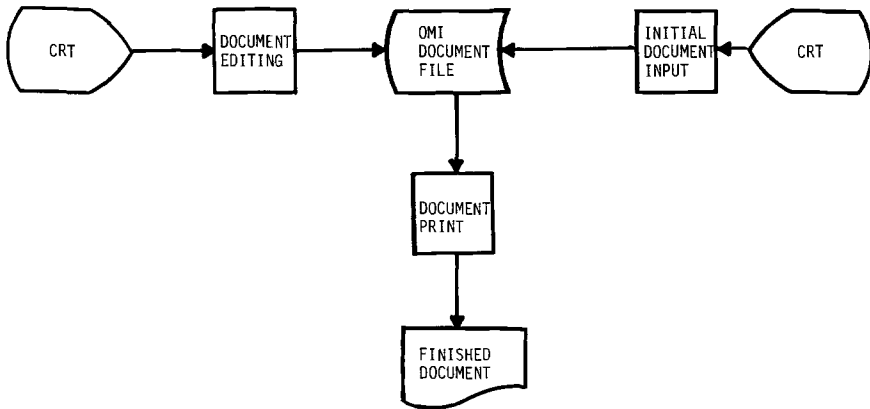


FIG. 9—Word processing subsystem.

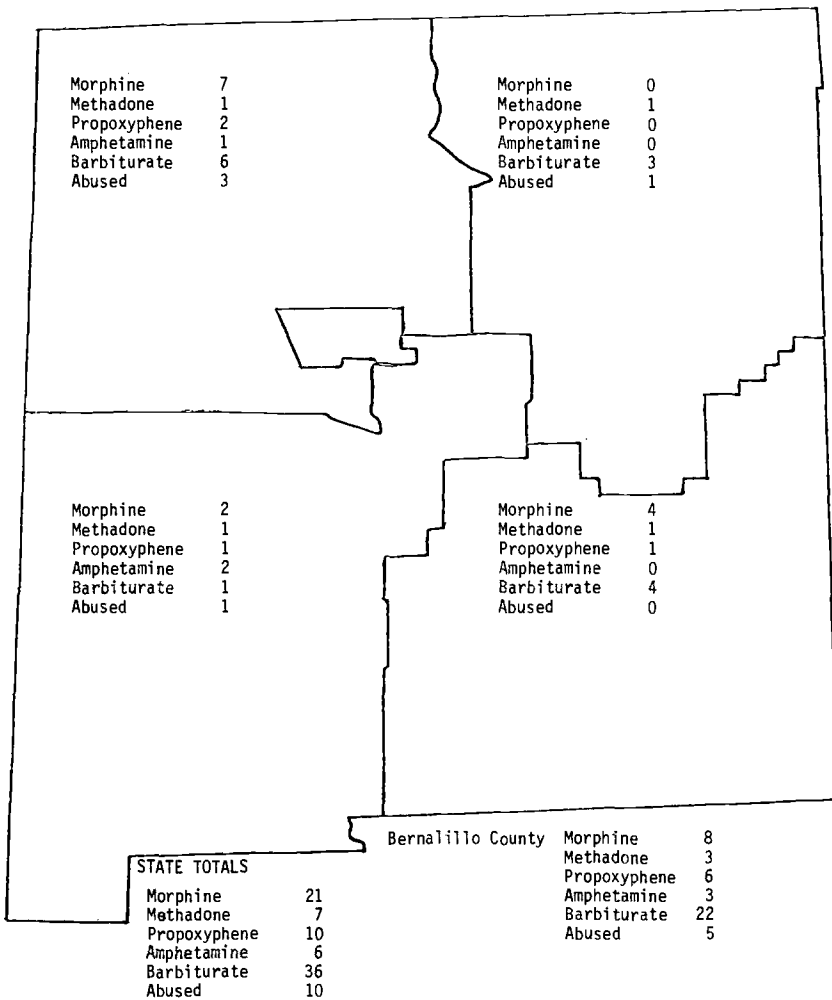


FIG. 10—An example of a report prepared through the use of the electronic data processing equipment. Chart shows the toxicological findings at autopsy in New Mexico in fiscal 1976.

such as multivariate analyses of large data sets, but it does afford great facility in such areas as tabulation and computation of averages.

The combination of convenient retrieval and the routine acquisition of data which is useful for research has enabled the office to respond quickly and with virtually no additional cost to numerous requests for research reports. Figure 10 depicts a chart prepared for the governor's Organized Crime Commission. Such report preparation is now considered a vital part of the function of the office. This ability to respond quickly and without any appreciable cost to the requesting agency is proving to be, both internally and externally, one of the most powerful justifications for the use of electronic data processing equipment with the office.

**Additional Files**

The forensic anthropological facial restoration and renal biopsy files and their associated programs for interactive data entry, editing, retrieval, and statistical computation were implemented on the computer as a direct result of the office being an integral part of the

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Project No. 2                                OMI No.
Name                                           Age 31 Sex M Group NEG
Date and Time of Death 06-01-76 4:0         Date and Time of Measurement
CONDITION: GOOD
Trauma or Other Factors Affecting Meas. FEW ABRASIONS
Physical Profile 3 --NORMAL Investigator MSMCK

                                ANTHROPMETRY (Note: E=Estimate)

Weight                               Stature                               Maximum Head Length 191
Maximum Head Breadth 146             Bizsomatic Breadth 132
Bizsomial Breadth 113               Total Facial Height 117
Upper Facial Height 73              Minimum Frontal Breadth 108
Internal Interorbital Breadth 33     External Interorbital Breadth 103
Ear Height L 68 R                   Ear Breadth L R
Nasal Breadth

Labial Height 30 Projection 20        Length 45
Breadth 57                           Philtrum Height 27

Midorbital Fold L R                 Medial Fold L R Lateral Fold L R
None L Y R Y                        Darwin's Point L R Free Lobe L R
Intermediate L Y R Y                Adherent L R
Nasal Tip: 3 --DEPRESSED             Remarks:
Nasal Contour: 1.5 --CONCAVE         Fracture Description:
Philtrum Contour: 1.5 --STRAIGHT     Remarks:
Labial Form: 2 --THICK               Remarks:

                                TISSUE THICKNESS (To Closest 0.25 mm)

Suprasorbital L 8.5 R 8.25          Frontal Eminence L 5.75 R 5.50
Suborbital L 5.0 R 0                 Inferior Malar L 16.75 R 18.0
Lateral Orbits L 13.0 R 13.5
Supraslenoid L 15.0 R 11.0
Zsomatic Arch L 9.75 R 10.
Occlusal Line L 18.0 R 15.0
Gonion L 11.5 R 14.25
Supra M2 L 14.5 R 17.5              End of Nasal 3.0
Glabellar 6.25                      Supra-Glabellar 6.0 Nasion 5.0
Mid Philtrum 11.25                  Upper Lip Margin 14.0 Lower Lip Margin 16.0
Chin-Lip Fold 11.5                 Beneath Chin 8.75 Mental Eminence 11.75
Livi's Index -1                     Cephalic Index 0.76439790575916231D 02
Facial Index 0.886363636363637D 02  Auricular Index 0.45081967213114754D 02
Nasal Index 0.1066666666666667D 03  Labial Index 0.52631578947368421D 02

COMMENTS:
    
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FIG. 11—Example of record from the facial restoration file.

Department of Pathology within the School of Medicine. They serve to illustrate the versatility of the system and demonstrate that, even with minimal staffing, such projects can be successfully undertaken if the proper combination of hardware and operating system software is available. Examples of records from these two files are depicted in Figs. 11 and 12. Although the records appear to be complex and lengthy, their analogy to the medical record should be apparent. Both files have continued to grow in size and the individual records within these files are being continually updated.

### Summary

Following one year of planning, a computer system was installed in the New Mexico Office of the Medical Investigator to meet the information management needs of a modern, statewide medical investigation program. During the past year of operation, the system

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NAME                               BIOPSY NO. 246 AGE 42 SEX F RACE SA
DATE OF BIOPSY 05/11/76          DIAGNOSIS(ES) Misc.-CHRONIC GN

                                SERUM

SERA NO. 121          DATE 05/11/76 DAY 0          RAJI +119          C1a -
SERA NO. RB36        DATE 11/23/76 DAY 192          RAJI +4           C1a -
SERA NO.              DATE              DAY              RAJI              C1a

                                IMMUNOFLUORESCENCE

IsG          C3          Fib          IsA          IsM Not Done

Pattern No. 1                               Location
Pattern No. 2                               Location
Pattern No. 3                               Location

                                ELECTRON MICROSCOPY

GRADE OF ELECTRON DENSE DEPOSIT(S)          Location
Location                                     Location
GRADE OF FUSION FOOT PROCESSES
OTHER EM OBSERVATIONS

                                HISTOPATHOLOGY

GRADE OF PROLIFERATION 0          Description
MEMBRANOUS CHANGES 0          Description
MESANGIAL CHANGES 0          Description
CRESCENT CHANGES 0          Description
INTERSTITIAL CHANGES 1          Description FIBROSIS;MDNO
VASCULAR CHANGES 1          Description A/S

                                CLINICAL

GRAVIDA 1
PRESENTING SIGN(S): HEMATURIA-6 WK EDEMA RHD-AI,MI MURMURS
EDEMA 3 24 HR. PROTEIN (G) 6.3 CREATININE 3.2 SER. ALBUMIN
URINE ANALYSIS PROTEIN-3+ RBC-PACKED
DISEASE DURATION (MOS.) 1.5
BP 210/120 THROAT CULTURE NEG BUN 37
MEDICATIONS:
DATE OF FUE NO. 1 11/23/76 CREATININE 2.4 BP 160/80 24 HR. PROT. C3
TREATMENT
DATE OF FUE NO. 2 CREATININE BP 24 HR. PROT. C3
TREATMENT
DATE OF FUE NO. 3 CREATININE BP 24 HR. PROT. C3
TREATMENT
DATE OF FUE NO. 4 CREATININE BP 24 HR. PROT. C3
TREATMENT

                                IMMUNOLOGY

ASO 166 C3(dL/L) 125 ANA - LE PREF DNA
Antilymph Antibodies - Serum Anti-GBM Antibodies -

```

FIG. 12—Example of record from the renal biopsy file.



has commenced to meet the operation, administrative, and research needs of this program. A PDP 11/34 computer using the MUMPS operating system and connected to the New Mexico State Police teletype network and to four on-line terminals provides the hardware and the software for NOMIS. The services of one full-time programmer and some consultation by a representative of Digital Equipment Corporation provide the necessary programming and operating support for the system.

### References

- [1] Bowie, J. and Barnett, G. O., "MUMPS—An Economical and Efficient Time-Sharing System for Information Management," *Computer Programs in Biomedicine*, Vol. 6, 1976, pp. 11-22.
- [2] Weston, J. T., *The Medicolegal Investigation of Death in New Mexico. Handbook for Representatives of the Office of the Medical Investigator, State of New Mexico*, The University of New Mexico, Albuquerque, 1977.
- [3] *College of American Pathologists Systematized Nomenclature of Medicine. Trial Versions*, Vols. 1-5, American College of Pathologists, Chicago, 1975.

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