Effective Patient Scheduling

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Patient appointments and scheduling of patients and physicians are the first step in any health-care delivery system. This paper deals with the conventional method usually found in preprinted appointment books, and the "wave" method. A method of testing this system in any practice environment is described, together with the comparative benefits of the wave method over the conventional method of scheduling. This paper also exemplifies one kind of research that can be accomplished in the private, ambulatory sector of medicine.

Everyone hates to wait for service, especially in the waiting room of a physician's office. It is generally difficult for the patient to estimate where he or she is in the queue and how much longer the wait for service will be. This, coupled with the patient's illness, may make a five-minute wait appear more like an hour.

The problem of patient scheduling surfaced at the Ambulatory Care Center (ACC) of the University of Alabama in Huntsville in the School of Primary Medical Care in the winter of 1975. The ACC is the largest of the School's three outpatient clinics and is functioning as a model group family practice for the North Alabama region. Within the ACC are four modules with six examining rooms per module. Each module has been designed to replicate a small model private clinic. Staffing of a module consists of one faculty physician, five residents, and the necessary support personnel. In addition to the modules, the ACC also has a pharmacy, laboratories, an Emergency Room, and a centralized medical records area.

As patients began to complain of long waiting times, it was decided to conduct a study of the problem. The study consisted of four phases covering a five-month period. Phase One was to collect data on the current method of scheduling. Phase Two was to analyze these data and to develop a simulation model of the patient flow. Phase Three was to use the model to determine an optimal scheduling method. Phase Four was to collect data on the new scheduling method and to evaluate the results.

The Problem

Each module has two sessions — a morning one from 8:45 to 11:45 and one from 2:00 to 5:00 in the afternoon. Three physicians staff each session. The scheduling of patients is done in the module by the receptionist.

A typical page from the old scheduling book is illustrated in Figure 1. With this method of scheduling, each physician could see a maximum of 24 patients per session (two each 15-minute period). Because of the many 15-minute periods from which the patient can choose, he or she has a good selection of available times. Consequently, a typical daily schedule would find a large percentage of the patient appointments clustered around certain time periods. Since first year residents spend more time with the patient, the six examining rooms would immediately reach full utilization during the popular time periods. As a result, long queues would develop until a less popular time period was reached.

Each physician was seeing an average of five to nine patients per three-hour session, depending on the physician's experience. This patient load was well below the maximum number of available 15-minute appointment periods. However, even with this patient load, the module's six examining rooms were close to full utilization. Consequently, the waiting problem could have been more severe with a greater patient load.

Data Collection

The patient flow through a module can be described by the following sequence of events. Upon arrival, the patient registers with the receptionist and waits in the module waiting room. Once an examining room becomes available, the nurse escorts the patient there. The patient waits in the examining room for the physician. The physician arrives and conducts the examination, after which the patient leaves the examining room and returns to the receptionist.

To thoroughly evaluate the patient flow, a rubber stamp was prepared and each charge ticket stamped prior to the patient's visit. This rubber stamp allowed the collection of the following data: patient number, sex, physician number, time of appointment, time of arrival, time nurse called the patient, time patient entered examining room, time physician entered examining room, time physician left examining room, time patient left examining room, and time patient left the module.

The various data elements were entered onto the form by the appropriate individuals. For example, the receptionist entered patient arrival and departure time, the nurse entered the time the patient entered the examining room, and the physician entered the time he/she entered and left the examining room.

Data were collected for a three-week period beginning in January 1976. During this period, 412 patients visited the module.

Data Analysis

Analysis revealed that the data were stratified by physician experience. (See Table 1.) That is, the data tended to cluster by faculty, by second and third-year residents, and by first-year residents. For example, patients seeing

the first year residents were in the examining room 53 percent (15 minutes) longer than faculty patients. On the average, the faculty members could see five patients an hour, the second and third year residents four an hour, and the first year residents two an hour. These physician service rates gave a good indication of how to schedule patients.

Simulation Model

Once the data were analyzed, a FORTRAN model[1] was developed to simulate the patient flow through the module. The model was validated using the previously collected data. A number of different scheduling procedures were investigated. The scheduling procedure which minimized patient waiting time and did not significantly decrease patient load consisted of a different schedule for the faculty, the second and third year residents, and the first year residents. These schedules for a morning session are given in Figure 2.

This method of scheduling is commonly referred to as the "wave" method.[2] The wave method is based on three factors: the average number of patients a physician can see an hour, the number of examining rooms, and the importance of not scheduling toward the end of each hour. The objective behind the wave is that at the start of each hour the physician will be back on schedule. For example, the faculty schedule in Figure 2 allows for six patients an hour. Two patients are scheduled each 15 minutes up to the three-quarter hour. The last 15 minutes of each hour are not scheduled and instead are used to allow the physician to finish the appointments scheduled that hour.

Evaluation of the New Method

After the new method of scheduling had been in use for several months, data were collected comparing the wave method with the old method. The previously designed rubber stamp was again used to stamp each charge ticket. Data were collected for a two-week period beginning in March 1976.

During this two-week period, 262 patients visited the module. That is, 131 patients per week visited the module as compared with 137 patients per week using the old scheduling method. These results suggest that the new method of scheduling did not reduce the number of patient visits.

Table 2 presents a comparison of the promptness with which patients were serviced. A larger percentage (64 versus 47 percent) of faculty patients were serviced later using the wave method of scheduling, which suggests that the faculty's schedule may be overloaded. On the other hand, a

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Physician: _____   Date: _____

Patient	Complaint	Chart #
9:00		
9:00		
9:15		
9:15		
9:30		
9:30		
9:45		
9:45		
10:00		
10:00		
10:15		
10:15		
10:30		
10:30		

Figure 1. Old Scheduling Form

Table 1. Average Times Using the Old Scheduling Method

| Average Time (Minutes) | Physician | | |
	Faculty	Second and Third Year Resident	First Year Resident
Patient in module	40	52	59
Patient wait in reception area	8	9	12
Patient wait in reception area for those having to wait	16	17	28
Nurse service	4	4	4
Patient examination room	28	39	43
Patient wait	11	18	13
Physician in room	12	16	25
Patient in room after examination	5	5	5

Figure 2. Wave Method of Scheduling

Faculty   DATE_____ AM

Patient	Complaint	# Minutes	Chart #
9:00			
9:00			
9:15			
9:15			
9:30			
9:30			
10:00			
10:00			
10:15			
10:15			
10:30			
10:30			
11:00			
11:00			
11:15			
11:15			

Second/Third Year Residents   DATE_____ AM

Patient	Complaint	# Minutes	Chart #
9:00			
9:00			
9:40			
10:00			
10:00			
10:20			
10:20			
10:40			
11:00			
11:00			
11:20			
11:20			

First Year Residents   DATE_____ AM

Patient	Complaint	# Minutes	Chart #
9:00			
9:30			
10:00			
10:30			
11:00			
11:30			

much larger percentage (68 versus 46 percent and 76 versus 56 percent) of resident patients were serviced on or before their appointment time, which indicates that the wave method did reduce patient waiting time.

Table 3 presents a summary of patient time spent in the module under the wave method of scheduling. These results can be compared with those of the old method of scheduling in Table 1. The overall patient time in the module is reduced from 50 to 39 minutes. The primary contributor to this reduction is the reduction in the patient waiting time in the reception area from 17 to 11 minutes.

The time the residents spend with the patient also dropped considerably, probably due to several factors. One factor is that during the first data collection period the ACC was registering many new patients who were required to have complete physical examinations. The other factor is that during the four months which elapsed between data collection periods the residents became more efficient in examining patients.

With the old method of scheduling, the longest waiting times were for the first-year residents. However, with the wave method, the longest waiting times were reversed and were for the faculty physicians. This reversal is due in part to the maximum number of patients which can be scheduled per three-hour session. With the old method, each physician could see a maximum of 24 patients per session (two each 15-minute period). With the wave method, the faculty can see a maximum of 16, a second or third-year resident 12, and a first-year resident 6 patients per session.

Figure 3 presents a comparison of the patient time in the module. The mean time was 50 minutes with the old method and 39 minutes using the wave method of scheduling. Using the old method, over 30 percent of the patients were in the module more than 60 minutes and eight percent more than 90 minutes. However, with the wave method only nine percent of the patients were in the module more than 60 minutes and one percent more than 90 minutes.

Figure 4 presents a comparison of the waiting times for those patients serviced after their appointment. Using the wave method, the mean wait was reduced from 17 minutes to 11 min-

Table 2. Comparison of Service

	Old Method			Wave Method		
	Faculty	Second and Third-Year Residents	First-Year Residents	Faculty	Second and Third-Year Residents	First-Year Residents
Patients serviced before appointment	32%*	24	40	23	44	49
Patients serviced on schedule	21	22	16	13	24	27
Patients serviced after appointment	47	54	44	64	32	24

*All table entries are percentages

Table 3. Average Times Using the Wave Scheduling Method

Average Time (Minutes)	Physician		
	Faculty	Second Third-Year Resident	First-Year Resident
Patient in module	40	37	45
Patient wait in reception area	12	7	6
Patient wait in reception area for those having to wait	16	15	12
Nurse Service	3	3	3
Patient in examination room	25	27	36
Patient wait	11	13	17
Physician in room	11	11	16
Patient in room after examination	3	3	3

utes, with over 60 percent of the patients having to wait less than ten minutes. Also, only eight percent had to wait over 30 minutes as compared with 16 percent under the old method.

Figure 5 presents a comparison of patient time spent in the examining room. Figure 6 presents a comparison of the amount of time the patient spent waiting for the physician in the examining room. The mean time in the examining room was reduced from 36 to 29 minutes. This reduction is attributed to the reduction in the patient waiting time from 16 to 12 minutes and to the increased service rate by the residents.

Conclusions

In summary, the wave method of scheduling greatly reduced the patient waiting times, which consequently reduced the patient time in the module. The reduction in the waiting time did not affect the overall patient load of the module. However, one reason for this minimal effect on patient load may be due to the increased efficiency of the first-year residents. With the wave method, the extremely long patient waiting times were eliminated. The elimination of these long waiting times can be attributed to the wave method of not scheduling patients toward the end of each hour. This allowed the physician to start each hour on schedule.

A Family Practice Center, and specifically a family practice module, is not identical to the experience of the family physician in private practice because of teaching commitments, but it is very similar in most other practice protocols and procedures. We feel that the similarities provide an ideal mechanism for research in family medicine, especially in the methods of health-care delivery.

The wave method of scheduling patients, with or without modifications to suit individual practice situations, provides benefits to the practicing physician as well as to the patient.

One of the foremost of these is improvement in medical records. Whether the physician uses a regular or problem-oriented record system, this method will provide him each hour with time to write or dictate into his record system. Many physicians, because of heavy patient loads and inefficient patient scheduling, put off doing records until the end of a practice session or sometimes until the next day. Much is lost of what patients say and what the physician has done for those patients. Others will not postpone the record duty, but may shorten what is recorded or write with such speed that the writing is illegible, even to the physician.

This system also provides time for nurses, bookkeepers, and others to "catch up" on chores that are carried out at the end of the day or put off indefinitely. It has changed the hurried look of a practice behind schedule in appointments to a more relaxed, un-
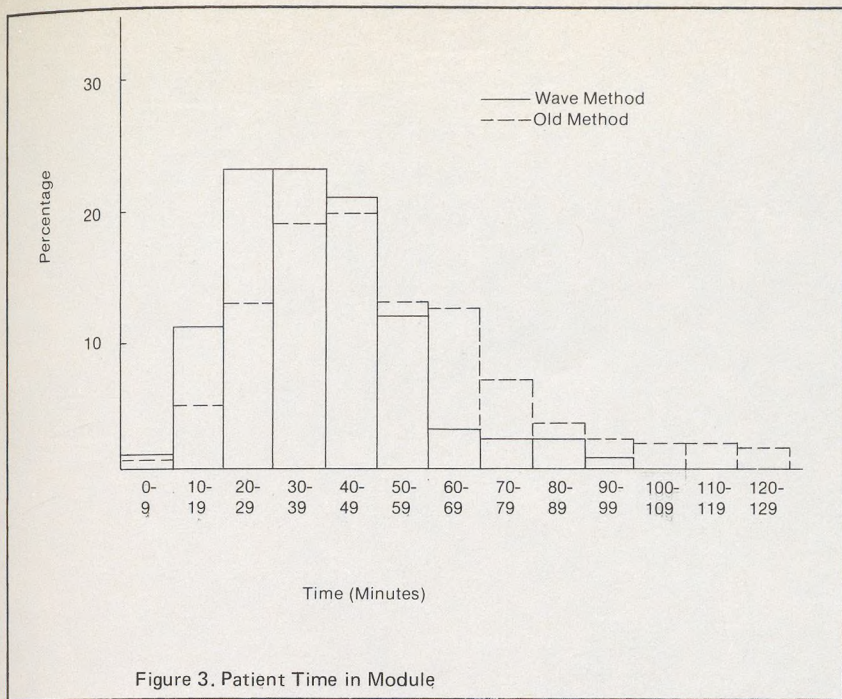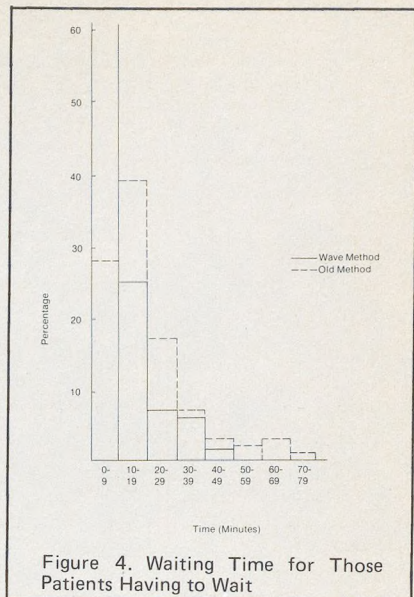
Figure 3. Patient Time in Module

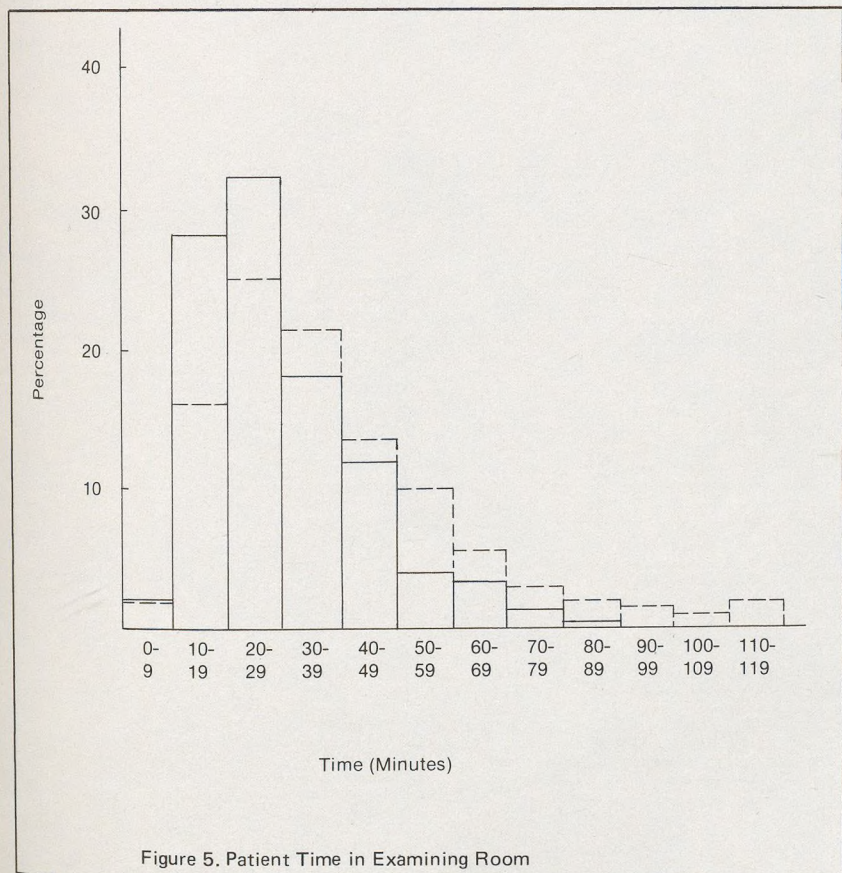

Figure 4. Waiting Time for Those Patients Having to Wait

Figure 6. Patient Waiting in Examining Room for Physician
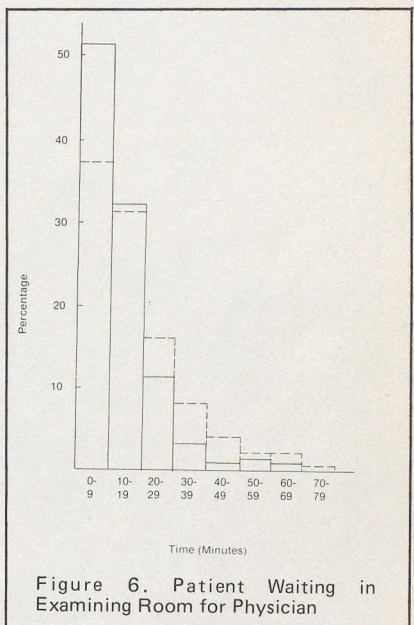

Figure 5. Patient Time in Examining Room

cluttered one. This positive effect spills over from physician and personnel to the patient and improves patient-physician relationships and attitudes. Just as courtesy is contagious, this change in attitude extends over after hours into the personal life of the physician, and we have had comments from faculty members that they feel less tired at the end of a practice session. Certainly the methods of trial are simple and, we feel, worthwhile to explore for two or three weeks in any type of practice.

References

1. Look J, Prased K, Smith R: Patient Scheduling at the Ambulatory Care Center. EG525 term paper, The University of Alabama in Huntsville, March, 1976
2. Silver M: Scheduling: Least developed art. Fam Pract News 5(23):34, 1975