

- 15 The following wait staff are needed at a restaurant. Use the first-hour principle to generate a personnel schedule. Assume a four-hour shift.

	PERIOD										
	11 A.M.	NOON	1 P.M.	2 P.M.	3 P.M.	4 P.M.	5 P.M.	6 P.M.	7 P.M.	8 P.M.	9 P.M.
Requirements	4	8	5	3	2	3	5	7	5	4	2
Assigned	4	4				3	2	2			
On duty	4	8	8	8	4	3	5	7	7	4	2

- 16 The following matrix contains the costs (in dollars) associated with assigning Jobs A, B, C, D, and E to Machines 1, 2, 3, 4, and 5. Assign jobs to machines to minimize costs.

JOBS	MACHINES				
	1	2	3	4	5
A	6	11	12	3	10
B	5	12	10	7	9
C	7	14	13	8	12
D	4	15	16	7	9
E	5	13	17	11	12

- 17 Bill Edstrom, managing partner at a biomedical consulting firm, has requested your expert advice in devising the best schedule for him for the following consulting projects, starting on February 2nd.

TASK	DESCRIPTION OF CONSULTATION		CALL RECEIVED		DUE DATE (CLOSE OF BUSINESS)
	LENGTH	COMPANY	DATE	TIME	
I	3 days	Novartis Corp.	February 1	9 a.m.	February 5
II	1 day	Reardon Biotech Corp.	February 1	10 a.m.	February 7
III	2 days	Vertex Pharmaceuticals	February 1	11 a.m.	February 7
IV	2 days	OSI Pharmaceuticals	February 1	1 p.m.	February 7

The consulting firm charges a flat rate of \$4,000 per day. All four firms impose fines for lateness. Reardon Biotech charges a \$500-per-day fine for each day that the completion of the consulting work is past the due date; Vertex Pharmaceuticals, Novartis, and OSI Pharmaceuticals all charge a fine of \$1,500 per day for each day late.

Prepare alternative schedules based on the following priority rules: SOT, FCFS, EDD, STR, and another rule—longest processing time (LPT), which orders jobs according to longest assigned first, second longest assigned second; and so on. For the sake of simplicity, assume that consulting work is performed seven days a week. Which rule provides Bill with the best schedule? Why?

CASE: KEEP PATIENTS WAITING? NOT IN MY OFFICE

Good doctor-patient relations begin with both parties being punctual for appointments. This is particularly important in my specialty—pediatrics. Mothers whose children have only minor problems don't like them to sit in the waiting room with really sick ones, and the sick kids become fussy if they have to wait long.

But lateness—no matter who's responsible for it—can cause problems in any practice. Once you've fallen more than slightly

behind, it may be impossible to catch up that day. And although it's unfair to keep someone waiting who may have other appointments, the average office patient cools his heels for almost 20 minutes, according to one recent survey. Patients may tolerate this, but they don't like it.

I don't tolerate that in my office, and I don't believe you have to in yours. I see patients *exactly* at the appointed hour more than

99 times out of 100. So there are many GPs (grateful patients) in my busy solo practice. Parents often remark to me, "We really appreciate your being on time. Why can't other doctors do that too?" My answer is "I don't know, but I'm willing to tell them how I do it."

BOOKING APPOINTMENTS REALISTICALLY

The key to successful scheduling is to allot the proper amount of time for each visit, depending on the services required, and then stick to it. This means that the physician must pace himself carefully, receptionists must be corrected if they stray from the plan, and patients must be taught to respect their appointment times.

By actually timing a number of patient visits, I found that they break down into several categories. We allow half an hour for any new patient, 15 minutes for a well-baby checkup or an important illness, and either 5 or 10 minutes for a recheck on an illness or injury, an immunization, or a minor problem like warts. You can, of course, work out your own time allocations, geared to the way you practice.

When appointments are made, every patient is given a specific time, such as 10:30 or 2:40. It's an absolute no-no for anyone in my office to say to a patient, "Come in 10 minutes" or "Come in a half-hour." People often interpret such instructions differently, and nobody knows just when they'll arrive.

There are three examining rooms that I use routinely, a fourth that I reserve for teenagers, and a fifth for emergencies. With that many rooms, I don't waste time waiting for patients, and they rarely have to sit in the reception area. In fact, some of the younger children complain that they don't get time to play with the toys and puzzles in the waiting room before being examined, and their mothers have to let them play awhile on the way out.

On a light day I see 20 to 30 patients between 9 A.M. and 5 P.M. But our appointment system is flexible enough to let me see 40 to 50 patients in the same number of hours if I have to. Here's how we tighten the schedule:

My two assistants (three on the busiest days) have standing orders to keep a number of slots open throughout each day for patients with acute illnesses. We try to reserve more such openings in the winter months and on the days following weekends and holidays, when we're busier than usual.

Initial visits, for which we allow 30 minutes, are always scheduled on the hour or the half-hour. If I finish such a visit sooner than planned, we may be able to squeeze in a patient who needs to be seen immediately. And, if necessary, we can book two or three visits in 15 minutes between well checks. With these cushions to fall back on, I'm free to spend an extra 10 minutes or so on a serious case, knowing that the lost time can be made up quickly.

Parents of new patients are asked to arrive in the office a few minutes before they're scheduled in order to get the preliminary paperwork done. At that time the receptionist informs them, "The doctor always keeps an accurate appointment schedule." Some already know this and have chosen me for that very reason. Others, however, don't even know that there are doctors who honor appointment times, so we feel that it's best to warn them on the first visit.

FITTING IN EMERGENCIES

Emergencies are the excuse doctors most often give for failing to stick to their appointment schedules. Well, when a child comes in with a broken arm or the hospital calls with an emergency Caesarean section, naturally I drop everything else. If the interruption is brief,

I may just scramble to catch up. If it's likely to be longer, the next few patients are given the choice of waiting or making new appointments. Occasionally my assistants have to reschedule all appointments for the next hour or two. Most such interruptions, though, take no more than 10 to 20 minutes, and the patients usually choose to wait. I then try to fit them into the spaces we've reserved for acute cases that require last-minute appointments.

The important thing is that emergencies are never allowed to spoil my schedule for the whole day. Once a delay has been adjusted for, I'm on time for all later appointments. The only situation I can imagine that would really wreck my schedule is simultaneous emergencies in the office and at the hospital—but that has never occurred.

When I return to the patient I've left, I say, "Sorry to have kept you waiting. I had an emergency—a bad cut" (or whatever). A typical reply from the parent: "No problem, Doctor. In all the years I've been coming here, you've never made me wait before. And I'd surely want you to leave the room if my kid were hurt."

Emergencies aside, I get few walk-ins, because it's generally known in the community that I see patients only by appointment except in urgent circumstances. A nonemergency walk-in is handled as a phone call would be. The receptionist asks whether the visitor wants advice or an appointment. If the latter, he or she is offered the earliest time available for nonacute cases.

TAMING THE TELEPHONE

Phone calls from patients can sabotage an appointment schedule if you let them. I don't. Unlike some pediatricians, I don't have a regular telephone hour, but my assistants will handle calls from parents at any time during office hours. If the question is a simple one, such as "How much aspirin do you give a one-year-old?" the assistant will answer it. If the question requires an answer from me, the assistant writes it in the patient's chart and brings it to me while I'm seeing another child. I write the answer in—or she enters it in the chart. Then she relays it to the caller.

What if the caller insists on talking with me directly? The standard reply is "The doctor will talk with you personally if it won't take more than one minute. Otherwise you'll have to make an appointment and come in." I'm rarely called to the phone in such cases, but if the mother is very upset, I prefer to talk with her. I don't always limit her to one minute; I may let the conversation run two or three. But the caller knows I've left a patient to talk with her, so she tends to keep it brief.

DEALING WITH LATECOMERS

Some people are habitually late; others have legitimate reasons for occasional tardiness, such as a flat tire or "He threw up on me." Either way, I'm hard-nosed enough not to see them immediately if they arrive at my office more than 10 minutes behind schedule, because to do so would delay patients who arrived on time. Anyone who is less than 10 minutes late is seen right away, but is reminded of what the appointment time was.

When it's exactly 10 minutes past the time reserved for a patient and he hasn't appeared at the office, a receptionist phones his home to arrange a later appointment. If there's no answer and the patient arrives at the office a few minutes later, the receptionist says pleasantly, "Hey, we were looking for you. The doctor's had to go ahead with his other appointments, but we'll squeeze you in as soon as we can." A note is then made in the patient's chart showing the date, how late he was, and whether he was seen that day or given another appointment. This helps us identify the rare chronic offender and take stronger measures if necessary.

Most people appear not to mind waiting if they know they themselves have caused the delay. And I'd rather incur the anger of the rare person who *does* mind than risk the ill will of the many patients who would otherwise have to wait after coming in on schedule. Although I'm prepared to be firm with parents, this is rarely necessary. My office in no way resembles an army camp. On the contrary, most people are happy with the way we run it, and tell us so frequently.

COPING WITH NO-SHOWS

What about the patient who has an appointment, doesn't turn up at all, and can't be reached by telephone? Those facts, too, are noted in the chart. Usually there's a simple explanation, such as being out of town and forgetting about the appointment. If it happens a second time, we follow the same procedure. A third-time offender, though, receives a letter reminding him that time was set aside for him and he failed to keep three appointments. In the future, he's told, he'll be billed for such wasted time.

That's about as tough as we ever get with the few people who foul up our scheduling. I've never dropped a patient for doing so. In fact, I can't recall actually billing a no-show; the letter threatening to do so seems to cure them. And when they come back—as nearly all of them do—they enjoy the same respect and convenience as my other patients.

QUESTIONS

- 1 What features of the appointment scheduling system were crucial in capturing "many grateful patients"?

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SUPER QUIZ

- 2 What procedures were followed to keep the appointment system flexible enough to accommodate the emergency cases, and yet be able to keep up with the other patients' appointments?
- 3 How were the special cases such as latecomers and no-shows handled?
- 4 Prepare a schedule starting at 9 A.M. for the following patients of Dr. Schafer:
 Johnny Appleseed, a splinter on his left thumb.
 Mark Borino, a new patient.
 Joyce Chang, a new patient.
 Amar Gavhane, 102.5 degree (Fahrenheit) fever.
 Sarah Goodsmith, an immunization.
 Tonya Johnston, well-baby checkup.
 JJ Lopez, a new patient.
 Angel Ramirez, well-baby checkup.
 Bobby Toolright, recheck on a sprained ankle.
 Rebecca White, a new patient.
 Doctor Schafer starts work promptly at 9 A.M. and enjoys taking a 15-minute coffee break around 10:15 or 10:30 A.M.
 Apply the priority rule that maximizes scheduling efficiency. Indicate whether or not you see an exception to this priority rule that might arise. Round up any times listed in the case study (e.g., if the case study stipulates 5 or 10 minutes, then assume 10 minutes for the sake of this problem).
- 1 This is the currently used term for a system that schedules, dispatches, tracks, monitors, and controls production.
- 2 This is when work is assigned to work centers based simply on when it is needed. Resources required to complete the work are not considered.
- 3 This is when detailed schedules are constructed that consider setup and run times required for each order.
- 4 This is when work is scheduled from a point in time and out into the future, in essence telling the earliest when the work can be completed.
- 5 This is when work is scheduled to tell the time work must be started so that it is completed by a specific date.
- 6 If we were to coin the phrase "dual constrained" relative to the resources being scheduled, we would probably be referring to what two resources?
- 7 For a single machine scheduling problem, what priority rule guarantees that the average (mean) flow time is minimized?
- 8 Consider the following three jobs that need to be run on two machines in sequence: A(3 1), B(2 2), and C(1 3), where the run time on the first and second machine are given in parenthesis. In what order should the jobs be run to minimize the total time to complete all three jobs?
- 9 According to APICS this is a system for utilizing data from the shop floor as well as data processing files to maintain and communicate status information on shop orders and work centers.
- 10 A resource that limits the output of a process; limiting capacity is called this.

1. Manufacturing Execution System 2. Infinite scheduling 3. Finite scheduling 4. Forward scheduling
 5. Backward scheduling 6. Labor and equipment (machines) 7. Shortest operating time 8. Bottleneck
 9 Shop-floor (or production activity) control 10. Bottleneck