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Case

Miller Pain Treatment Center

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Abstract. On a cool Saturday morning Dr. Keith Weems walked briskly down the hallway toward the main entrance to Eastern Hospital (JHH). He was on his way to visit in-patients in several wards as part of his duties as the pain specialist on call for that weekend. However, his mind kept drifting to issues he was facing as the new manager of the Miller Pain Treatment Center in the neighboring Eastern Outpatient Center (E-HOC). Dr. Weems had been working as part of the Eastern system for several years. However, he recently merged his successful private practice into the Miller Pain Treatment Center and was appointed as its director. In so doing he moved from a setting where he was the clear boss to one in which he was dealing with a collection of more established doctors already set in their ways. He also had to figure out how to improve the care delivery process in this environment, which considered itself to be part of the premier teaching hospital in the world. After reviewing the operations and meeting the staff he was coming to grips with the fact that this new setting was much more complex than his old practice in a myriad of ways. Additionally, between treating outpatients and in-patients, managing the clinic, teaching medical students, and conducting research, it was clear that the complexity of the job mirrored the complexity of the operating environment. However, he was confident that he could find ways to get this larger clinic to surpass the success of his old, simpler practice.

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Keywords: process analysis • healthcare delivery • discrete event simulation • case study

Eastern Hospital and E-HOC

Eastern Hospital (JHH) is a 918 bed general medical and surgical facility founded in the 19th century. The hospital currently handles roughly 47,000 admissions per year and 400,000 outpatient visits. This includes over 22,000 inpatient surgeries and 86,000 emergency room visits annually. JHH is considered by many to be the preeminent medical facility in the world and was ranked #1 by U.S. News and World Report for over 20 years. However, such rankings do not paint the total picture for all areas, especially when considering outpatient care. As the journal states, "our intent when we published the first Best Hospitals annual ranking in 1990 was to help people who find themselves in need of unusually skilled inpatient care."

Over its long history, JHH has evolved to include a large outpatient service. Much of this service is housed in the neighboring E-HOC, but this is supplemented by a number of outpatient clinics in surrounding communities. Many metrics of quality related to outpatient care, differ from those most often discussed when considering inpatient services. For outpatient care, key metrics typically revolve around (1) access to care, (2) preventive measures, and (3) treatment outcomes including the reduction in complication rates. In some areas, these are relatively easy to identify. For example, for clinics that focus on chronic conditions such as diabetes or cardiovascular disease, we can look at outcomes such as modification of risk factors, the number of patients with cardiovascular diseases who remain stable, or the number of diabetics who remain stable. Complications in these areas include limb amputations brought on by diabetes or strokes and heart attacks in patients with cardiovascular disease. By comparison, many outcome measures in chronic pain clinics are more subjective because patients and health care providers focus on altering the impact of pain on functioning and quality of life. However, other metrics such as access to care are more readily measurable.

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Private Practice

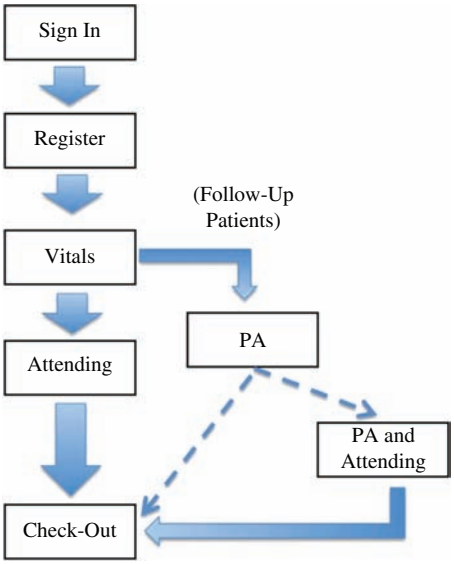
Before assuming the role as the lead administrator for the Miller Pain Treatment Clinic, Dr. Weems had been employed as the sole pain specialist at a private practice satellite clinic within the Eastern system. This practice was housed in a newer facility in a suburban location with ample parking and lush grounds. In this practice, he was the sole attending physician (Attending) and worked in conjunction with a physician's assistant (PA) and nursing and administration staff to deliver outpatient care to patients with chronic pain.

His clinic dealt with three types of patient visits. "New" patients were those coming to the clinic for the first time. These patients were instructed to arrive 30 minutes before the appointment time to fill out forms and provide insurance information. (Other patients are asked to arrive 15 minutes early.) New patients represent about 30% of all cases. For these visits special care was needed to gather data on the patient's medical history and other conditions. "Return" patients (roughly 40%) were those that needed additional care from the Attending. The practice also included a number of "Follow-up" patients (roughly 30%) who simply needed a prescription refill or to provide feedback on how they were progressing. As both a new doctor in the Eastern system, and the only doctor at this loction, Dr. Weems felt that it was his responsibility to manage patient satisfaction in his clinic, as this would ultimately affect the clinic's profitability and reputation.

The process flow of the private practice was fairly straight-forward and is depicted in Figure 1. A sample of activity times is presented in Table 1. Virtually all patient visits are by appointment. The first patient is scheduled for 8 A.M. For New and Return visits, the patient signs in upon entry to the clinic. Front desk staff retrieves the patient's records and completes any needed administrative activities. We label this step *Registration*. After an examination room becomes available, a clinical assistant leads the patient to one of 4 examination rooms and records vital signs. We label this step *Vitals*. The patient's file is then left in a slot outside the door indicating that a patient is inside. The Attending reviews the file and enters the examination room to interact with the patient. We label this step *Attending*. After completing the visit with the Attending, the patient proceeds to checkout before exiting the system. We label this step *Check-Out*.

For Follow-up visits the PA replaces the Attending in the process flow, but does need to consult with the Attending in about ½ of such cases. Due to the nature of the medications involved, prescription refills are typically not authorized over the phone. For tightly controlled substances such as OxyContin® or Percodan®, the Attending must authorize each refill request by signature. However, most of these visits are routine, and the bulk of the review process is handled by a PA who is assigned one of the four examination rooms for the

Figure 1. Process Flow of Patient Visit in Private Practice



Notes. Front desk staff involved in *Register*, *Check-Out*; CA involved in *Vitals*; Attending involved in *Attending*, *PA and Attending*; PA involved in *PA*, *PA and Attending*. For *Follow-Up* visits *Attending* is replaced with *PA*, *PA and Attending*.

Table 1. Sample Activity Times (in Minutes) for Selected Steps Common to Private Practice and AMC

Record	Registration	Vitals	Physicians assistant	Check-out
1	9	3	15	1
2	4	2	26	5
3	9	3	47	4
4	8	3	24	10
5	4	4	56	9
6	3	1	21	7
7	2	3	12	3
8	1	3	19	4
9	6	3	9	5
10	8	3	21	1
11	4	3	14	1
12	4	3	13	6
13	4	2	21	3
14	11	2	26	2
15	2	3	32	4
16	3	3	25	8
17	7	5	23	2
18	3	4	18	2
19	3	1	42	6
20	3	2	16	3
21	2	5	22	2
22	4	5	19	4
23	1	4	25	3
24	1	2	14	5
25	5	2	17	3
Average	4.33	3.53	22.62	4.72
Standard deviation	2.68	1.75	13.73	3.26

Note. Average and standard deviation shown refer to entire data set provided in the online spreadsheet supplement.

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day. In these cases the PA sees the patient and prepares the prescription for the Attending's signature, which takes virtually no time. However, for about half of the follow-up cases, the PA needs to consult with the Attending before preparing the prescription. When this happens, the PA typically needs to have a conversation with the Attending. The average duration of this activity is three minutes.

Efficiency of Clinic Operations

Working in a small satellite clinic afforded Dr. Weems some control and flexibility. This was valuable to him because he had to juggle clinic sessions, time spent doing procedures that were not billed the same as clinic visits, and time in the hospital helping manage pain for inpatients. This type of autonomy had its appeal to many entrepreneurial practitioners. On the other hand, these small clinics were serving the same general population as E-HOC, and the barriers to entry for a doctor with a successful practice were fairly low. Consequently, these small practices were in competition with each other as well as larger elements of the Eastern system. This motivated many of the smaller clinics to develop and leverage a reputation for superior service.

For example, if Dr. Weems was available, he would often go into the waiting room and retrieve the next patient on the appointment schedule himself. If he was falling behind schedule, he would occasionally step into the waiting room to explain to patients why they were being asked to wait. Dr. Weems was also known to accommodate a patient who needed to reschedule an appointment, even if this meant starting before 8 A.M. or staying after 5 P.M. At times Dr. Weems spent extra time with a patient that was having a particularly hard time managing their chronic pain. This time might include advising, counseling, or even praying with patients that were having an emotionally difficult time dealing with their circumstances.

In addition to these informal efforts to improve the patient experience, Dr. Weems quickly recognized that even though most patients didn't fully understand the complexities of medical care, they certainly understood that waiting for service was an unpleasant part of a stressful experience. Consequently, the doctor trained in medicine has to double as an operations manager. As Dr. Weems explains, "Given the realization that the era of multitasking physicians who double as clinic managers was at hand, the only way to survive was to roll up your sleeves and get on with the job."

As part of his efforts to develop and maintain a good reputation for service quality, Dr. Weems decided that he needed accurate data about how patients flow through the clinic. To collect this he had the front desk staff create a simple paper form when the appointment was made. This form would be attached to the patient's file when they checked in. Staff at the front desk would record the appointment time, the time when the patient signed in, the time when the patient got back to the desk to check out, and the time that the patient completed the exit procedure. The clinical assistant (CA) would record when the patient was led to the examination room and when she left the room after collecting vital data. Dr. Weems recorded when he entered the examination room, and when he finished. This data was collected over the course of several years. Tables 1 and 2 show samples of selected activity times recorded in the clinic.

Patient Tardiness and Waiting Times

Dr. Weems hoped to use the data that he had collected about clinic operations to help improve some aspects of service quality. Past research had repeatedly demonstrated that patient satisfaction with an outpatient service was significantly related to waiting time, and Dr. Weems hoped that waiting times were an area where improvements could be made. When he looked at the data that had been collected Dr. Weems noticed that some patients arrived late to an appointment. He suspected that this would set the clinic behind schedule. If that happens it might increase waiting times for patients scheduled to arrive later in the clinic session. Dr. Weems decided to attack this problem directly.

It was standard practice to send patients a letter about a week before their visit that contained a reminder of the time and date of their appointment. The standard letter included a sentence explaining that if the patient arrived late their appointment may need to be rescheduled. However, in practice, late patients were virtually always accommodated. Dr. Weems decided to be more proactive about enforcing this policy. The letters confirming each appointment were continued and the information about rescheduling late arrivals was highlighted. To make the policy more salient, a new activity was added to the clinic staff's job. Patients were called 24–48 hours prior to the appointment by clinic staff to remind them of their appointment time. During the call, patients were verbally reminded about the lateness policy. In addition, a sign stating that late patients would be asked to reschedule was displayed prominently on the front counter where patients checked in.

Since other clinics seemed to ignore the rescheduling policy, it was not clear that patients would be convinced that the policy would be enforced in this clinic. Dr. Weems realized that in order to change behavior, he and the team would have to maintain consistency in the way in which the policy was carried out. After discussions with the staff, Dr. Weems settled on an approach that would involve letting the patients who arrived "late" know that if they were to be seen at that point, it would be taking time away from other patients who arrived on time. For dissenting patients, Dr. Weems employed the strategy of telling them that

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Table 2. Sample Activity Times (in Minutes) for Steps Involving Attending in Private Practice

Record	Attending time new patients private practice	Attending time return patients private practice
1	12	15
2	27	14
3	16	15
4	15	30
5	18	16
6	29	30
7	29	24
8	20	14
9	33	14
10	30	14
11	29	4
12	35	14
13	15	11
14	33	17
15	39	26
16	23	22
17	10	15
18	35	10
19	30	30
20	20	31
21	30	20
22	20	11
23	55	12
24	34	15
25	28	23
Average	30.97	16.94
Standard deviation	12.41	7.76

Note. Average and standard deviation shown refer to entire data set provided in the online spreadsheet supplement.

Table 3. Sample of Patient Arrival Times Minus Appointment Times Before and 12 Months After Policy Change

Record	Arrival time minus appointment time before policy change	Arrival time minus appointment time after policy change
1	0	−21
2	−13	−23
3	−40	−15
4	−20	−38
5	−10	−23
6	−5	−5
7	−10	−2
8	−30	−15
9	−18	−36
10	−1	−20
11	−34	−30
12	−2	−36
13	−10	−10
14	−10	−49
15	−31	−37
16	−16	−53
17	−60	−52
18	−30	−45
19	−15	−24
20	−29	−34
21	4	−18
22	−36	−29
23	−35	2
24	−26	−29
25	−35	−17
Average	−24.09	−25.55
Standard deviation	24.77	16.14

Notes. Average and standard deviation shown refer to entire data set provided in the online spreadsheet supplement. Negative values indicate number of minutes patient arrives before appointment time.

if the late patient was willing to face the next patient on the schedule who arrived on time and tell that patient that he or she would have less time with the physician because of the late arrival, then the patient who was "late" would be seen if the next patient on the schedule agreed. No late patient ever took up the "offer" to face another patient depriving them of their due time with the physician.

Dr. Weems was quite pleased with the results of this effort. The portion of patients who arrived late was cut in half, and over 12 months the need to reschedule patients due to their late arrival disappeared. Dr. Weems kept a continual record of patient sign-in times and appointment times. Table 3 shows patient appointment and arrival times before the policy was implemented, and 12 months later. This experience convinced Dr. Weems that simple changes in policies or procedures could have an impact on clinic performance.

Merging Clinics

After four years of operation, Dr. Weems received a call from the chief of his division, Dr. Ravinasa to inform him that the departmental chair, Dr. Qutowski decided that it would be best for the department if the satellite clinics were closed and the services they offered were moved into E-HOC. The reasons for this decision were two fold. First, after reviewing the profit and loss (P&L) figures for the department it seemed clear that collectively, the clinics were not operating at full capacity and this move would reduce fixed costs. Having staff at multiple locations duplicated several roles. In addition, real estate costs at the attractive suburban locations was rapidly rising. Second, the department found it difficult to attract new faculty to the satellite facilities given the allure of the teaching and research missions of the main hospital.

Dr. Weems would continue to see "his" patients, have the same number of clinic sessions per week, and work with the same PA. The clinic space in E-HOC was similar to his clinic in that it also offered four examination rooms for patient assessment, including one that could be assigned to the PA. As part of the consolidation effort, Dr. Weems would be appointed as the director of operations for the larger clinic with responsibilities to help improve the profit and loss performance of the Center.

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Miller Pain Treatment Center

The Miller Pain Treatment Center located in E-HOC offers a comprehensive range of services for patients suffering from acute or chronic pain. It also functions as an Academic Medical Center (AMC) which means that it doubles as a training ground for Residents and Fellows. These doctors have completed 4 years of medical school but are working toward a specialization such as anesthesiology. In addition to the four examination rooms, the facility also includes a suite of rooms where a variety of more invasive procedures occur. For example, Dr. Weems uses this space to install spinal cord stimulators in some patients. These stimulators are electronic devices that deliver electrical impulses directly to the spine as part of a larger pain management strategy.

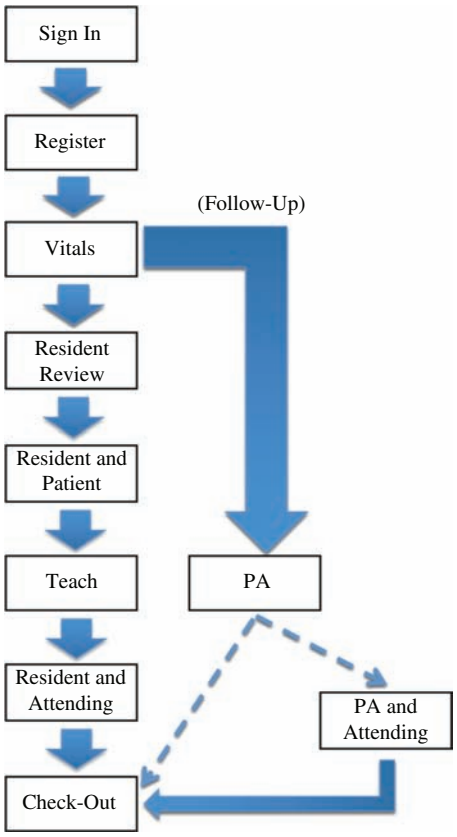
The center staff includes five attending physicians along with a full time PA. However, for each four-hour clinic session only one Attending will be present. A typical schedule for an Attending includes two, four-hour sessions involving the examination rooms, and another two, four-hour sessions using the procedure rooms. In addition, each physician typically visits inpatients five days per week and is on 24-hour call for five weekdays and one weekend, every five weeks. Beyond this load, Eastern physicians manage an ongoing research agenda that includes a mixture of funded and unfunded projects.

While many doctors enjoy the autonomy of private practice, operating under the umbrella of the AMC offers many advantages. Close proximity to colleagues facilitates research and makes it easier to form a network of collaborators. Famous institutions such as Eastern also attract the most challenging cases. As Dr. Qutowski explained, "we will always be the hospital of last resort. When your physician can't figure out what to do next, they know they can always send you to us." Documenting care delivered in such cases often leads to research publications. However, even for doctors not highly concerned about publication rates, the intellectual atmosphere of being at the leading research hospital in the world is a compelling attraction to many physicians who want to be at the top of their respective fields.

In addition to patient care, clinic administration, and research, Attendings working in the Miller Pain Treatment Center are actively involved in training the next generation of physicians. As the letter sent to all new patients states:

> Please be aware that your care at the Miller Pain Treatment Center will involve interaction with board certified physicians at various levels of medical training under the close supervision of your attending physician. While this may slightly extend the total time necessary for your visit, this academic approach provides a higher quality of care for our patients through more thorough discussion and review of patient problems and needs.

Figure 2. Process Flow in the AMC



Notes. Front desk staff involved in *Register* and *Check-Out*; CA involved in *Vitals*; Resident involved in *Resident Review, Resident and Patient, Teach, Resident and Attending*; Attending involved in *Teach, Resident and Attending, PA and Attending*; PA involved in *PA, PA and Attending*. For *Follow-Up* visits *Resident Review, Resident and Patient, Teach, Resident and Attending* is replaced with *PA, PA and Attending*.

This added role of the clinic as an educational facility results in a more complex patient flow, as shown in Figure 2. After the *Registration* step at the front desk and the *Vitals* step with the CA, the activities of the student are typically inserted into the patient flow. After the CA leaves the patient in one of the examination rooms, a resident is informed of the patient's presence. The resident then retrieves the patient file and reviews the case before entering the examination room (*Resident Review*). The resident then interacts with the patient (*Resident*) with no direct intervention of the attending physician, who may be visiting with another patient. After visiting with the patient, the resident then "presents" the case to the Attending. The Attending uses this interaction to get information about the patient and the issues at hand. However, the Attending also uses this time as a teaching step (*Teach*) to instruct the resident about what should be done next. This interaction can take several different forms.

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The Attending uses this time to impart factual information, clinical insights, and lessons from experience about how to proceed. Factual knowledge might include a discussion of what different conditions can be causing the patient's symptoms. Clinical knowledge includes things like lessons on how to differentiate between conditions based on subtle findings from the physical examination of the patient or from information gained via specific tests such as X-rays or magnetic resonance imaging. This is the "apprenticeship" part of the training where the resident learns by induction. Dr. Weems feels that it is important for each resident to spend some time with patients on each day. The Miller Clinic typically uses three residents at a time, and they take turns dealing with patients. Under this arrangement, each resident would typically see two cases during each four-hour clinic session.

After this interaction, the Attending and resident reenter the examination room, and the Attending speaks with the patient directly. Since the resident has done some preliminary work, the Attending's face time with the patient is typically shorter than it would be in private practice. After this, the patient is ready to head to *Check-Out*.

Issues in the AMC

The AMC model reflects a much more complex environment when compared to private practice, largely because the educational activities add steps to the process flow. This must have some effect on cycle times and throughput. However, Dr. Weems still wants the flow in the AMC to be as smooth as possible and is searching for ways to achieve improvement. As he had done in the private practice, he starts by collecting data on activity times in the AMC. Sample times involving new and returning patients are shown in Tables 4 and 5 respectively.

Dr. Weems has a few ideas on how to improve clinic flow. First, he suspects that the way patients are scheduled might be affecting the efficiency of the clinic. (A copy of the current scheduling template is shown in Table 6.) In the current schedule appointments are set at 15 minute intervals. However, the time required to treat a new patient is highly variable and can run much longer. If this happens, the clinic might fall behind schedule. On the other hand, if a new patient doesn't show up, this might have a big impact on performance. History shows that roughly 10% of scheduled appointments were canceled for a variety of reasons. The clinic typically finds out about these cancellations when the staff calls patients to remind them of an upcoming appointment. This means that the clinic staff finds out about an opening too late to fill it with another patient. Dr. Weems believes that if the scheduling of patient appointments is optimized, these variations in consultation length, and the impact of "no-shows," might be reduced. Unfortunately, he believes that trying a collection of new schedules to figure this out will be much too disruptive.

Table 4. Sample Activity Times (in Minutes) for Steps Involving Resident in AMC For New Patients

Record	Resident review	Resident and patient	teach	Resident and attending
1	1	27	3	14
2	5	17	8	5
3	7	9	3	7
4	0	17	2	1
5	6	27	7	9
6	2	13	5	8
7	4	32	5	10
8	4	15	3	5
9	9	17	12	7
10	3	10	5	13
11	23	33	6	5
12	34	20	7	13
13	2	13	4	2
14	3	11	4	6
15	18	6	6	7
16	5	14	3	8
17	10	17	3	7
18	22	6	7	19
19	23	30	8	8
20	10	48	7	8
21	4	7	2	10
22	3	30	22	7
23	15	11	16	2
24	4	17	8	4
25	5	21	10	11
26	10	22	6	9
Average	10.44	20.16	7.85	12.45
Standard deviation	9.38	10.82	5.62	7.44

Note. Average and standard deviation shown refer to entire data set provided in the online spreadsheet supplement.

Another factor to consider is that while some patients arrive late, most actually arrive early. If the first patient of the day arrives prior to 8 A.M., they have to wait until the front desk processes them before they can be seen. In his private practice the staff often started work a little early, so that the first patient could be seen by 8 A.M. He believes that this is key to keeping the clinic on schedule but is not quite sure. He wonders if the policy regarding late arrivals that worked in his private practice would make a difference in the AMC.

Another issue nags at Dr. Weems. While the clinic typically schedules three residents to be in the clinic, there is some variability regarding their availability. Residents are students with multiple duties within the hospital. Occasionally, one or even two residents miss a clinic session because they are away, performing other tasks. Some of these events are predictable because they are related to seminars that the residents are required to attend. He is not sure how this affects flow times for patients on the schedule for that day.

The data collected in the AMC shows that the time Attendings spend teaching residents during the clinic

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Table 5. Sample Activity Times (in Minutes) for Steps Involving Resident in AMC For Return Patients

Record	Resident review	Resident and patient	teach	Resident and attending
1	1	30	15	11
2	11	19	2	11
3	17	39	2	57
4	9	23	0	10
5	4	17	5	3
6	4	17	11	2
7	9	4	7	5
8	1	33	9	7
9	9	24	6	5
10	2	7	11	11
11	1	8	3	5
12	1	10	4	11
13	4	27	12	13
14	20	7	1	10
15	4	23	3	3
16	2	16	0	12
17	12	4	2	4
18	4	17	2	3
19	32	28	5	3
20	4	13	4	10
21	32	18	3	11
22	1	3	6	2
23	15	4	5	9
24	9	12	2	3
25	2	5	0	7
Average	9.30	12.99	5.17	9.24
Standard deviation	10.60	7.96	4.07	8.71

Note. Average and standard deviation shown refer to entire data set provided in the online spreadsheet supplement.

visit varies considerably from one doctor to the next. Since teaching is a critical activity for the AMC, he needs to know how the duration of this activity relates to clinic performance. He suspects that this time has a big impact on waiting times. After thinking about this issue for a while Dr. Weems came up with an idea that he called pre-processing. In this approach each patient would be assigned to a resident in advance. This would allow the resident to review the case the night before the patient's scheduled visit. It would also allow the Attending to do some of the case-specific teaching offline after the resident's review. This might improve flow through the clinic on the following day by reducing the resident's review time, and the teaching time that routinely occurs while the patient waits in the examination room. If pre-processing is used it might be possible to cut the average times for these activities in half.

Table 6. Scheduling Template for AMC

Appt. time	Patient type
0800	New
0800	Follow-up
0815	Return
0830	New
0845	Return
0845	Follow-up
0900	New
0915	Return
0930	New
0930	Follow-up
1000	New
1015	Follow-up
1030	Return
1045	Return
1100	Return
1100	Follow-up
1115	Return

Notes. The PA uses one examination room for follow-up visits. This room is not used for new and return visits.

Each of these ideas is fraught with risks. Getting staff to come in early might increase costs and has to be approved by the AMC. However there is a possibility that the hospital administration could be convinced to stagger the starting time for one of the patient service coordinators (PSC). This would involve having one PSC at the front desk by 7:30 A.M. This would guarantee that a PSC is available for the patients who come in early for an 8:00 A.M. appointment. Changing the schedule would mean changing the work environment for Dr. Weems and the rest of the attending physicians as well. Convincing other attending physicians to try any of these ideas might be a tough sell.

How can he convince these experienced doctors, some of whom were more senior in academic rank, that the clinic should try some of these policy changes? Many of these ideas might seem rather radical for any hospital. However, this might be especially true for a hospital that has done things its own way for over 100 years and considers itself to be the best in the world. How could he argue that it was time to change anything now?

Acknowledgments

Carey Business School Cases are developed solely as the basis for class discussion. Cases are not intended to serve as endorsements, sources of primary data, or illustrations of effective or ineffective management.