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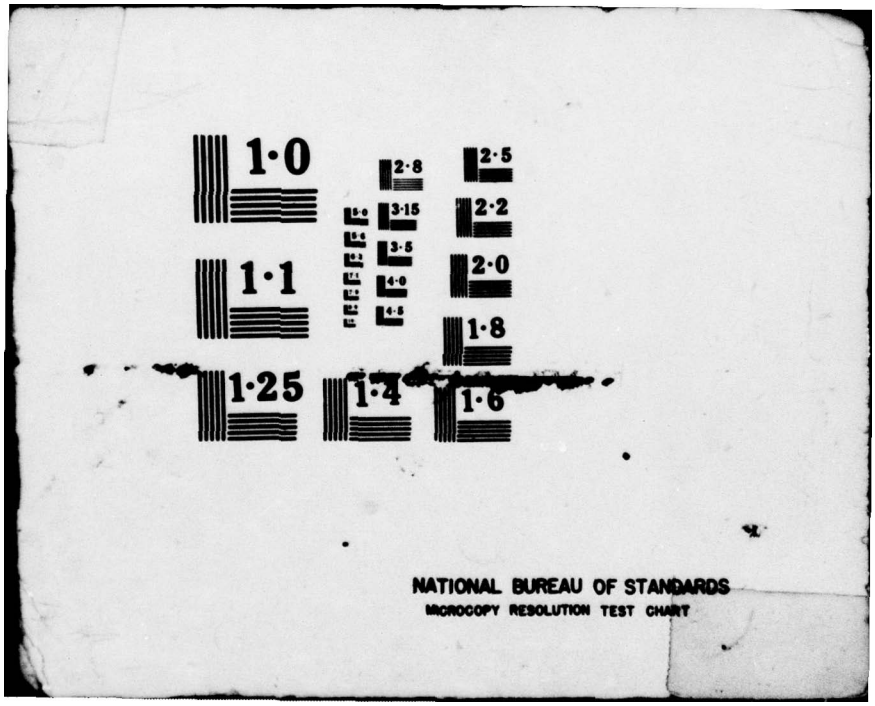
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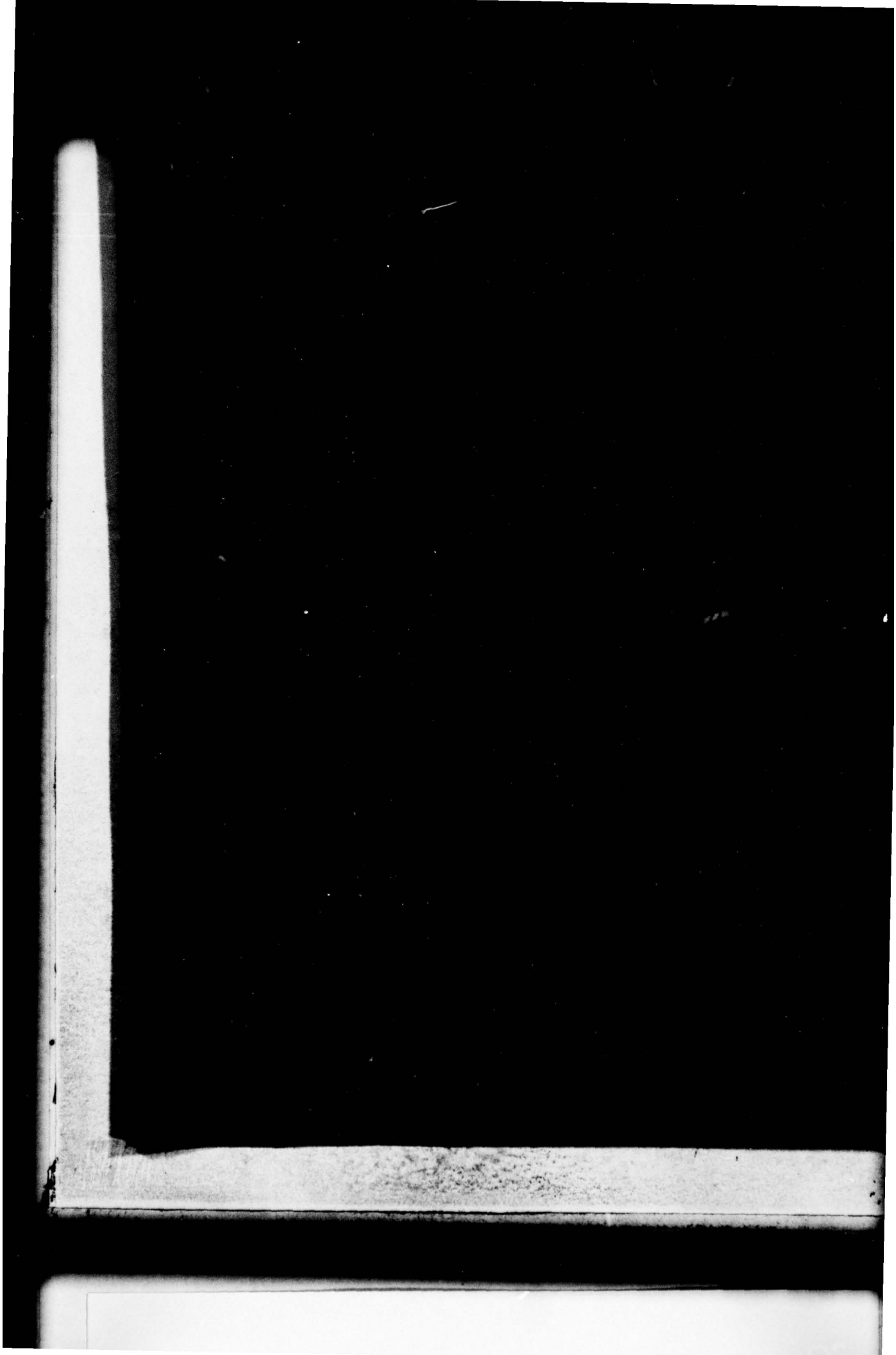

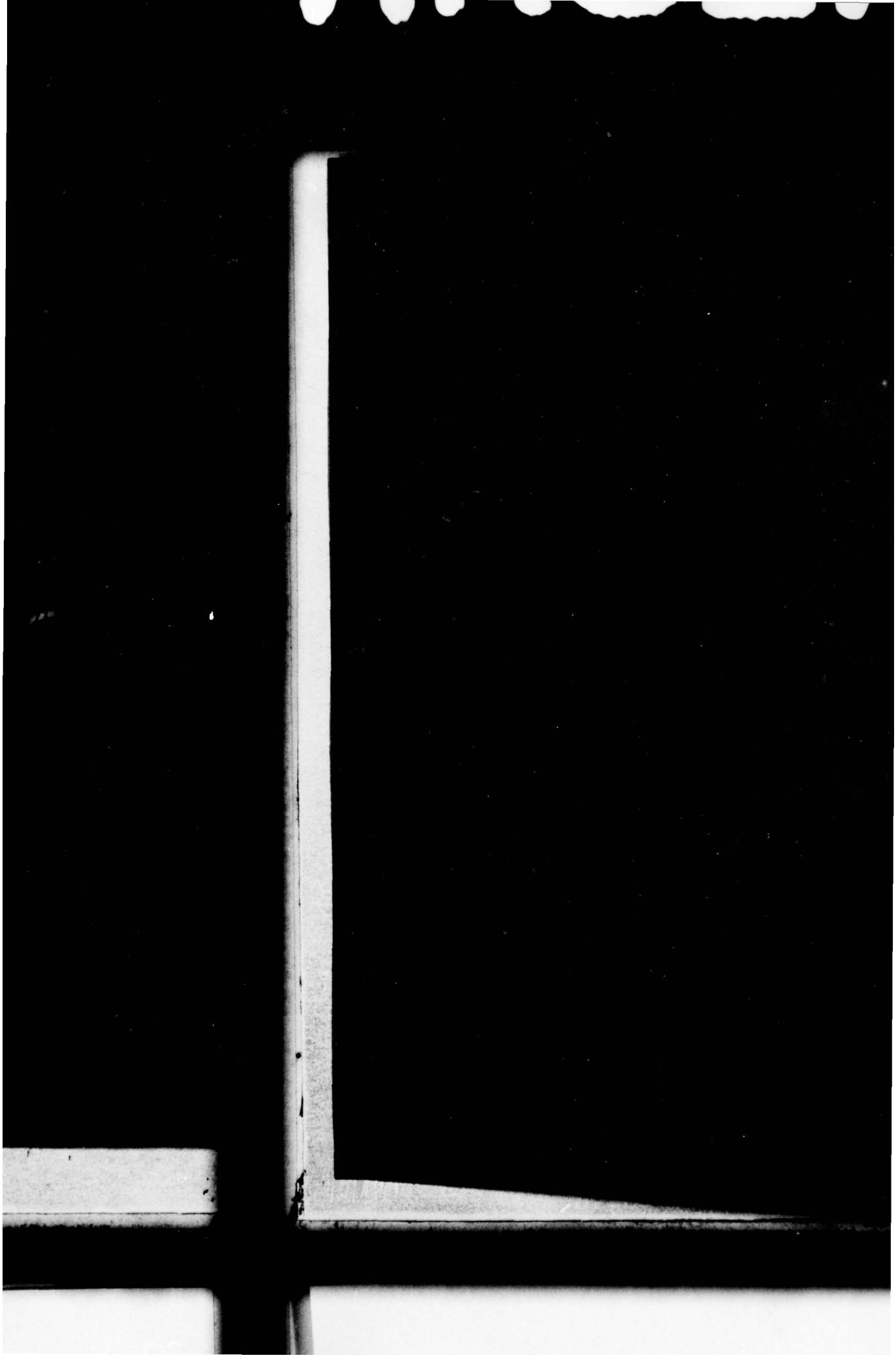

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This report presents the findings of interviews conducted in March 1978 with the pharmacy staff at Naval Regional Medical Center Charleston to obtain their subjective assessments of the performance and impacts of an automated pharmacy information system after its first 3 months of operation. Seventeen of the 20 pharmacy staff members at Charleston were interviewed, and all respondents expressed a favorable opinion of the system

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20. ABSTRACT (Continued)

and reported a positive impact of the pharmacy computer on the quality of patient care. In this report is a description of the respondents' observations of the advantages and disadvantages of the automated outpatient pharmacy system in the areas of drug interactions, patient profiles, counseling and compliance, drug information, and general outpatient dispensing methods.

HEALTH SYSTEMS DIVISION NOTE
HSDN 78-2

INTERVIEW EVALUATION OF THE DATASTAT OUTPATIENT PHARMACY SYSTEM AT NAVAL REGIONAL MEDICAL CENTER CHARLESTON

July 1978

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the TRIMIS Program Office
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ABSTRACT

The DataStat Outpatient Pharmacy System is designed to improve and expand pharmacy operations by performing such functions as the printing of labels and reports, patient profiling, interaction monitoring, and inventory control. In December of 1977, the Naval Regional Medical Center at Charleston, S.C., became the first U.S. military hospital to implement DataStat. This paper presents the results of interviews conducted in March 1978 with the pharmacy staff at NRMC Charleston to obtain their subjective assessments of the performance and impacts to date of the automated outpatient system.

The following list summarizes the benefits realized to date with DataStat, in the opinion of the pharmacy staff:

- Benefits to Pharmacists
  - Increased involvement in profiling, interaction monitoring, and compliance monitoring
  - Increased involvement as therapy advisers to physicians
  - Improvements in amount and accessibility of drug information
  - Increased awareness and ability to detect potential drug problems
  - Use as a management tool
- Benefits to Technicians
  - Increased involvement in patient care process
  - Increased pharmacist involvement with and supervision of technicians
  - Automatic typing of labels
  - Use as an educational tool

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- Benefits to Physicians
  - Possible changes in therapy and avoidance of complications
  - Improved compliance monitoring
  - Resource for patient information
  - Resource for drug information
- Benefits to Patients
  - Detection of potential drug problems
  - Decreased time required to refill prescriptions
  - Improved label accuracy and legibility
- Benefits to Others
  - Patient information resource for hospital
  - Drug information resource for command.

Benefits not realized according to the respondents are 1) reductions in patient waiting time (may have increased), 2) reductions in new technician training time (may have increased), 3) reductions in time required to print labels, and 4) the use of and associated benefits of DataStat in the area of inventory control. In addition, numerous capabilities of DataStat were reportedly not being utilized to their full potential as a result of 1) perceived understaffing, 2) physician unfamiliarity with DataStat, and 3) a large proportion of patients not yet logged into the system.

Overall the system has been favorably received by the entire pharmacy staff, and all those interviewed perceived it as having a positive impact on the quality of patient care. They have encountered no major problems with the hardware equipment or the service provided by the lessor. However,

slow terminal response times, software problems, and staff resistance to change were encountered during the first month of operation. The majority of patient comments about the system seem to be negative but become less negative after a staff member explains the functions performed by the system and the temporary circumstances contributing to patient waiting time.

Suggestions for improvements offered by the respondents include 1) using a faster label printer, 2) maintaining the same or greater staffing level with DataStat, 3) logging patients into the system elsewhere or earlier, 4) not installing the system during the busy winter months, and 5) providing better training and user instructions.

ACKNOWLEDGEMENTS

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CONTENTS

		Page
I.	ACCEPTANCE OF DATASTAT AND IMPROVEMENTS SUGGESTED BY THE PHARMACY STAFF	1
	A. Introduction	1
	B. Pharmacist Interviews	2
	1. Drug Interactions	2
	2. Patient Profiles	6
	3. Counseling and Compliance	7
	4. Drug Information	9
	5. Inventory Controls	10
	6. Outpatient Dispensing Methods	11
	7. General Questions	14
	8. Pharmacists' Overall Opinions of DataStat and Suggestions for Improvement	15
	C. Technician Interviews	18
	1. Reaction to System	18
	2. Equipment Performance and Utility	21
	3. Perceived Role Change and Suggested Improvements	22
	D. Conclusions	22
II.	INTERVIEW EVALUATION INSTRUMENTS	25
	A. Introduction	25
	B. Instruments	26
	1. Pharmacist IEI	26
	2. Pharmacy Technician IEI	45

TABLES

Table		*Page*
1	Pharmacist Response to Question on Effect of DataStat on Drug Interaction Monitoring System—Benefits	4
2	Pharmacist Response to Question on Effect of DataStat on Drug Interaction Monitoring System—Disadvantages	4
3	Pharmacist Response to Question on Benefits of DataStat Drug Information Outside the Pharmacy	10
4	Pharmacist Suggested Improvements to DataStat or its Implementation	17
5	Technician Response to Question "What do you like about the system?"	19
6	Technician Suggested Improvements to DataStat or its Implementation	23

I. ACCEPTANCE OF DATASTAT AND IMPROVEMENTS SUGGESTED BY THE PHARMACY STAFF

A. Introduction

In mid-September 1977 the first cathode ray tube (CRT) terminal was installed in the pharmacy at the Naval Regional Medical Center (NRMC), Charleston, S.C., in order to begin logging patients into the computer files of the DataStat Outpatient Pharmacy System. The system became fully operational at Charleston on December 1, 1977. About 3 months later, on March 7 and 8, 1978, interviews were conducted with the pharmacy staff to obtain their perceptions of the impacts and performance of the DataStat System. This paper reports the principal findings and insights gained from these interviews.

As of the second week in March the pharmacy staff consisted of four pharmacists and 16 technicians (techs). Three technicians were not interviewed (one was at another dispensary, one was on leave, and one was the overnight tech), leaving a total of 17 respondents. The interviews were conducted in the pharmacists' offices, with only the interviewer and the respondent present at each session. While appointments were not scheduled in advance, no interview was either rushed or abbreviated for any reason. Because of the unstructured nature of the interview, tape recorders were used with the permission of the respondent. The respondents were assured of the impartiality of the interviewer and of their own anonymity. In the analysis that follows, respondents are identified by numbers randomly assigned after all interviews were completed.

The technician interviews ranged in duration from 15 minutes to 40 minutes and averaged about 30 minutes. Two pharmacist interviews lasted 1 1/2 hours, another took 1 1/4

hours, and the fourth took 1-3/4 hours. The questions asked in the interviews were those presented in the draft, *Evaluation Plan for an Outpatient Pharmacy System (DataStat)*, Analytic Services Inc., July 1977. The two interview schedules that were used are presented in Section II. Neutral probes were supplemented by focused probes designed to steer the respondent back to the main topic or response categories without biasing his responses. While responses were unusually uniform and positive after only 3 months of automated data processing (ADP) operations, the staff were not informed beforehand of the Interview Evaluation Instrument (IEI) contents, and it is the opinion of the interviewers that the respondents were giving their own personal and candid assessments of DataStat. Finally, it should be pointed out that from the time of DataStat implementation to the time interviews were conducted, the pharmacy staffing level was reduced slightly (not a consequence of DataStat) and, with the flu season, the patient load increased from about 750 to over 1,000 prescriptions per day. These two changes had a bearing upon the performance of the pharmacy and the computer, as will become clear in the pages that follow.

B. Pharmacist Interviews

1. Drug Interactions

The first series of questions on the pharmacist IEI addressed the impact of DataStat in the area of drug interactions. All four respondents reported that their involvement in drug interaction monitoring, detection (including allergies), and counseling with physicians had increased from near zero to daily involvement in each activity, and that this was a direct result of DataStat implementation. The magnitude and importance of these new tasks to the pharmacist can be better seen by some of their comments below:

> Before [DataStat] we had no way of monitoring drug interactions. Well, there are a couple of classic drug interactions that everybody knows in pharmacy, but the only way you got to catch those was if the two prescriptions were presented at the same time. [Otherwise], we had no chance of ever comparing prescription A with prescription B. (Pharmacist #4)

> ...and drug allergies of course, we didn't even know before because we didn't get the patient's chart and the chart is what has "allergic to penicillin" in it. We never saw that. But now we see it because we inputted that data into the computer and immediately the computer tells us "allergic to penicillin" as it comes up. Before, we just had to give what the doctor wrote, with the hopes that he caught the allergies. (Pharmacist #2)

> This has precipitated a lot more calls to the physician than we ever did before. But that's good for us to communicate with them. And once we tell them about this interaction between the two drugs the patient's taken, then they'll know it for the future...I think it sort of educates the physician because half the time when we call, the doctor says, "I didn't know those interacted," or "I didn't know she was taking that." (Pharmacist #2)

> Our role has changed in that we have become more of a therapy advisor than in the past. (Pharmacist #3)

Tables 1 and 2 summarize the benefits and disadvantages of DataStat in the area of drug interactions as mentioned by the pharmacists. The advantages most often reported were that DataStat made interaction monitoring possible in the first place by profiling and acting as a fifth pharmacist, that the pharmacy staff (especially technicians) were now more aware of drug interactions, that potential lawsuits can be avoided (benefitting the physician and Patient Affairs), and that DataStat serves as a handy source of drug interaction information.

TABLE 1
PHARMACIST RESPONSE TO QUESTION ON EFFECT OF DATASTAT ON DRUG INTERACTION MONITORING SYSTEM–BENEFITS

Response Category	Number of Responses
Monitors for pharmacists where not feasible before	4
Increases staff awareness of drug interactions	2
Avoids potential lawsuits	2
Serves as information source	2
Permits faster response to inquiry	1
Compensates for understaffing	1
Involves pharmacists more at *front line* (filling line)	1

TABLE 2
PHARMACIST RESPONSE TO QUESTION ON EFFECT OF DATASTAT ON DRUG INTERACTION MONITORING SYSTEM–DISADVANTAGES

Response Category	Number of Responses
Does not distinguish between medications prepared for internal and external use	4
Lack of distinction leads to ignoring of interaction reports	2
System gives no references as bases for interaction report	1

All pharmacists mentioned one shortcoming of the DataStat drug interaction system; namely, the failure of the system to distinguish between medications prepared for internal and external use; which leads to numerous unnecessary interaction reports and to Pharmacist #4's comment:

> ...what I'm afraid of is that if I continue to ignore some things that I know are superfluous, I will get into the ignoring habit and I don't want to get into an ignoring cycle, if there is such a term.

Two respondents offered the opinion that there was some unused system potential in this area due to the lack of manpower available to follow up each potential interaction. This is the first of numerous instances where the staff (including technicians) reported underutilization of DataStat capacity as a direct result of perceived understaffing.

Respondents were asked (later in the interview) if they discussed drug interactions with prescribers and how they thought the prescribers viewed DataStat's capabilities in this area. All four pharmacists reported at least weekly drug interaction discussions with physicians and seemed to agree that while many physicians utilized the pharmacy more and changed therapy more since DataStat, many others were still unaware of the system and/or its capabilities.

> I think that they are in the *process* of perceiving more, of noticing that we are contacting them more frequently about drug interactions. (Pharmacist #3)

> If I had to say which we get more of, the change in therapy or a "thanks for calling but let them go anyway," I think we get more changes in therapy. Another thing, of course, that happens to us is this, "I told him to stop taking that other medication" or "she's not taking that anymore," that sort of thing... But there are more positive responses to our calls than negative. (Pharmacist #4)

> We have already caught 12 to 15 potential allergy problems since DataStat, and called the physician. And that's only allergies. (Pharmacist #1)

In summary, the pharmacists felt that the benefits of DataStat in the area of drug interaction monitoring and detection far outweighed the disadvantages of the system in this area and that current problems were correctable software problems. Primarily, the existence of the DataStat drug interaction system has, in the opinion of the pharmacists, enabled them to become more involved with both the physicians and the pharmacy techs, called upon their professional knowledge more often, and subsequently enhanced their ability to provide quality health care.

2. Patient Profiles

Another new role for the pharmacists at NRMC Charleston was working with the patient profile, as all respondents agreed that no profiling was done outside of the patient's chart under manual operations, nor was it feasible. The four officers also agreed that the existence of the drug profile has increased the extent of their involvement in the health care delivery process and definitely improved the quality of health care. It is from the profile that most other DataStat benefits are derived; namely, detecting interactions, overlaps (patient receives same drug from two physicians), allergies, medication stockpiling, etc. Another benefit of the profile to physicians is pointed out by Pharmacist #2:

> The military changes doctors every 2 or 3 years. No matter what doctors were there with them before, [with DataStat] the new doctor can be informed of what the patient has been on from the past, and how the patient is going with regard to medication.

Three of the four respondents felt that their professional self-image had been improved as a result of their profile-related tasks. The fourth did not perceive any change in self-image but agreed with the others that each of them receives physician inquiries almost daily for profile-related information. More often than not, the physicians examine the profiles themselves according to the pharmacists.

3. Counseling and Compliance

While interaction monitoring and detection were perceived as an important DataStat benefit by the pharmacists, they reported that the more common day-to-day assistance from the computer was provided in the area of patient compliance. The four officers felt that DataStat had not only facilitated what compliance monitoring existed before (by printing a projected refill date on the label) but here again enabled them to add new tasks; namely, checking for many more types of drug misuses than in the past. Overlap prescriptions from different physicians (duplications) were now being detected fairly often, and instances of stockpiling detection were not uncommon, especially since military patients usually receive free medications:

> ...that would never happen in a civilian practice, never. Patients just would not pay for [extra medication]. Here, with no one paying for it, with the fact that it's hard to get an appointment with a physician, and with the fact that they do have to wait in line, they try to get as much as they can. What we can do here is we can monitor to see how much a patient is taking, and to see how much they have at home. These patients stock up so much medication it borders on the point of being ridiculous. (Pharmacist #1)

All four respondents perceived improvements in their ability to detect overdue or early refills with DataStat;

however, three also mentioned that they were not utilizing its ability to detect overdue refills (i.e., obtaining a list from the computer of those who missed their scheduled refills that day or week, and consulting the physician) for two reasons:

> We don't have enough staff to perform this function, number one; and number two, we feel that we haven't yet purged the stockpile of medications that the patients have saved up from before. (Pharmacist #4)

Understaffing was also cited by two officers as the reason that numerous overlaps and instances of apparent stockpiling were still being missed or detected too late (i.e., they were not able to call up and check every profile before filling a prescription*). All four officers called understaffing the main reason that patient counseling by pharmacists has continued at a low level of involvement.

The pharmacists agreed that patient counseling was part of their work in the pharmacy; however, only two felt that DataStat had increased their involvement in this activity (the other two reported no change). Although all felt that the system had the capacity to improve patient counseling, two respondents mentioned that in addition to the staffing problem, there was no counseling window or booth where the pharmacist and patient could talk in private.

The pharmacists had all discussed patient compliance with prescribers and were evenly divided when asked whether or not they thought physicians were noticing changes in compliance since DataStat. Three of the four, however, felt that physicians were already acknowledging the capacity of DataStat to change patient compliance.

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* Almost all prescriptions are filled using what is called the *advanced function* of DataStat. In order to determine whether or not a reported overlap is a true misuse of medication, the staff member must escape from (leave) this function and call up the individual's profile.

4. Drug Information

Responses to the first IEI drug information question were related to discussions with prescribers about drug interactions and have already been presented under that topic heading. Responses to the second question again indicate a consensus that DataStat has changed the drug information system at NRMC Charleston by making more information available more readily, especially for the technicians. Typical of the comments received was that of Pharmacist #3 who commented that in his view the primary impact of DataStat on drug information was that information now appeared "in one big book versus many smaller books before."

All four officers felt that the pharmacy had already been and will continue to be improved by the DataStat drug information system for reasons similar to those listed in Table 1. They also felt that there were numerous benefits of DataStat's drug information outside the pharmacy, and these responses are presented in Table 3.

Pharmacist #2 describes the second benefit listed in more detail:

> The billing office comes to us for the patient's correct mailing address; the GP clinic called ten times just last Saturday for the new addresses and phone numbers of recent transfers into this area whom they have treated; and doctors come in here all the time for the correct home phone numbers for some of their patients.

It is also interesting to note the benefit reported by one pharmacist—that with DataStat they will know the catchment area or number of patients eligible for care at their hospital as soon as the number of outpatients appearing at the window without a red "C" marked on their ID card (C indicates logged in DataStat) decreases to near zero.

TABLE 3
PHARMACIST RESPONSE TO QUESTION
ON BENEFITS OF DATASTAT DRUG INFORMATION
OUTSIDE THE PHARMACY

Response Category	Number of Responses
Improves patient care through changes in therapy, etc.	4
Serves as most current hospital source for patient addresses and phone numbers	3
Assists the physician as well as the pharmacy	2
Serves physicians and Patient Affairs in avoiding potential lawsuits	2
Serves as more of a drug information center for the command than before	1
Will soon tell us the number of patients eligible for care at this hospital	1
Will pay for itself economically in the long run	1

5. Inventory Controls

The pharmacists reported that the pharmacy was only beginning to experiment with DataStat's inventory function in the area of controlled substances and that DataStat had not yet had any impact in the inventory area. The main obstacle to be overcome is that at NRMC Charleston the units of measure

for inventory are different from the units of purchasing and the system cannot yet accommodate this. All of the respondents, however, were optimistic that DataStat would be able to perform some valuable inventory functions in the future and looked forward to benefiting from this large source of unused system potential.

6. Outpatient Dispensing Methods

The pharmacists unanimously agreed that DataStat had changed the patient encounter at the window and that patient waiting time for routine prescriptions had not decreased. Regardless of the direction of computer impact, the seasonal increase in patient demand and the reduction in staffing served to increase patient waiting time. While most of the patients were quick to "put two and two together and blame the computer" (Pharmacist #3), the four officers could not agree as to whether or not DataStat had a net impact on waiting time.

Computer-related tasks, such as checking to see if the patient is in the computer, checking the profile for overlaps or any evidence of drug misuse, and calling the physician in cases of potential allergy or interaction problems all tend to add to the patient's wait. An even more important new source of delay was the fact that from December 1977 to March 1978 the majority of outpatients were not logged into the computer and still had to fill out the computer form. On the other hand, the new labels made some aspects of outpatient dispensing easier and faster; in particular, the time required to refill prescriptions. Two respondents felt that DataStat had increased the patient waiting time, while the other two perceived no net change and attributed patient complaints to their expectation of shorter waits

coupled with an increase in their demands for services and a decrease in staffing. The following comment echoes the concern of several staff members with patient waiting time:

> Something needs to be done to shorten the patient waiting time—that's my major complaint about the system. I feel guilty when I see little kids out there having to wait with their parents—sick, feverish, having to wait for their prescriptions. I feel very bad about this, and the techs feel the same way. (Pharmacist #3)

The second, third, and fourth interview questions in the IEI outpatient dispensing section asked the respondent to compare automatic label preparation with manual label preparation. The only point of disagreement concerned the time required to prepare labels. Two pharmacists felt DataStat had increased the time required, while the other two reported a decrease in label preparation time. Part of the difficulty in drawing a conclusion here appears to be due to changes in the way labels are prepared. One person enters label information now compared with two or three typists before; DataStat labels are printed in batches of 15 to 25 and in triplicate now compared with individual typing before; and DataStat now runs most of its checks for interactions, overlaps, etc., prior to printing the labels. The pharmacists did agree that during peak workloads, the 300-baud (30 characters per second) label printer appeared to be a bottleneck that could be eliminated by a faster printer.

All respondents reported dramatic improvements in both label accuracy and legibility, with the virtual elimination of spelling errors, incomplete information, cross-outs, type-overs, and lost prescriptions. The respondents mentioned fewer lost prescriptions as a result of having the label

printed in three parts, all with the correct prescription number; part 1 for the bottle itself, part 2 for the prescription blank, and part 3 as a bag label for those patients returning later to pick up medications.

Finally, in regard to labels, the respondents were asked to compare the amount of information on the new label with that on the old labels that were prepared manually. All reported an increase in the amount of information and cited the projected refill date and the three-part label printing as being improvements associated with DataStat. They perceived the prescription check process (ensuring that the prescription, the label, and the medication correspond) as being essentially unchanged, except that improvements in label accuracy and computer numbering of the three label parts had reduced the frequency of errors and lost prescriptions.

When asked if DataStat had changed any other drug dispensing activities, two pharmacists mentioned additional differences in label preparation. For any given label a technician need only type a few codes and abbreviations, and the computer will do the rest. Because labels were being printed in batch, however, this meant that they had to be paired with the original written prescriptions which could result in mismatching—unlike the manual method of typing labels from the prescription.

In summary, the pharmacists were pleased that they were "definitely preparing a more professional product" (Pharmacist #4) that was being delivered to the patient more carefully, legibly, and accurately; however, they were disappointed in DataStat's ability to reduce patient waiting time at the window. As the flu season passes and the majority of patients

become logged into the computer, the problem of patient waiting time, according to the pharmacists, should be less severe.

7. General Questions

The four officers were asked if DataStat had impacted any other professional activities. One respondent mentioned the increased involvement of the pharmacists with technicians on the *front line*. Two others described some problems with personality clashes and resistance to change in the pharmacy during DataStat's first month of operation. Reasons given for the initial negative impact of the computer on staff relations were: 1) everyone was required to work extra hours to make the system succeed; 2) the technicians were not allowed to use the CRTs while the system was so vulnerable to user error; and 3) as patient waiting time steadily increased, staff members began to question the merits of DataStat.

Three of the four pharmacists reported an increase in new technician training time because of DataStat, as explained by Pharmacist #4:

> It takes more time to teach a person how to use the computer than it does to teach him how to type because they know how to type when they come into the pharmacy. And so, yes, certainly there's been an increase in training time.

The fourth felt that the observation period required to monitor the performance of a new technician was still the same length of time as before DataStat. Additional comments were that only a couple of technicians were new since DataStat and that the training process now seemed more like a training/education process with DataStat.

The respondents were generally very pleased with the performance and capabilities of the hardware equipment and with

the service provided by the lessor. Terminal response times were reported to be usually very good; however, one pharmacist felt that during peak hours the DataStat capabilities at the central hardware site were inadequate. Another respondent commented that an additional CRT would be highly beneficial, but only if accompanied by an increase in staff.

No one indicated problems in the area of computer printing of reports. The officers mentioned that reports could be generated without delay whenever desired and that the formats and amount of information presented were also appropriate for the needs of the pharmacy. Some reports were not yet being utilized; namely, those relating to inventory and to patient compliance evaluation (*no shows* for refills, etc.), but these would be put to use in the near future, according to the respondents. Reports used daily in the pharmacy are the lists of command (sig) codes and drug abbreviations and the end-of-day summary containing a list of what prescriptions were filled that day, for whom, by whom, at exactly what time, etc.

8. Pharmacists' Overall Opinions of DataStat and Suggestions for Improvement

In general, the DataStat Outpatient Pharmacy System has been received very favorably by all four pharmacists at NRMC Charleston. Their summary statements speak for themselves:

> I would say I'm very satisfied with it. I think it's really an exciting concept and I think it's really good. I think the potential for utilizing one of these systems is there, and that we're not utilizing it enough. I don't know if, with manpower being what it is in the military, it ever could be [fully utilized]. (Pharmacist #1)

> I'm sold on it. I was sold on it when I first saw it 7 years ago... I didn't realize all the problems that might come up with it, but I'm glad we got it. I'm glad I was a part of it and I hope that we go Navy-wide with it...but it's going to take a *lot* of management effort. (Pharmacist #2)

> I'm 100 percent favorable for the concept and implementation of it. I'm very much for the system and hope it grows, flourishes, and becomes universal. I also hope that in future facilities that get this system, someone will look at it and say **"Well now,** we're going to be turning out more work here, generating more information, so we're going to need more people." Here we didn't get any more people, and that's been a problem. (Pharmacist #3)

> I'm very happy with the system. I think that we've demonstrated that a computerized outpatient pharmacy system can work in a 1,000-prescription-a-day operation and do more than just print labels, because obviously there are a lot of ways to print labels automatically faster and better, i.e., just a mag card typewriter. But I think we're doing a lot more than just printing labels and that's the biggest thing I hope we can impress upon our customers and in fact upon the people within the pharmacy, too, because I think there are a lot of people within the pharmacy who look at it as just a glorified typewriter. It is more than that and I think that our technicians now are becoming aware of that. (Pharmacist #4)

At the close of the interview, respondents were asked for any suggestions to improve DataStat or its implementation. Table 4 lists the responses given by the four pharmacists. All of the pharmacists suggested a longer period for logging patients into DataStat than the 2 1/2 months at NRMC Charleston. When the system was brought up and running, less than one-third of the patient population was entered in the computer, according to one pharmacist. Three respondents also recommended logging patients into the system from a

TABLE 4
PHARMACIST SUGGESTED IMPROVEMENTS TO DATASTAT OR ITS IMPLEMENTATION

Response Category	Number of Responses
Begin logging patients into system earlier	4
Increase staffing level with new system	4
Have drug interaction software discriminate between medication prepared for internal and external use	4
Use faster label printer	4
Log patients into system elsewhere in hospital	3
Install in off season rather than during busy winter months	2
Create an in-service implementation team to assist individual sites	2
Involve technicians with system more actively	2
Formalize user training/ improve vendor instructions	1
Improve time-sharing capabilities at central hardware site	1
Reference drug interaction reports	1
Generate more statistical reports	1
Use less tiring color background for CRT display	1
Use sig base and drug abbreviations formula developed at Charleston for future sites	1

terminal elsewhere in the hospital. The officers' suggestion to increase the staffing level with DataStat relates to their desire to use more of the system's potential and to Pharmacist #3's comment that "the pharmacist shouldn't have to come in at 5:00 a.m. just to log in patients."

The respondents repeated their suggestions that the DataStat drug interaction software be modified to distinguish between medications prepared for internal and external use, and that a faster printer be used to handle the peak loads of over 1,000 prescriptions per day encountered at NRMC Charleston. Suggestions to install the system during the off season rather than the busy season, to send an implementation team ("preferably in-service with experienced operators and a public relations person") to new sites, and to get the technicians more involved with the system also were mentioned by more than one pharmacist.

C. Technician Interviews

The 13 technicians interviewed were asked about their personal reactions to DataStat, its ease of use, its impact on their jobs, and their suggestions for improvements.

1. Reaction to System

All technicians interviewed expressed favorable overall opinions of DataStat. Eleven of the 13 technicians reported that they liked using the system; the other two considered it no more or less enjoyable to work with than the manual system. Table 5 summarized the responses of the technicians when asked, "What do you like about the system?"

TABLE 5
TECHNICIAN RESPONSE TO QUESTION
"WHAT DO YOU LIKE ABOUT THE SYSTEM?"

Response Category	Number of Responses
Results in fewer spelling errors/retypes	6
Includes built-in safeguards	6
Codes and abbreviations make for ease of use	6
Does most of necessary typing	5
Keeps patient profile	4
Screens for drug interactions/ overlaps	3
Serves as a learning tool	3
Makes prescription refills easier	2
Faster than manual	1

As can be seen from the table, the technicians particularly liked the accuracy of DataStat, the added safeguards built into the system for both the patient and the user (who now can correct his mistakes immediately), and the ease of using DataStat. Many of the technicians were also pleased with the system's ability to type labels, keep profiles, screen for interactions, and at the same time serve as a learning tool.

Seven of the technicians felt that their tasks in the pharmacy had changed as a result of DataStat. Most of the explained changes related to not typing labels, inputting

patient data into the computer, and checking the profile for overlaps, interactions, or noncompliance. Five respondents perceived their tasks to be easier than before DataStat, but only two felt that they had less work now with the computer. Several technicians, however, anticipated less work as more patients become logged into the system and as patient demand for services recedes.

Only one technician preferred the old system to DataStat, giving the reason that under computer operations there are more patient complaints and too much time required for patient education about DataStat. When asked what was better with the old system, eight of the 13 technicians responded that the manual system was faster than DataStat.

All of the technicians agreed that DataStat had changed patient care for the better, with comments such as "a much better brand of service now," "fewer medications stocked up at home for children to get into," or "especially now with profiling and screening for interactions." The consensus of the technicians, however, was that most of the patients whom they had talked to regarded the computer as a nuisance adding to their waiting time, until the system was explained to them by a staff member. Patients were also confused by the computer printing of the generic drug name on the label.

When asked if DataStat had changed the relationships among the people in the pharmacy, three respondents reported a negative impact on relations during the first month when technicians were not given access to the CRTs. Six technicians perceived relations to be better now, by having worked together to overcome problems with the system and by having the pharmacists out on the front line now with the technicians:

> On the old manual system, it would be four or five technicians running the front line and no one else would even be around to actively supervise. It's definitely brought the pharmacists into more active supervision. (Technician #5)

2. Equipment Performance and Utility

The technicians were for the most part very pleased with the performance of the computer equipment and its ease of use. All those interviewed reported having used the CRTs, and all were satisfied with the formats and amount of information in the displays.

Terminal response times were usually fast enough to suit the technicians, and while two respondents perceived response time to be a problem as much as 30 percent of the time, the most frequent answer by far was that response time was a problem perhaps 5 to 10 percent of the time.

Every respondent observed an improvement in the accuracy of label printing with DataStat. No other reductions in error rates were reported except for the frequent comment that the system won't accept mistakes and hence allows the user the opportunity to correct his errors immediately.

Without exception, the technicians interviewed found DataStat easy to use and easy to learn to use, the only difficulty being the initial memorizing of codes and abbreviations necessary for working with the terminal. Other than this initial obstacle, the use of terminal commands, the entry and retrieval of data, and the changing of labels and other forms posed no problem whatsoever for the technicians. Finally, the respondents were also satisfied with the reliability of both the system and its components, reporting only scattered incidents of keyboard failure or transmission problems between NRMC Charleston and the central hardware site.

3. Perceived Role Change and Suggested Improvements

Ten technicians interviewed perceived a change in their role in the health care delivery system as a result of DataStat. Typical descriptions of the nature of their role change were "less mechanized and closer to the patient," "more aware of potential problems and more knowledgeable," "less day-to-day drudgery," and "participating much more in the patient care process." Twelve of the 13 respondents felt they were more effective in their roles as pharmacy technicians. One respondent felt less effective personally since "the computer now does most of what we used to do, better."

Table 6 lists the suggestions for improvement of the DataStat system offered by the pharmacy technicians. The most frequent suggestions, for faster label printing and additional staff, relate to the technicians' general dissatisfaction and concern with patient waiting time. Other comments made by more than one technician were that it would be nice if better user training and instruction were provided and if compounded prescriptions and calling up the profile could be done without having to escape from the advanced function* of DataStat.

D. Conclusions

The results of the four pharmacist interviews and 13 technician interviews indicate an unusually positive response to DataStat after only 3 months of operation. All 17 respondents have accepted the system, based on their responses to the last question on the pharmacist IEI and the first question on the technician IEI, and perceive it as being beneficial to patient care by improving the accuracy and capabilities of pharmacy operations.

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* See footnote on page 8.

TABLE 6
TECHNICIAN SUGGESTED IMPROVEMENTS TO DATASTAT OR ITS IMPLEMENTATION

Response Category	Number of Responses
Faster label printer	6
Increase in staffing	4
Better user's manual and training	3
More capabilities within advanced function*	2
Earlier entering of patients	1
Earlier marking of ID cards after entry into system	1
Less tiring color for CRT display	1
Notification signal for when labels are running out	1
Smaller terminals and printers	1

*Almost all prescriptions are filled using what is called the *advanced function* of DataStat. To determine whether or not a reported overlap is a true misuse of medication, the staff member must escape from (leave) this function and call up the individual's profile.

Other than increasing the printer speed and the ability of the drug interaction software to discriminate between medications prepared for internal and external use, the respondents found little room for improvement in the DataStat system itself. Much more, however, was offered in the way of suggestions for future installation of DataStat in military pharmacies. Foremost was the opinion of the pharmacy

staff that the site should maintain the same or greater number of personnel in order to hasten the system stabilization process and to fully utilize the new capabilities created by the presence of DataStat. Another frequent remark was that many headaches and patient complaints could have been averted by entering a majority of patients into the system before beginning ADP operations, which in turn could only be done by beginning the log-in process earlier than the 2 1/2-month interval at NRMC Charleston. Finally, two pharmacists pointed out that many of the difficulties encountered during these early months of DataStat operation stemmed from installing the system at the onset of the busy winter season rather than during the slower spring months.

As of June 30, 1978, approximately 81,000 patients (an estimated 75 to 85 percent of the local eligible population) have been logged into the system compared to 59,000 (50 to 60 percent) when the interviews were conducted in March. This fact and the passing of the flu season appear to have reduced the problem with patient waiting time (based on discussion with officers at the pharmacy), though no numerical estimates of the decrease were obtained. However, the performance of DataStat during the month of June was hampered by a higher incidence of faulty transmission between NRMC Charleston and the central hardware site than when the interviews were conducted. Problems with fully implementing the DataStat inventory functions and inpatient functions are still being worked out, and automated service has now been expanded to two nearby sites--the Naval Weapons Station Dispensary (Charleston Naval Base), and the U.S. Air Force Base Dispensary, Charleston.

II. INTERVIEW EVALUATION INSTRUMENTS

A. Introduction

This section contains the interview instruments used to obtain the results presented in Section I. The interview evaluation instrument is designed to indicate the subjective perceptions of pharmacy personnel in the salient areas of contrast between the manual and automated modes of operation in the pharmacy. In addition, segments of the IEI are designed to provide information on the technical performance of the DataStat system and on its appropriateness to management information needs and system loads. The IEI is composed of two separate sub-instruments, which are to be administered independently to pharmacists and pharmacy technicians.

The principal technique used in the IEI is controlled nondirective probing. As applied to information-gathering interviews, this technique allows the interviewer to focus on topics to be discussed in a neutral, or unbiased, role. Since this technique can become inordinately time consuming, the nondirective probes have been supplemented by several direct probes. Application of direct probing will be governed by the judgment of the interviewer.

B. Instruments

1. Pharmacist IEI

a. Drug Interactions

(1) Is monitoring drug interactions a part of your work in the pharmacy?

( ) Yes

( ) No

Has DataStat changed the drug interactions monitoring system?

( ) Yes

( ) No

Probe: Is it better? Worse?

Probe: Nondirective

Probe: What are the benefits of the DataStat drug interaction system?

Probe: What are the disadvantages of the DataStat drug interaction system?

(2) Have your tasks with respect to drug interactions changed with the DataStat system?

( ) Yes

( ) No

Probe: Nondirective

Probe: Which tasks have changed?

Probe: Which tasks have been added?

Probe: Which tasks have been deleted?

Probe: How has your role changed?

Probe: Nondirective

(3) Is drug interaction detection part of your task?

( ) Yes
( ) No

Probe: Nondirective

Probe: Has the DataStat system changed the way you perform these tasks?

( ) Yes
( ) No

Probe: Nondirective

Probe: Is your involvement:

Same?
Less?
Greater?

(4) Is drug allergy detection part of your task?

( ) Yes
( ) No

Probe: Nondirective

Probe: Has the DataStat system changed the way you perform these tasks?

Probe: In your opinion, will the DataStat system change drug allergy detection?

( ) Yes
( ) No

Probe: Nondirective

Probe: Is your involvement:

Same?
Greater?
Less?

(5) Is drug interaction counseling part of your task?

( ) Yes
( ) No

Probe: Nondirective

Probe: Has the DataStat system changed the way you perform these tasks?

Probe: In your opinion, will the DataStat system change drug interaction counseling?

( ) Yes
( ) No

Probe: Nondirective

Probe: Is your involvement:

Same?
Greater?
Less?

b. Patient Profiles

(1) Do you work with patient profiles?

( ) Yes
( ) No

(If respondent answers No, go to section c.)

(2) Has the regimen of drug therapy for individual patients changed with the DataStat system?

( ) Yes
( ) No

Probe: Nondirective

Probe: What changes have occurred in the regimen of drug therapy due to the DataStat system?

Probe: Nondirective

(3) Has the content of the drug profile changed?

( ) Yes
( ) No

Probe: Nondirective

Probe: Has the amount of information changed?

Probe: How do you think these changes affect the quality of health care?

Improved?
Worse?
About the same?

(4) Have your tasks related to patient profiles changed with DataStat?

( ) Yes
( ) No

Probe: Nondirective

Probe: Have these task changes affected the extent of your involvement in the health care delivery process?

( ) Yes
( ) No

Probe: Are you:

More involved?
Less involved?

Probe: Has your professional self-image changed as a result of your patient profile-related tasks?

( ) Yes

( ) No

Probe: Has your self-image been:

Improved?
Lowered?

(5) Has your use of patient profiles changed?

( ) Yes

( ) No

Probe: Nondirective

(6) Have you discussed drug profiles with prescribers?

( ) Yes

( ) No — Go to section c.

Do these prescribers ask you to retrieve information from drug profiles?

( ) Yes

( ) No

Probe: Nondirective

Probe: How often?

Once a day or more?
Two or three times a week?
Once a week?

Do prescribers examine the drug profiles themselves?

( ) Yes

( ) No

How often do they examine them?

Once a day or more?
Two or three times a week?
Once a week?

c. Counseling and Compliance

(1) Is monitoring patient compliance with their medication regimen part of your work?

( ) Yes
( ) No

Probe: Nondirective

Probe: Has the DataStat system changed your ability to detect overdue or early refills?

Probe: Nondirective

(2) Have your tasks with respect to patient compliance monitoring changed with the DataStat system?

( ) Yes
( ) No

Probe: Nondirective

Probe: Which tasks have changed?

Probe: Which tasks have been added?

Probe: Which tasks have been deleted?

Probe: How has your role changed?

Probe: Nondirective

(3) Is patient counseling part of your work in the pharmacy?

( ) Yes
( ) No

Probe: Nondirective

Probe: Has the DataStat system changed your counseling activities?

Probe: Nondirective

Probe: Is your involvement:

Same?
Less?
Greater?

(4) Have you discussed patient compliance with prescribers?

( ) Yes
( ) No

Do you perceive from your discussions that prescribers find any change in patient compliance since DataStat?

( ) Yes
( ) No

Probe: Better?
Worse?

Do you perceive from your discussions that prescribers think that the DataStat system has the capacity to change patient compliance?

( ) Yes
( ) No

Probe: Nondirective

d. Drug Information

(1) Are there prescribers for whom you regularly fill prescriptions?

( ) Yes

( ) No

Do you talk with them about the pharmacy?

( ) Yes

( ) No — Go to question (2).

How often do you talk with them about the pharmacy?

Probe: Once a day or more often?
Two or three times a week?
Once a week?

Have you discussed drug interactions with them?

( ) Yes

( ) No

Do you perceive from your discussions that prescribers find any change in the frequency of drug interactions?

( ) Yes

( ) No

Probe: Increase?
Decrease?

(Continued on next page)

Do you perceive from your discussions that prescribers think the DataStat system has the capacity to reduce the frequency of drug interactions?

( ) Yes
( ) No

Will the additional information affect standard drug therapy?

( ) Yes
( ) No

Probe: Nondirective

(2) Has the DataStat system changed the drug information system?

( ) Yes
( ) No

Probe: Nondirective

Probe: Capabilities?

Probe: More?
Less?

Probe: Nondirective

Probe: Accessibility of drug information?

Probe: Nondirective

(3) Will the pharmacy be affected by the drug information in the DataStat system?

( ) Yes
( ) No

Probe: Improved?
Degraded?

Probe: Nondirective

Probe: Benefits outside the pharmacy? To society?

Probe: Nondirective

e. Inventory Controls

(1) Has the DataStat system changed the system for managing stock levels?

( ) Yes
( ) No

Probe: Nondirective

Probe: Better?
Worse?

Probe: Nondirective

Probe: Has the ability to accurately predict needed stock levels changed?

( ) Yes
( ) No

Probe: Improved?
Worse?

Probe: Is there a change in the accuracy of seasonal variation predictions for stock levels?

( ) Yes
( ) No

Probe: Improved?
Worse?

Probe: Has the DataStat system affected service?

( ) Yes
( ) No

Probe: In what ways has service been affected?

Probe: Nondirective

Probe: Better?
Worse?

Probe: Nondirective

(2) Has the amount of outdated inventory changed?

( ) Yes
( ) No

Probe: Nondirective

Probe: More?

Probe: What is your estimate of the value of the increased outdated inventory in dollars or as a fraction of total inventory?

Probe: Less?

Probe: What is your estimate of the value of the savings in dollars or as a fraction of total inventory?

(3) Has the DataStat system changed the controlled substance inventory system?

( ) Yes
( ) No

Probe: Nondirective

Probe: Has the ability to accurately predict needed controlled drug stock levels changed?

( ) Yes
( ) No

Probe: Nondirective

Probe: Improved?
Worse?

Probe: Nondirective

Probe: Is there a change in the accuracy of seasonal variation predictions for controlled drug stock levels?

( ) Yes
( ) No

Probe: Nondirective

Probe: Improved?
Worse?

Probe: Nondirective

f. Outpatient Dispensing Methods

(1) Has the DataStat system changed the patient encounter with the pharmacy at the input window?

( ) Yes
( ) No

Probe: Nondirective

Probe: In what ways has the patient encounter changed?

Probe: Nondirective

Probe: What are the effects of each of these changes?

Probe: Nondirective

(2) Does the automatic label preparation change the time required for label preparation?

( ) Yes
( ) No

Probe: Nondirective

Probe: Increased?
Decreased?

(3) Is there a change in accuracy?

( ) Yes
( ) No

Probe: Nondirective

Probe: More?
Less?

(4) Is there a change in the information on the label?

( ) Yes
( ) No

Probe: Nondirective

Probe: More?
Less?

(5) Has the DataStat system changed the prescription check process?

( ) Yes
( ) No

Probe: Nondirective

Probe: In what ways has the prescription check process changed?

Probe: Nondirective

Probe: What are the effects of each of these changes?

Probe: Nondirective

(6) Has the DataStat system changed any other drug dispensing activities?

( ) Yes
( ) No

Probe: Nondirective

Probe: What other drug dispensing activities have changed?

Probe: Nondirective

Probe: What are the changes, for each activity?

Probe: Nondirective

Probe: What are the effects of each of these changes?

Probe: Nondirective

(7) Has the DataStat system changed any other professional activities?

( ) Yes
( ) No

Probe: Nondirective

Probe: What other professional activities have changed?

Probe: Nondirective

Probe: What are these changes, for each activity?

Probe: Nondirective

Probe: What are the effects of each of these changes?

Probe: Nondirective

g. General

(1) Have you talked with patients about the DataStat system?

( ) Yes
( ) No

Probe: Nondirective

Probe: What did they say about DataStat?

(2) Have you trained pharmacy personnel since DataStat?

( ) Yes
( ) No

Probe: Is there a difference in the training time required for new personnel to work in this pharmacy?

( ) Yes
( ) No

Probe: Nondirective

Probe: More time required?
Less time required?

(3) Is there any difference in error rates with DataStat?

( ) Yes
( ) No

Probe: With the printing of reports?

( ) Yes
( ) No

Probe: Nondirective

Probe: More errors?
Less errors?

Probe: With label printing compared with manual preparation?

( ) Yes
( ) No — Probe: Nondirective

Probe: More errors?

Probe: Less errors?

Probe: Are there terminal character display errors?

( ) Yes
( ) No — Probe: Nondirective

(4) Are you familiar with the hardware capacity of the DataStat system for consumables (labels, computer paper, forms)?

( ) Yes
( ) No

Probe: Is the capacity capable of handling the load?

( ) Yes
( ) No

Probe: Nondirective

Probe: Are changes necessary? Are changes desirable?

Probe: Nondirective

(5) Do you use reports generated by the DataStat system?

( ) Yes
( ) No

Probe: Nondirective

Probe: How often do you use them?

Probe: Do reports meet your needs?

( ) Yes
( ) No

Probe: Nondirective

Probe: Is format appropriate?

Probe: Nondirective

Probe: Any changes?

Necessary?
Desirable?

Probe: Nondirective

Probe: Is the information complete?

( ) Yes

( ) No

Probe: Nondirective:

Probe: Too much information? (Go to 3rd probe below.)

Probe: Nondirective

Probe: Too little information?

Probe: Is the time when the reports are generated important?

( ) Yes
( ) No

Probe: Nondirective

Probe: Are reports timely?

Probe: Nondirective

Probe: Do you use the reports extensively?

( ) Yes

( ) No

Probe: Nondirective

Probe: Which reports?

Probe: Nondirective

Probe: Which reports do you not make use of?

(6) Who uses the terminal displays in the pharmacy?

Probe: Pharmacists?

Probe: Technicians?

( ) Yes

( ) No

Probe: Have you discussed the display with technicians?

( ) Yes

( ) No

Probe: How often?

Probe: Did technicians discuss response time?

Probe: Nondirective

If response time is excessive:

Probe: Did they complain?

Probe: Nondirective

Probe: How often?

(7) What do you think of the DataStat system?

Probe: Nondirective

Probe: Are you satisfied?
Are you dissatisfied?

Probe: Nondirective

2. Pharmacy Technician IEI

a. Reaction to System

(1) Has the DataStat system changed your tasks in the pharmacy?

( ) Yes

( ) No

Probe: Nondirective

Probe: Are your tasks: Easier?
Harder?

Probe: Do you have more work?
Less work?
About the same?

Probe: What are your personal reactions to DataStat?

Probe: Nondirective

Probe: Do you like to use the system?

( ) Yes

( ) No

Probe: Nondirective

Probe: What do you like about the system?

Probe: Nondirective

(Go to next question.)

Probe: Nondirective

Probe: Do you prefer the old system?

( ) Yes

( ) No

Probe: Nondirective

Probe: What was better with the old system?

Probe: Nondirective

(2) Has the DataStat system changed patient care?

( ) Yes

( ) No

Probe: Nondirective

Probe: Is patient care better? Worse?

Probe: Nondirective

(3) Have you talked with patients about the DataStat system?

( ) Yes

( ) No

Probe: Did they know the DataStat system had been installed?

( ) Yes

( ) No

Probe: Did they think it had changed the operation of the pharmacy?

( ) Yes

( ) No

Probe: Nondirective

Probe: Did they think it was better?
Worse?
Same?

(If answer is same go to question (4); if answer is better, worse, or mixed, go to next probe.)

Probe: Nondirective

(If answer is better go to next probe; if answer is worse, skip next two probes; if answer is mixed, skip next probe.)

Probe: What is better?

(Go to question (4).)

Probe: What is better?

Probe: What is worse?

(4) Has the DataStat system changed the relationships among the people in the pharmacy?

( ) Yes

( ) No

Probe: Nondirective

Probe: Do people get along better?
Worse?

Probe: Are relations more relaxed?
Less relaxed?

b. Equipment/Utility

(1) Do you use the terminal displays?

( ) Yes

( ) No

Probe: What information do you use?

Probe: Nondirective

Probe: Is there information you do not use?

Probe: Nondirective

Probe: Is there too much information?

Probe: Is the format acceptable?

Probe: Nondirective

Probe: Is the format clear?

Probe: Nondirective

Probe: Is the format:

Well organized?
About what you would expect?
Badly organized?

Probe: Nondirective

Probe: Are the displays an appropriate means for obtaining the information you feel is required for your tasks?

Probe: Nondirective

(2) Are terminal response times fast enough?

( ) Yes

( ) No

Probe: Always?

( ) Yes

( ) No

Probe: Nondirective

Probe: What percent of the times are not fast enough?

(3) Is there any difference in the error rate with DataStat?

( ) Yes

( ) No

Probe: Printing of reports?

Probe: Nondirective

Probe: More errors?
Less errors?

Probe: Label printing compared with manual preparation of labels?

Probe: Nondirective

Probe: More errors?
Less errors?

Probe: Terminal character display errors?

Probe: Nondirective

(4) Are you familiar with the hardware capacity for consumables (computer paper, labels, forms)?

( ) Yes

( ) No

Probe: Is the capacity sufficient for the load placed on the system?

Probe: Nondirective

Probe: Are changes necessary? Desirable?

Probe: Nondirective

Probe: What changes would be desirable?

(5) Do you replace consumables?

( ) Yes

( ) No

Probe: Is it easy? Difficult?

Probe: Nondirective

Probe: How easy (difficult)?

Probe: Nondirective

Probe: How much time per day do you spend on this?

(6) Is the DataStat system easy to use?

( ) Yes

( ) No

Probe: Is it difficult?

Probe: Nondirective

Probe: In what ways is it difficult to use the system?

Is it easy to learn to use the DataStat system?

( ) Yes

( ) No

Probe: Is it difficult?

Probe: Nondirective

Probe: Which things were difficult to learn?

Are terminal commands easy/difficult to use?

Probe: Nondirective

Probe: What are the difficulties?

Are drug abbreviations easy/difficult to use?

Probe: Nondirective

Probe: What are the difficulties?

Is entry of data easy/difficult?

Probe: Nondirective

Probe: What are the difficulties?

Is retrieval of data easy/difficult?

Probe: Nondirective

Probe: What are the difficulties?

(7) Is the DataStat system reliable?

( ) Yes
( ) No

Probe: Does the system go down?

( ) Yes
( ) No

Probe: Nondirective

Probe: How often?

Probe: Nondirective

Probe: Do components break down?

( ) Yes
( ) No

Probe: Nondirective

Probe: Which components break down most often?

Probe: Nondirective

Probe: How frequently would you say each of these components malfunctions?

c. Perceived Role

Has your role in the health care delivery system changed with the DataStat system?

( ) Yes

( ) No

Probe: Nondirective

Probe: Are you more/less effective?

Probe: In what ways has your role changed?

Probe: Nondirective

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