Scheduling System Analysis

Department of Physical Medicine and Rehabilitation

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April 21, 1987
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary</td>
<td>2</td>
</tr>
<tr>
<td>Introduction/Purpose/Current System</td>
<td>4</td>
</tr>
<tr>
<td>Alternative Solutions</td>
<td>6</td>
</tr>
<tr>
<td>Approach and Methodology</td>
<td>7</td>
</tr>
<tr>
<td>Findings and Conclusions</td>
<td>8</td>
</tr>
<tr>
<td>Recommendations</td>
<td>11</td>
</tr>
<tr>
<td>Action Plan</td>
<td>12</td>
</tr>
<tr>
<td>Appendices</td>
<td></td>
</tr>
<tr>
<td>A - Project Proposal</td>
<td>13</td>
</tr>
<tr>
<td>B - System Flow Chart</td>
<td>17</td>
</tr>
<tr>
<td>C - Literature Search</td>
<td>24</td>
</tr>
<tr>
<td>D - Example System Application</td>
<td>29</td>
</tr>
</tbody>
</table>
SUMMARY

An efficient scheduling system is an integral part of any clinical department. This is particularly true if that department sees patients in a variety of circumstances and clinical settings. The Physical Medicine and Rehabilitation Department at the University of Michigan Medical Center is just such a unit. Each day, patients with widely divergent rehabilitation needs are scheduled in a number of different settings using a wide array of treatment methodologies.

It was suggested that, as part of a larger operations review, the scheduling system be examined and the possibilities of computerization be explored. This report presents the findings of that project. The five phase project entailed the examination of the manual system already in operation, a review of its deficiencies and recommendations for improvement. After examining the alternatives, a new system was recommended. Using past research and papers on the subject, a set of specifications was prepared and applied to a specific software package. An action plan is included to map out the initial steps toward computerization.

The manual system was found to be very inefficient in several ways. First, the therapists waste a great deal of time in the scheduling process. The administrative and clerical support needed are excessive. There are no reports generated concerning the schedule, the equipment of the time used. There is a problem with assigned transporters to each case during the busy times.

Five different options emerged from these problems. They are (1) Do Nothing, which yields no improvement in the system, plus no data base on therapy; (2) Improve Manual Process, which has the possibility of improving scheduling process, but still no data base; (3) Decentralized Computerized Scheduling, which has the advantages of the computerization, but leaves the computer operation and the control of the system spread out among divisions; (4) Centralized Computerized Scheduling, which puts control in one place, but there is little therapist input in appointment criteria; (5) Hybrid Computerized System, which combines the advantages of both plans, using therapist input concerning appointments, but maintaining a central facility for scheduling.

The Hybrid System was recommended as the system best suited for the needs of the department, due primarily to the reasons stated above and for the use of the data base and the flexibility of not being dependent on one person to schedule everyone with no input. The specifications of the system to be considered and the support needed are reviewed briefly below:

• Scheduling: The system should be able to display facilities available, make changes easy, include special appointments, provide for sequential scheduling and bottle neck alarms, match patient and therapist and handle multiple appointments.

• Therapists: The system should include the therapist's specific preparation routines and a remarks section and also schedule appointments of varying lengths.

• Hardware: The system should be IBM compatible, user friendly and include the possibility of a data link, as well as the capability to load data into other systems.
• **Reports Generated** The system should have multiple formatting capabilities, to generate reports for actual patient time, types of therapy, space and equipment use, what was accomplished, and a record of billable hours.

• **Support Systems** The department should ensure communication between the scheduling clerks and the therapists. There should only be one computer station in the system and copies of all generated reports should be sent to all PM&R divisions and the other hospital units concerned. Training for additional clerks should also be provided.

The action plan for implementing such a system would take the following steps: (1) Decide on the type of system to implement, (2) begin the software search and decide on a package, (3) define the equipment needed to support the software, (4) decide on a staffing level appropriate for the system and fill it, (5) train the staff members in the system and (6) leave time for adjustment of the new system. With time, the new system should provide a coherent and lasting scheduling system for the department; one that will schedule easily and support and contribute to the efficiency of the department.
INTRODUCTION

The scheduling system plays an integral role in the efficient operation of any clinical department. In the absence of an adequate system, utilization of personnel and equipment is severely reduced. In the past, manual systems have been used to coordinate patient appointments but little was done in the way of analyzing the efficiency of patient care and staff utilization. Computerization is an effective means of streamlining and improving the entire scheduling process. With the introduction of computers into health care facilities, many different avenues of department operations may be reviewed. The patient scheduling process may now move beyond just allocating time slots. It now holds the key to overall effective operations.

PURPOSE

As part of a larger operations review of the Department of Physical Medicine and Rehabilitation, it was determined that the manual scheduling system used for the 24 bed adult rehabilitation unit is an inefficient, time consuming and possibly biased system. Furthermore, there is a serious deficiency in the amount of usable data and reports concerning administrative details of the department. The five phase project plan (see Appendix A) consisted of:

• definition of the patient flow in the scheduling system
• evaluation of the patient flow
• Investigation of improvements to manual system
• Investigation of computerization options through a literature search
• application to an example system

The project team investigated the present manual system and also examined the possibilities of a computerized scheduling system. This report reviews their investigation and presents specifications to be used in choosing a computerized scheduling system.

CURRENT SYSTEM

Physical Medicine and Rehabilitation currently uses a manual system of appointment scheduling that requires therapists to physically record their patient appointments on a centralized scheduling sheet. Two of the three divisions utilizing the scheduling procedure (Physical Therapy & Speech and Language Pathology) congregate in a small room very far removed from their divisions and pencil in appointments on a first come first serve basis. Physical Therapy actually sends their therapists to this site while Speech and Language Pathology sends an administrative assistant as a representative for their therapists. Their portion of the scheduling procedure must be completed by approximately 10:00 A.M.

Upon completion of the PT and Speech portion of the procedure, Occupational Therapy receives the schedule to pencil in their appointments. They attempt to assign patients back to back appointment times and search for any final corrections before the schedule is sent to the appropriate secretary for duplication and distribution. This clerical function must be accomplished between 1:00 P.M. and 1:30 P.M., thereby allowing adequate time for scheduling of referral patients and allowance for transportation to coordinate with the schedule produced.
Once the schedule is distributed to the 6A rehabilitation floor and each of the therapy divisions, it becomes essentially inflexible. Any alterations such as preempting of a therapy appointment by Rehabilitation Psychology & Social Work or noting of conflicts by the clerk on 6A or in the therapy divisions must be modified by telephone. Once a conflict is identified, every division concerned with the patient therapy must be notified, as well as transportation. This becomes a time consuming task.

A complete flow chart analysis for the entire process can be found in Appendix B. A simplified diagram of the scheduling procedure is found below in Figure 1.

Coordination and cooperation between divisions allows the manual system to function but several deficiencies were found which could further increase efficiency if corrected. The allocation of transportation personnel has emerged as one factor limiting scheduling efficiency. At the present time, the Physical and Occupational Therapy divisions are allowed only a specified number of transporters per time interval. Thus, the primary functions of the divisions are being restricted by a support function (i.e., transportation).

Occupational Therapy assumes a large burden of coordinating back to back appointments of patients between divisions and resolving conflicts before the schedule is duplicated and distributed. For this function they are only allowed an hour and a half. Two approaches may be employed to alleviate this burden. Either the PT and Speech divisions may complete their portion of the schedule earlier in the morning to give OT more time, or the whole scheduling process may be moved to more than one day in advance. This would relieve the pressure felt by the Occupational Therapy division.

Minor improvements may include moving the central scheduling area to a position closer to the majority of the therapists. Presently, scheduling takes place in a room far removed from a majority of the therapists utilizing the schedule. Legibility also becomes an issue when the individual therapist must pencil in their own therapy appointments on one schedule.
ALTERNATIVE SOLUTIONS

In evaluation of the scheduling procedure, five possible alternatives were explored. Two options required no computerization while the other three utilized computerization in three different applications. Each alternative has its relative advantages, but upon research of past scheduling systems, the hybrid system of computerization seems the most viable option for PM&R. Each of the alternatives are outlined below.

- **Do Nothing**  This approach utilized the current manual system of scheduling with no consideration given to improvements of current procedures. The system as it stands now works adequately, but no analysis of past treatment is available, no reports may be generated, and the deficiencies listed in the current situation still exist.

- **Improved Manual Process**  The manual scheduling procedure is still utilized but current system deficiencies would be remedied. With the transportation and OT scheduling times issues resolved, this system would operate more efficiently than Do Nothing but analysis of past data is still unavailable.

- **Centralized System With Decentralized Input/User Access**  This scheduling process would allow schedulers in each division to have access to a terminal to schedule their own patients. All the terminals would be linked so knowledge of changes would be current to all therapy divisions as well as the 6A rehabilitation floor. Analysis of past patient data would be available and reports to administrators could be generated for equipment and staff utilization studies.

- **Centralized Computerized Process**  This alternative would centralize the scheduling process. One central person would control the schedule and the finalized appointment times would be distributed to therapists and 6A. As in the Decentralized Process, reports on utilization and past patient information could be generated by this system.

- **Hybrid Computerized Process**  This computerized option would centralize the actual entry of patient appointment times but the therapist would input the specific considerations for the individual patient. This produces a system that frees the therapist to do activities other than scheduling but allows essential input to individual patient needs. As in all the computerized systems, necessary reports and analysis of data may be generated from this system.
APPROACH AND METHODOLOGY

Detailed analysis of the current manual system was accomplished by compiling an extensive flow chart. Representatives from the three divisions using the system (PT, OT and Speech) attended meetings to reach an agreement as to exactly how the system operated. After several revisions, a standard operating procedure was agreed upon and used for analysis.

The research relating to computerized scheduling systems was done using a variety of journals at the Medical School Library. Four articles directly relating to specifications needed for patient scheduling systems were reviewed. Highlights of these articles are included in Appendix C.

An existing computerized operating room scheduling system was chosen to test specifications developed during the study. The purpose of this comparison was to assure that specifications for a computerized system in PM&R were reasonably able to be duplicated in current software. Though detailed documentation of the operating room scheduling system could not be obtained, knowledge of this system along with promotional information provided an adequate means for comparison. A review of this comparison can be found in Appendix D.
FINDINGS AND CONCLUSIONS

Software Specifications

This section presents specifications that should be taken into account when considering specific scheduling software packages. In defining the criteria for a computerized system, the material obtained in the literature search proved an invaluable source of information. The number and variety of parameters listed here attest to this fact. All specifications listed below are currently available in other computerized scheduling systems.

Scheduling

- **Includes Facilities Available** The system should be able to display alternate room or equipment availability if primary facilities are not available.

- **Easy Changes** The system should be able to easily cancel and reschedule appointments when necessary.

- **Includes Special Appointments** The system should be able to schedule for service team meetings, family meetings and other appointments as well as for individual patients.

- **Sequential Scheduling** The system should be able to perform sequential scheduling for individual patient appointments.

- **Bottleneck Alarms** The system should be able to warn of potential scheduling bottlenecks before they occur (i.e., in terms of time, room, equipment or space restrictions).

- **Matches Patient and Therapist** The system should be able to automatically match therapist with patient when patient is scheduled.

- **Handles Multiple Appointments** The system could possibly handle multiple examination requests per patient and arrange them in optimal order to best utilize facilities and equipment. This is sometimes known as a 'smart scheduler' and is usually found only on the more expensive and elaborate systems.

Therapists

- **Includes Preparation Routines** The system should be able to determine whether preparation routines are necessary before an appointment and take these into account when scheduling.

- **Schedules Varying Length Appointments** The system should be able to schedule appointments of varying lengths.

- **Includes Remarks Section** The system should allow for the insertion of messages and remarks pertaining to the patient or therapy procedure.
• **Considers Therapist's Constraints** The system should be able to utilize scheduling constraints (i.e., schedule only 85% of therapist's time).

**Hardware**

• **User Friendly** The system should be user-friendly to allow anybody to schedule appointments should the need arise.

• **Possible Data Link** The system should possess the ability to link up with other systems such as the billing department or other scheduling systems if future computerization is a possibility for departments other than PM&R.

• **Retrievable Data Base** The system should contain a data base for the retrieval of historic information. It should also be able to export the necessary data to an external software system package such as Lotus or dBase III, or possibly contain its own statistical package to perform data analyses.

• **Storage Capacity** The required storage capacity of the system will be dependant upon how far back historical records will be retained. A hard disk is the most likely candidate for data storage, although floppy disks could be used for little-used or older records.

• **IBM Compatible** The system should be IBM-PC compatible, if possible.

**Reports Generated**

• **Multiple Formatted Reports** The system should be able to generate multiple scheduling formats (i.e., therapist schedule, patient schedule, equipment schedule, room schedule).

• **Record of Actual Therapy Performed** The system should be able to record the following:
  - actual therapy time spent with patient (versus scheduled therapy time).
  - what types of therapy were performed during a session.
  - space and equipment used.
  - what was accomplished by a specific category or group (i.e., Individual therapist, team, discipline, referral dept. or hospital).
  - patient billing charge tickets.

**Implementation Support Systems Required**

This section describes what items should be considered to support a computerized software scheduling system. They do not deal with the software package, but with the administrative needs of implementing such a system. These specifications are given in light of the assumed hybrid computerization plan, combining a centralized person on scheduling, but with control of the appointment constraints and characteristics remaining with the individual therapists.
• **Preferred Time Schedule** In the spirit of the preferred time schedule, therapists should discuss patient treatment needs with the scheduling clerk once a week and formulate a preliminary treatment schedule that need only be altered when necessary instead of recopied in its entirety every day.

• **Easy Access to Scheduling Secretary** Therapists and other personnel must have easy access to the scheduling secretary for convenience and to avoid delays when it becomes necessary to alter the schedule.

• **Only One Station** We recommend only one computer and printer be utilized to reduce paper generation and the possibility of several different schedules circulating simultaneously.

• **Close Link to Therapists** The scheduling clerk should be closely linked with the therapists to facilitate a better understanding of patient needs.

• **Copies to PM&IR Divisional Clerks** Therapy and scheduling personnel should be provided with copies of the project proposal so that they may comment on the design and specifications. This will provide greater receptiveness to computerization and will result in a more effective system due to worker insights.

• **Copies of Schedule to Other Departments** Provide other departments with copies of patient schedules to assist them in scheduling non-PM&IR treatments to help reduce cancellations.

• **Training on System For Additional Clerks** All personnel now involved with scheduling should be trained on the new system so that, if required, they may schedule their own appointments. In this way, the system does not become person-dependent.
RECOMMENDATIONS

A number of benefits will result from the adoption of the recommended scheduling procedure. Some of these benefits are a direct result of the computerization while others are unique to the hybrid scheduling procedure.

Scheduling information may be stored in a permanent data base for future reference. Once this has been accomplished, a great variety of statistical analyses will be possible. For example, facility utilization could be monitored to determine if specific facilities with low occupancy could be re-equipped to meet high demand in other areas. Scheduling the equipment required for therapy sessions would also be possible in a computerized system so that equipment utilization could be monitored in the same way as facility use. All manner of analyses, including automatic calculation of billed time worked, will be possible to enable both therapists and administrators to provide improved care for patients.

If other departments were provided with copies of patient schedules, it may be possible for them to schedule non-PM&R appointments around therapy treatments to assist in reducing the growing cancellation rate. This could be particularly effective if patient scheduling were moved to more than one day in advance.

Inherent in the hybrid system would be the ability for nearly anyone to schedule appointments should the need arise. In this way, the scheduling procedure remains person-independent. For example, if the scheduling clerk takes ill, the entire scheduling process would not grind to a halt because he or she is the only person who knows how the system operates.

In the present manual system, the copying and distribution tasks are rotated on a monthly basis between three secretarial pools. These tasks are basically regarded as "hot potatoes" to be passed on to the next division as soon as possible. With a computerized system, these secretaries would be relieved from this duty to perform their regularly scheduled tasks.
ACTION PLAN

In order to effectively implement a computerized scheduling system in PM&R, an action plan must be followed with a common goal shared by both Hospital Information Systems and the entire PM&R department. These two departments together must agree that computerization is the ultimate solution to scheduling difficulties. Once this issue is addressed and agreed upon, the following steps may be taken to implement the system:

• Decision on Implementation of centralized, decentralized or hybrid system

• Software Search Utilizing specifications previously defined, an extensive search of the current market for scheduling software packages should be undertaken. If appropriate software cannot be located, Hospital Information Systems could be contracted to write such a system.

• Definition of equipment Each computerized alternative requires differing hardware needs. Once the decision is made on which system is to be implemented, specifications for hardware may be researched.

• Staffing System support staff levels would change for each system alternative. Once the system needs have been established, a staffing level for the scheduling process should be set.

• Training Staff selected for scheduling would have no prior knowledge of the new system. In order to utilize all the functions available to the scheduler, training sessions must be given to familiarize the staff with the system. This training is normally provided by, and should be expected of, the software package vendor.

• Adjustment With any new system, unexpected problems arise. It is essential that support staff remain accessible to staff to answer questions and help in modification procedures.
Purpose of Project

The purpose of this project is to evaluate the current Physical Medicine and Rehabilitation (PM&R) manual system of scheduling adult rehabilitation service patient appointments to determine system deficiencies and recommend methods of manual system improvement. Also, to determine if computerization of PM&R scheduling is possible. If computerization is possible, provide design specifications and criteria for measuring the scope of information to be included in software. These criteria will then be applied to one commercially available operating room scheduling program to insure that the criteria are applicable.

Scope of Project

Evaluation is to encompass the inherent process of manual scheduling as well as detailed patient flow analysis. Emphasis will be placed on the twenty-four bed adult rehabilitation unit patients.

We plan to define criteria to be used in the computerization of this scheduling system and analyze these criteria with respect to the improved system.

Approach

Evaluation of the current manual scheduling system will be accomplished through a five phase program.

1. Initially, the present system will be defined by a detailed patient flow analysis.
2. The second phase will encompass the evaluation of flow analysis to determine current system deficiencies.
3. The third phase will consist of investigating solutions to deficiencies and recommendations for improvement.
4. The fourth phase will investigate the option of computerizing the scheduling system. A literature search of past scheduling system evaluations, coupled with specific PM&R scheduling needs will determine our specification and design criteria for a computerized system.
5. The final phase will involve the evaluation of an operating room scheduling program based on the criteria generated in phase four.

Expected Impact/Outcome

Our goal is a clear definition of the present manual system of scheduling followed by recommended improvements. We feel computerization at this time with present system deficiencies would only compound the present problems.

The outcome of our study should be to define and recommend suitable solutions to inherent problems in the manual system. Once this is accomplished, our specifications and design criteria for computerization may be used in the search for an appropriate software package to fulfill PM&R's scheduling needs.

We hope our evaluation and recommendations of the PM&R scheduling system will provide for better productivity and increased efficiency of the scheduling and treatment of Physical Medicine and Rehabilitation patients.
**Person-Time Budget**

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<th>Time</th>
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<td>Class Time Participation</td>
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<tr>
<td>Meetings with Nick Tumminello</td>
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</tr>
<tr>
<td>Meetings with Diane Nixon</td>
<td>One hour +/week</td>
</tr>
<tr>
<td>Project Team Meetings</td>
<td>Three hours +/week</td>
</tr>
<tr>
<td>Extraneous Data Collection</td>
<td>One hour +/week</td>
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**Schedule (time line attached)**

1. Tour of Facility
2. Interviews for Patient Flow Analysis
3. Defn. of Manual Scheduling System
4. Define Deficiencies of Present Scheduling System
5. Recommendations for Improvement of Present System
6. Computerization Literature Search
7. Defn. of Computer Specifications
8. Scheduling Program Evaluation
9. Preparation of report and presentation
Proposed Time Schedule

- 9 Feb
- 16 Feb
- 23 Feb
- 2 Mar
- 9 Mar
- 16 Mar
- 23 Mar
- 30 Mar
- 6 Apr
- 13 Apr
- 20 Apr

- Tour Facility / Initial Orientation
- Interview for Patient Flow Analysis
- Spring Break
- Definition of Manual System
- Definition of System Deficiencies
- Recommended Improvements
- Literature Search
- Determine Computerization Specifications
- Apply to Case Model System
- Write Report
- Revise / Finalize Report
- Prepare / Make Presentations
- Definition of Manual System
- Literature Search
APPENDIX B

MANUAL SYSTEM FLOW CHART
Start

Patient Admitted and Assigned To Appropriate Rehab Team

Therapists Schedule Preferred Times on Preferred Time Schedule

Proceed To Daily Schedule
Therapists Schedule Daily Appointments •

Does Patient Have Multiple Therapy Appts.?  

Yes  → Try To Schedule Back-To-Back Therapy Appointments

No

Do Therapists Note Any Conflicts?  

Yes  → Concerned Therapists Negotiate Conflict & Decide Who Treats Patient

No

Other Divisions (RPS, MRS, etc.) Schedule Daily Appointments **

Schedule Copied by Appropriate Secretary and Distributed ***

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** At 1:00 PM, usually 3-4 patients only

*** Beginning at 1:00 PM, ending no later than 1:30 PM

* PT (9:00 AM) and Speech (10:00 AM), OT (by 1:00 PM)
Therapist notes either clinic or bedside, Therapist name, and time interval of the appointment

A See Page 3  B See Page 4  C See Page 5
A

Does Ward Clerk On 6A Note Any Conflicts With Schedule? *

Yes

Clerk Notifies Appropriate Therapy Division By Phone (if possible)

Is Alternate Appointment Time Available?

Yes

Alternate Appointment Is Scheduled

No

Patient Misses Therapy Appointment

Therapist Will Perform Other Tasks **

End

D

End

* Refers to conflicts between Rehab Schedule and schedule for patient's other non-Rehab appointments

** Other Tasks Include:
• Utilizing parallel scheduling of patients (PT, OT only)
• Seeing bedside patients who are not scheduled (Speech only)
• See new referral patients
• Work on research projects or patient documentation
Concerned Therapists Meet To Negotiate Conflict And Decide Who Treats Patient.
Does RPS Need To Preempt Any Appt.'s?

Yes

RPS Leaves A Note For Therapist(s) Involved and Notifies Transport Desk

No

End

End

Therapist Will Perform Other Tasks **

** Other Tasks include:
- Utilizing parallel scheduling of patients (PT, OT only)
- Seeing bedside patients who are not scheduled (Speech only)
- See new referral patients
- Work on research projects or patient documentation
Can Patient Be Seen Bedside?

*When appointment is re-scheduled, all appropriate concerned parties are notified of change. This includes, if applicable:
- Transport Desk
- 6A Ward Clerk
- Various PM & R Divisions

Is There Transporter Available At Time Desired?

Appointment Scheduled For Bedside *

End

Is Therapist Available To Transport?

Appointment Scheduled For Clinic *

End

Patient Misses Therapy Appointment

Therapist Will Perform Other Tasks **

End

** Other Tasks Include:
- Utilizing parallel scheduling of patients (PT, OT only)
- Seeing bedside patients who are not scheduled (Speech only)
- See new referral patients
- Work on research projects or patient documentation
APPENDIX C

LITERATURE SEARCH ON SPECIFICATIONS FOR COMPUTERIZED SYSTEM
Scheduling systems in radiology vary dramatically in levels of computerization. Some systems have the traditional appointment book approach with pages created on a computer screen while others are beginning to offer more and more advanced features. These systems do not necessarily require more scheduler training. In actuality, as portions become more available to users, the systems become more user friendly.

Fully automated scheduling systems perform needed tasks better using the same amount of patient information as provided for less advanced systems. Multiple examination requests can be handled simultaneously and rearranged into optimal order for effective use of equipment and personnel. Data about the nature of the examination, the equipment necessary for treatment, and data concerning the patient are drawn from a database and utilized in determining the final schedule. Overbooking may also be controlled utilizing a warning function.

Computer files may be used to further enhance scheduling. Information concerning particular patients and procedures themselves may be drawn upon to make decisions about length of appointments.

Other parameters are also available. A system could include alternate room groups, which show alternate treatment rooms if the primary room is not available. Another parameter is a conflict group number which is used to detect conflicts with other examinations. Finally, a computer system can determine whether preparation routines are required for a certain treatment and must be accounted for within the schedule.

Most parameters that are effective in radiology scheduling systems would also be effective in a system in PM&R. An order entry system for referrals from other departments would link the entire PM&R process. This would not directly influence 6A scheduling but would enhance the global PM&R scheduling process. A database to store individual patient information, therapy procedures and equipment necessary for treatment would allow for historic reports to be generated and would allow for a more effective use of resources and personnel. Alternate room groups could be considered as equipment scheduling to double check to ensure equipment was not already being used. A parameter checking for conflicts would also be quite effective. Storage of information regarding preparation routines could include whether treatment was bedside or clinic as well as other items.

**Specifications To Be Utilized In PM&R Computerized Scheduling System**

1. Order entry from other departments
2. Multiple examination requests
3. Alternate room or equipment groups
4. Conflict group numbers
5. Preparation routines
Automated Appointment System Excels
Herpok, Franz J. and others
Hospitals

Duke University Medical Center in Durham, N.C. has developed a computerized scheduling procedure called the Total Medical Record (TMR). This system allows providers to control their own schedules and enables management to allocate resources effectively while expediting wait times for patient appointments. TMR may be molded to fit many different departmental needs.

TMR allows for many options in appointment scheduling. Appointments may vary in length and individual physicians may restrict their schedule so only a certain percentage of their time will be utilized. (e.g. leaving time for emergency patients etc.) Messages and remarks may be inserted under patient names and the option of overbooking may be exercised. Sequential scheduling of patient's appointments (e.g. one urology followed by radiology) allows for less cancellations and individual service teams may enter appointments just like individual physicians.

Another option is the matching of physician and patient automatically. The patient specifies a physician at the outset of treatment and a database links the patient to the physician so when the patient's name is entered, the specific physician's schedule will appear on the screen.

Providers also receive benefits from the TMR system. TMR provides a warning when providers are reaching their scheduling limits. This allows early detection of bottlenecks and reduces peaks and valley in activity. TMR allows generation of instant reports and has a holding file of historic data.

Specifications To Be Utilized in PM&R Computerized Scheduling System

1. Allows for variation in length of appointment times.
2. Use of scheduling constraint (e.g. 85 percent utilization of schedule).
3. Allowance for insertion of messages and remarks.
4. Handles appointments for service teams as well as individual therapists.
5. Patient and physician automatically matched when patient's name is keyed in.
8. Holding file of patient and equipment data.
9. Warnings of potential bottlenecks before they happen.
Friendly Hills Medical Center in La Habre, California developed an on-line computerized appointment scheduling procedure to replace the current manual system. This was in response to chronic problems of error correction, inconsistent scheduling and credit control in the manual process. Specification included in Friendly Hills computerized appointment scheduling system could be used in the design of a computerized procedure for a PM&R department or division. Payoffs realized at Friendly Hills may be realized in PM&R as well.

The entire staff was involved in the conceptual development of the computerization process. A proposal of the project was given to supervisory personnel and scheduling personnel were given opportunities to comment on design and specifications for the new system. This served two purposes. Personnel were more receptive to the new system when installed and their input regarding everyday details of scheduling procedures resulted in a more effective system.

Friendly Hills system required that the system satisfy the needs of scheduling, cancelling, rescheduling appointments and displaying scheduled appointments not only for immediate information but for historical recall. Schedules were also able to be retrieved by patient's name or by physician for a particular day. This system key was in with master computer flies to generate charge tickets. The program was so user-friendly that consistency in scheduling was obtained.

Friendly Hills greatly benefited from this system. While this system did not affect physician productivity, scheduling personnel productivity improved. Less time spent scheduling provided time for other tasks. Also, appropriate scheduling for each physician provided consistency within the department. Most importantly, centralized or decentralized appointment scheduling philosophies were both served by the system. One clerk could schedule all physicians or multiple terminals provide access for many clerks to schedule individual physicians.

Specifications To Be Utilized in PM&R Computerized Scheduling System

1. Schedule, cancellation and reschedule capabilities.
2. User friendliness for consistency (basic prompting for clerks)
3. Historic and future scheduling information available.
4. Multiple scheduling formats. Individual therapist schedule, Patient schedule all available.
5. Linking with master files for charge tickets.
6. Allowing involvement of all personnel in determining specifications for computerized system.
A 230 bed medical-surgical hospital in Lanham, Maryland opted to replace their current manual paper driven operating room scheduling system with a computerized process for their nine operating rooms. Two secretaries scheduled 100 to 150 procedures a day to accommodate the demand. Using the paper procedure, scheduling was dependent upon schedulers skills and amount of information the secretaries could remember about the procedures, equipment, etc. The paper system was too people dependent for Lanham's needs.

The primary aim of the computerized system, in Lanham's eyes, has careful control of identifiable factors that influence a smooth flow of work. Once these factors could be easily controlled, maximum use of operating room time would exist. Most importantly, improved cost effectiveness and utilization of facilities and staff would also be present.

Determining the length of procedure was the main component that needed to be dealt with before a computerized system could be implemented. Once this was determined using seven different variables, advantages of a computerized system were recognized:

1. With a computerized system, the actual schedule could be linked to billing for automatic bill generation.
2. All departments requiring use of operating room schedules could get a copy neatly, accurately and on time.
3. Phone calls concerning cancellations, emergencies etc. could be handled more expeditiously.
4. A favorable reputation of running on time could be established.
5. Anesthesiologists and supervisory nursing personnel use the system to review workloads several days in advance.

In regards to utilizing any of these goals and recommendations for a scheduling system in a Physical Medicine and Rehabilitation Unit, several factors are quite relevant. Automatic linkage into billing procedures would be quite useful as well as expedient handling of cancellations and emergencies. A neat, uniform produced schedule would allow for less uncertainty and early review of staff levels could increase utilization.

An important point to consider is the availability of a paper back up system. Any system chosen must have a printing capacity so if a power failure or other such emergency occurs, the entire department does not come to a standstill.
APPENDIX D

COMPARISON TO OPERATING ROOM SCHEDULING SYSTEM
ORS The Operating Room Scheduler and M.I.S
Evaluation of PM&R Specifications

In order to effectively evaluate whether software specifications are available in scheduling packages on the current market, a comparison system was selected to evaluate. The Operating Room Scheduler (ORS) marketed by D.J. Sullivan and Associates provided a comparison system for specifications needed in a PM&R scheduling system.

Most scheduling needs specified for a PM&R system are available in the ORS system. ORS displays a large grid sheet for each operating room that allows for scheduling of patient with the specific surgeon, equipment needed and a predetermined operating room. With this capability, patients in PM&R could be scheduled by therapist along with the equipment needed for treatment. Allocation of treatment room may also be stored with the system. Capability exists to make easy cancellation and rescheduling of surgeries due to layout of the grid sheet. The ORS system also displays the equipment and special features of each operating room so alternative plans may be used if conflicts exist.

The ORS system provides the technology to support all the hardware considerations needed in PM&R. ORS runs on an IBM compatible system configured with at least 640K of memory, a color monitor and a wide-carriage printer. The system also allows for linkage with a main frame system in the future. The system was designed with simplified prompts and help functions to allow anyone to run the system. A retrievable data base allows report generation on any function of the surgeon (e.g., length of procedure, equipment used, types of surgery performed) or on most aspects of the procedure performed. The ORS system has an internal statistical program that is powerful enough to meet its needs so no provision exists for downloading into a statistical analysis program.

A major objective in the design of ORS was the design of a system that could monitor scheduling practices to track utilization. For this to occur a wide range of reports must be generated. ORS is capable of generating reports on the daily operating room schedule, preference cards, procedure summary, room utilization, staff utilization and delay statistics. While none of these reports would fulfill any of PM&R's needs, it is evident technology exists to support their needs. If the standard list of reports generated is insufficient, an ad hoc writing feature allows anyone to design their own custom report.

Support systems for ORS directly from D.J. Sullivan and Associates, the vendor. Once a system is purchased it is the vendor responsibility to train hospital staff utilizing the equipment and to provide backup consultations for a predetermined period of time. While an in house consultant such as Hospital Information Systems may provide limited answers to general questions, they should not be relied upon to learn the details of the system. The burden of support lies with the vendor.

Most software and hardware specifications needed for an effective scheduling system in PM&R are available in the current market. This is not to say purchasing a software package will solve all needs. Some modifications may be needed but vendors realize they are selling generic packages and will provide support to tailor them to a specific customer's needs.