



CHAPTER EIGHT

SCHEDULING

Scheduling for staff and resources are recurring and time consuming tasks for health care managers. If not done skillfully, scheduling of either can waste resources and reduce the revenue of the health care organization. In this chapter, we discuss staff scheduling mostly pertaining to nursing staff, and resource scheduling mainly for surgical suites (operating rooms). While both of these are, respectively, the major resource consumption areas, the latter is one of the major revenue-generating centers of the hospitals.

Staff Scheduling

Staff scheduling allocates the budgeted FTEs to the proper patients in the proper units at the proper times. There is controversy about the most effective and efficient scheduling pattern, centering on shift length: Is the eight-, ten-, or twelve-hour shift preferable? The choice can affect turnover, absenteeism, and overall job satisfaction. Moreover, scheduling relates directly to the quality of patient care by affecting coverage and continuity of care, as well as staff morale.

The five factors to consider when scheduling are: coverage, schedule quality, stability, flexibility, and cost. *Coverage* refers to how well patients' needs are met: does the schedule meet patients' needs, maintain continuity of care, and provide even coverage for all patients? *Schedule quality* refers to how well the staff likes

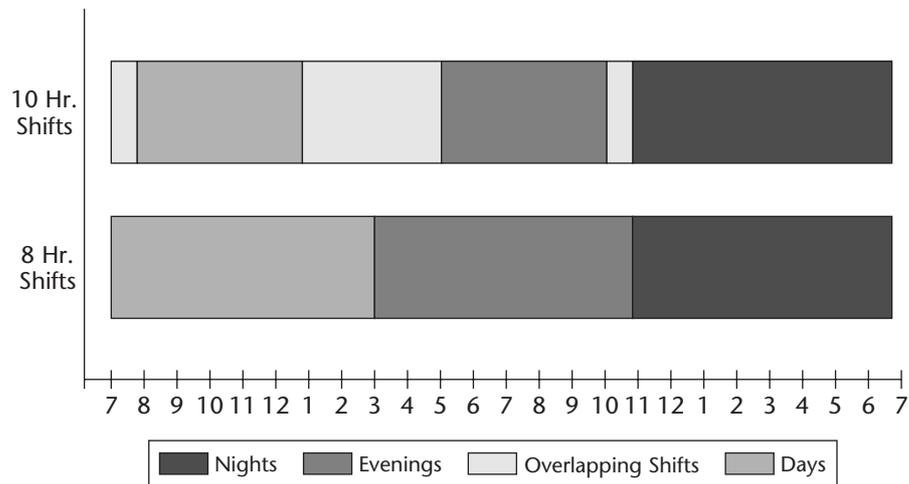
the plan. That is influenced by such factors as equalization of rotation, weekends, days off, and work stretch. A third element is the *stability* of the schedule. Can the nurses count on predictable schedules? Or, are their schedules always changing? On the other hand, *flexibility* of the schedule is also an important concern. Can the schedule adapt to environmental changes, for example, nurses changing among shifts, orientation and continuing education programs, and understaffing. Finally, given the revenue constraints facing many organizations, *costs* are an important concern. Are resources being consumed wisely? Would an alternative scheduling produce better care at lower cost?

As noted, one important issue is shift length, which should be decided in light of the criteria presented above. A 5/40 shift refers to a five-day, forty-hour week; thus the employee works eight hours/day. Similarly, a 4/40 shift refers to a four-day workweek of forty hours, or ten hours daily.

Traditionally, the eight-hour, five-day workweek (5/40), has predominated. However, with recognition that employee satisfaction, schedule flexibility, and high quality of care must be sought, innovative approaches have turned toward the option of a compressed workweek. The change would be made either in days (such as from a 5/40 to a 4/40 plan), in hours worked (from a 4/40 to 4/36 plan), or in both days and hours (from a 5/40 to a 3/36 plan). Many organizations have chosen to change the number of days worked in a week but to keep the total hours the same. For changes in shift hours, the most popular alternatives to the traditional eight-hour shift are the ten- and twelve-hour shifts.

In general, ten-hour shifts, compared to eight-hour shifts, provide several consecutive days off, more weekend days off, opportunity to work with other shift workers, more staff during busy periods, increased continuity of care, and provide time for meetings and in-service education. However, this shift pattern requires more staff, and may increase staff fatigue. Moreover, twelve-hour shifts similarly provide several consecutive days off, more weekend days off, and increased continuity of care. In addition, this shift pattern requires one less shift report, and is attractive for hiring new staff. Nevertheless, it may require more staff, and promote fatigue. Although considerable research on the use of different shift lengths has been reported by experienced health care professionals, there is considerable disagreement among them (Newstrom and Pierce, 1979).

The four-day, forty-hour workweek gained popularity in the early 1970s, although it was first tried in the 1940s, by both the Gulf and Mobil Oil companies (Newstrom and Pierce, 1979). Today, many nursing units are seeking the advantages of the ten-hour shift. For instance, it creates a shift overlap, which allows hospitals to cope with daily peak demand periods, thereby avoiding extensive reallocation of staff and staff overtime. The overlap in the ten-hour shift system can be designed to occur during the periods of greatest patient need. The improved

FIGURE 8.1. COMPARISON OF EIGHT- AND TEN-HOUR SHIFTS.

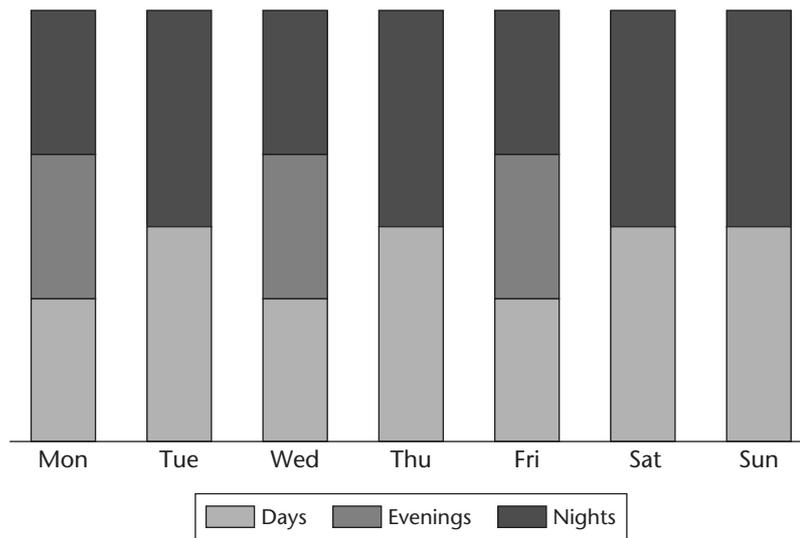
communication between shifts should enhance the continuity of care. Since having a three-day weekend is perceived as a benefit to the nursing staff, morale and productivity may also improve. However, the increased number of days off per year and the overlap of shifts mean that more employees must be hired to staff a ten-hour rotation. Recall the staffing coverage factor from Chapter Seven. The resulting increase in labor costs can be a major drawback of the system. Figure 8.1 compares the eight-hour and the ten-hour schedules.

A modification of the traditional 4/40, in which the worker works four days and then has three days off, is the “eight-day week.” Under this system, employees work four ten-hour days, after which they have a four-day break before beginning the cycle again. Thus, two shifts of employees can alternate between being on and off of the 4/40 work cycle throughout the year.

The twelve-hour shift provides the most days off weekly, which can help in recruiting and retaining staff. It also reduces the number of shifts that administrators must prepare and gives the staff more open days for continuing education. However, working the long hours of the twelve-hour shift has the potential for employee burnout. Some organizations may allow workers to alternate eight- and twelve-hour shifts, in an attempt to realize the benefits of each. An example of this alternating pattern is seen in Figure 8.2.

The following section provides some examples of programs that have been tried to improve nurses’ recruitment, satisfaction, and retention, as well as aspects of patient care, by altering scheduling and shift patterns.

FIGURE 8.2. PATTERN OF ALTERNATING EIGHT- AND TWELVE-HOUR SHIFTS.



The Eight-, Ten-, and Twelve-Hour Shifts—Studies of Shift Patterns. Many health care organizations have experimented with changing shift lengths to address a variety of concerns. Some organizations may want to reduce staffing levels; others may want to reduce costs. Supporting staff recruitment and retention when medical personnel are in short supply is another aim. Other aims might be to improve nurses' productivity, or their job satisfaction, which would mean less necessity to hire part-time nursing personnel from outside agencies. Improving the continuity of care, and thus patient satisfaction is also cited as benefit.

An Ohio hospital, recognizing the need for greater flexibility in scheduling and also the importance of more time off for nurses, who work under highly intense conditions, adopted a ten-hour shift (Velianoff, 1991). Rather than relying on the traditional 7 A.M., 3 P.M., 11 P.M. starting times for shifts, with two hours of overlap, they created six different shifts. Depending on the workload, either five or six daily shifts are used. As a result of the change, the organization reported reduced overtime, and greater productivity. Moreover, nurses were less distracted from patient care by their job satisfaction issues. Ninety percent of the hospital's nurses preferred the ten-hour shift over previous systems.

The advantages of the ten-hour shift are not recognized by all health care managers, however. The director of a nursing unit in New York, for example,

claims that ten-hour shifts are not cost-effective, and that such advantages as do exist do not outweigh the extra costs of hiring additional staff (the coverage factor). In the 1990s, she argued, "We need to promote nurse satisfaction *in addition* to continuous, cost-effective, quality care." (Corsi, 1991). In response, the editor of *Nursing Management* recognized that ten-hour shifts are not the most cost-effective. However, she noted that if they reduce turnover and absenteeism, the expenses are justified. It is apparent that the perceived merits of the ten-hour shift depend largely on the goals or guidelines of the individual institution.

A comparison of nurses' work patterns in the eight- and twelve-hour shifts was completed at a 132-bed, not-for-profit community hospital in Southern California. Overall, the study found that shift length did not significantly influence job performance in the sample. Of particular interest are the similar absenteeism rates for both shifts. Contrary to the literature, which often predicts higher absenteeism for the eight-hour shift schedule, the number of shifts missed was the same for both the eight- and the twelve-hour work patterns. Noting that the primary reason for absences was personal illness, the author suggests that a health promotion program may be more effective than a change in the schedule system in lowering the absenteeism rate. Notice also that the hours spent in continuing education did not differ significantly and were in fact higher for the eight-hour shift. Though a commonly cited advantage of the twelve-hour shift is that it leaves more time open for nurse education.

Palmer (1991) further claims that twelve-hour shifts are preferable in areas where the nurse to patient ratios are low, such as in intensive care and the emergency room. In these units, a nurse can care for up to four patients at a time for the twelve-hour period. When the nurse is not overburdened and continuity of patient care is enhanced, a twelve-hour shift can have substantial advantages. In other areas of the hospital, the possibility of burnout may prohibit the use of the twelve-hour shift. For instance, Palmer has found that twelve-hour shift nurses who float to medical units often request an eight-hour shift to avoid unacceptable levels of fatigue. Concluding her study, she notes that although twelve-hour shifts may give the hospital a competitive advantage in recruitment and retention; its personnel policies and compensation packages must be carefully examined to maintain productivity.

In sum, the success of a change in shift length varies greatly from organization to organization. Each facility must evaluate where it wants to head, and what aspects of its operations it wants to improve. No one system suits every health care organization, and the choice depends on the particular institution's goals.

The implementation process can also significantly affect the success of a program to change shift lengths. Involving the nursing staff in the planning and incorporating their views in the final decisions will greatly improve the possibilities

for a successful program. To address some of the flaws with straight eight-, ten-, and twelve-hour work shifts, many organizations are turning to flexible working schedules.

Cyclical Scheduling. Work schedules can be classified as either permanent (cyclical) or flexible (discretionary). Under a **cyclical work schedule**, employees do not rotate shifts. The schedule is usually planned for a four- to six-week period, and is repeated period after period. Exhibit 8.1 illustrates the cyclical staffing schedule concept for both a four- and a five-week scheduling period. The “0” in the illustration indicates a day off. The system allows the employees to select the shift that best fits their schedule. However, having chosen it, the nurses are locked into that shift. This can create difficulties in hiring new nurses to replace those who leave, because they must be willing to take the schedule of the departing nurse.

The cyclical schedule, although it does promote even coverage, high stability, and lower scheduling costs, is inflexible to environmental changes such as nurses who ask to change from full to part time, or rotating nurses between departments according to patient census and acuity. Therefore, cyclical schedules are best used in a stable environment where nurses (or allied health professionals) do not rotate between shifts, and where the supply of employees is sufficient to ensure that a new one can easily be hired into an open cyclical slot.

Flexible Scheduling. As you well know, today’s health care environment is highly unstable, and personnel shortages, particularly of nurses, make recruitment difficult. Consequently, hospitals have turned to *discretionary work systems*. Discretionary work systems fall into two categories—staggered and flexible schedules. The *staggered start system* while not changing the number of hours worked per week, allows employees to decide when to start their work day. A variation on the staggered start is the *staggered week, or flex week*. Under this system, employees maintain eight-hour days, and average forty hours per week. However, they alternate, for instance, between a 4/32 and 6/48 plan.

Because coverage is essential and managing a staggered start system to ensure it is expensive, the flexible working hour system is much more common in health care. Under a flexible system, the health care manager can cope with fluctuations in demand. A core level of staff is established, based on a long-term assessment of staff needs (see Chapter Seven for detailed discussion), and is augmented by daily adjustments (reallocation) using various methods to ensure that staffing levels meet patient needs. Nurses must be willing to change shifts to meet fluctuations in patient demand. Besides that, a pool of full and part-time nurses is formed for use during periods of high patient demand (either through census or acuity), and scheduling procedures must be adapted for their use. The organization must also be flexible in responding to its employees’ needs, in order to reduce turnover.

EXHIBIT 8.1. CYCLICAL STAFFING SCHEDULES FOR FOUR AND FIVE WEEKS.

The Four-Week Schedule

Weeks →	1					2					3					4					5																	
Employee	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S			
A	0	0					0	0	0					0	0	0						0	0	0						0	0	0						0
B			0				0			0				0			0					0			0					0			0					0
C			0	0			0			0	0			0			0	0				0			0	0				0			0	0				0
D			0	0	0		0			0	0	0		0			0	0	0			0			0	0	0			0			0	0	0			0
# of Staff Scheduled	2	3	3	3	3	3	3	2	3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3

The Five-Week Schedule

Weeks →	1					2					3					4					5																	
Employee	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S			
A	0	0					0	0	0					0	0	0						0	0	0						0	0	0						0
B			0				0			0				0			0					0			0					0			0					0
C			0	0			0			0	0			0			0	0				0			0	0				0			0	0				0
D			0	0	0		0			0	0	0		0			0	0	0			0			0	0	0			0			0	0	0			0
E			0	0	0		0			0	0	0		0			0	0	0			0			0	0	0			0			0	0	0			0
# of Staff Scheduled	3	4	4	4	4	3	3	3	4	4	4	4	3	3	3	4	4	4	4	3	3	3	3	4	4	4	4	3	3	3	3	4	4	4	4	3	3	3

With flexible scheduling, the nurses select the schedule pattern that best meets their needs, given the scheduling system adopted by the administrator of the unit. Some form of part-time shift is usually necessary to meet a unit's staffing needs. Often, the part-time shift positions are filled by a pool of float nurses hired directly by the hospital. Another source of temporary or part-time nurses is staff relief agencies, also known as supplemental nursing services, external temporary agencies, and registries (Rasmussen, 1982). The health care organization pays the agency, which in turn pays its employees. Nurses from these agencies can be let go when not needed, and otherwise relieve an overburdened hospital staff. However, they are often viewed as outsiders by the regular nursing staff, especially since they usually paid more per hour than the hospital pays its nurses.

Flexible scheduling is common because of the increasing uncertainty and costs facing health care facilities. In 1990, the American Nurses Association adopted a statement on flexible scheduling and part-time work, to ensure that nurses would be allowed opportunities for part-time work. The Association argues that nurses need options if they are to "manage multiple personal and professional roles" (Kinney, 1990).

Findlay (1994) provides a comprehensive review of the literature on flexible work systems in nursing and gives an account of the flexible working system he developed for the 30-bed continuing care psychiatric unit where he worked. His system was based on a 37.5-hour workweek; nurses worked five days on and two days off, with no more than eight hours of work per day, Monday through Friday, and no more than 9.5 hours per day on weekends. Overlaps between all shifts ensured the continuity of care, and duty rosters were assigned in six-week cycles. Nurses could choose their shift preferences on a first-come-first-served basis. Daily, ten-minute overview meetings dispersed essential patient information, and a weekly, thirty-minute meeting handled issues unrelated to the patients.

An evaluation of this system after six months showed that flexible schedules used nursing resources more effectively. Patients benefited from improved continuity of care, and staff no longer had to be routed from other units. By not having to hire staff agency nurses or pay overtime, the unit reduced its expenditures by 15 percent in the six months after implementation. With nurses freed from a rigid schedule, innovations in patient care were developed and implemented. Surveys of the nurses indicated that they too believed that care continuity had improved. Additional benefits identified by the nurses included: more time for patient-related activities, boosted morale, higher job satisfaction, greater unity on the ward, less tiring workload, and more flexibility in annual leave and public holidays.

When flexible scheduling results in different nurses being with the same patient over his or her hospital stay, clinical information must be transferred from shift to

shift. All nurses caring for a particular patient must be aware of all the factors affecting his/her care. Only when nurses are aware of the history of the patient can they together provide continuous care of high quality.

In sum, flexible staffing programs can help the health care organization meet the five scheduling criteria presented at the beginning of this section. Coverage can be maintained by adjusting staffing patterns when necessary while ensuring continuity of care and comprehensive knowledge of patients' histories. From the literature, flexible scheduling appears to promote schedule quality in terms of job satisfaction. Although flexible staffing does not always allow stable schedule for nurses, it also must be remembered that often they are working when they wish to. In that sense, changes in scheduling patterns are assumed to meet the needs of the staff. The very term, flexible staffing, tells us that the fourth criteria, flexibility, is being met. Finally, flexible staffing usually cuts costs by reducing the need for overtime and hiring temporary nursing personnel at a premium. Nonetheless, without proper implementation even the most thought-out flexible staffing program can fail. Computerized scheduling technology has made flexible scheduling more feasible and it is discussed next.

Computerized Scheduling Systems. In 1976, Warner estimated that less than 1 percent of all hospitals used a computerized scheduling system. Today many more do, as they recognize the value of such systems. Computerized acuity systems, such as the Medicus NPAQ system discussed in Chapter Seven, can translate workload estimates into the appropriate required staffing and skill mix levels. Computerized scheduling can ensure that staffing levels are high enough to meet patient needs, while producing schedules of that promote satisfaction among the staff. Computerized scheduling systems can easily take both employee preferences and institutional policies into account. Furthermore, they tend to cost less in terms of money and time than traditional, "by hand" scheduling methods do. The advantages of computerized systems are most pronounced when the nursing environment encounters unexpected change, and therefore should be of particular use today.

Implementation of a New Work System. After spending several months evaluating the current staffing patterns, reviewing the literature, analyzing systems in other institutions or nursing units of a hospital that use a different scheduling pattern, and finally developing a pattern for the nursing unit, it is important not to rush its implementation. Unless the implementation is handled well, all the previous months' efforts will have been in vain.

Employees naturally resist change. Those barriers to change must be dissolved before any system can be effective. The process must begin during the initial planning: from the outset, employees should be persuaded that their views about

the current staffing patterns are being sought in order to develop a pattern that will suit them better. The nursing staff should participate at all levels of the planning process, and their input should be understood to be important.

A written proposal outlining the change should be developed and circulated to all nursing staff on the unit. Its advantages and disadvantages, and the effectiveness of similar scheduling patterns at other institutions and as described in the literature should be documented. Questions and concerns should be openly addressed, and then strategies to minimize the disadvantages should be developed. Careful attention must be paid to issues such as lengths of breaks, especially for ten- and twelve-hour shifts; vacation and sick-day policies; pay, especially shift differentials and overtime; and times for staff education.

Only after the staff has considered the changes, their advantages and disadvantages, and their roles in the process, should implementation begin. During implementation, head nurses and the administrator must assess the effectiveness and efficiency of the new patterns. The administrator should be routinely available to address questions and concerns, identify problems, and make adjustments as seen necessary. After implementation, it is important to evaluate the program through surveys, productivity and utilization data, and evaluation of the financial results.

Newstrom and Pierce (1979) identify several considerations of importance during planning and then implementation. The first such consideration is *workforce values*; they can be ascertained through surveys and personal interviews with the staff. Any policy that goes to counter those values will be difficult if not impossible to apply without serious consequences. A second consideration is the evaluation of *alternative forms*. A careful review of the literature can help the health care manager to identify potential alternatives and their attributes, as well as pitfalls to avoid. Often, systems used at other institutions would have to be adapted to meet the values, goals, and concerns of your institution. Even after a plan is developed, it may need adjustments to work well. Another concern is *employee acceptance*. The literature shows that without this acceptance, success will be in jeopardy. Involving employees in planning, implementation, and evaluation should increase acceptance. Another recommendation is the use of a *pilot test*; instead of applying the new work system to several units at once, or even to the entire unit, it should be applied to a small, representative sample. A pilot test should help to iron out the bugs in the system, producing a model to which the remainder of the unit or other units can adhere.

After implementation, the system must be evaluated. Are the employees more satisfied than before? Is their productivity increasing? Have patient complaints diminished? Are continuity of care objectives being met? Are costs being saved. If not, why? Is the new system flexible? These questions are just a few of many that must be answered during evaluation. However, if problems do exist, that does

not mean the new system is a complete failure and should be abandoned. Rather, steps should be taken to recognize inadequacies and make adjustments. A goal of evaluation, after all, is to ensure that the quality of both the staffs' and the patients' care and lives is enhanced under the new system.

Surgical Suite Resource Scheduling

The surgical suite is a major source of revenue for the modern hospital, so careful scheduling there is critical to its profitability. The surgical suite also offers a major area for cost containment, because 1) surgical suites have high costs and traditionally low facility and/or personnel utilization rates; and 2) surgical patients constitute a significant portion of the demand served by other hospital departments (Magerlein and Martin, 1978; Dexter and Traub, 2002). *Surgical suite patient scheduling* assigns patients, staff (surgeon[s], anesthesiologists, nurses, and so on), equipment, and instruments to specific rooms within the surgical department. Efficient scheduling can both raise revenues and reduce costs, thereby increasing profits.

Inefficient scheduling leads to idle time between cases, significant overtime costs, increased patient anxiety due to delays, and quite possibly, dissatisfied surgeons. Surgeon satisfaction may be among the more important factors to consider in scheduling, because they are in essence the "customers" of the operating room (OR). Their satisfaction can be attained by assuring high probability for surgical start times and creating a schedule they perceive as fair. In addition, the OR scheduling must be carefully coordinated with other areas of the organization, particularly the post-anesthesia care unit (PACU), beds, and surgical and floor nurse schedules.

The goals of surgical suite scheduling mentioned most often in the literature include:

- Effective use of the surgical suite by reducing delays and turnover time.
- Satisfaction of surgeons.
- Safety and satisfaction of patients.
- Satisfaction of the operating room staff.
- Simplicity and ease of scheduling.
- Effective use of the PACU.
- Achieving a low case-cancellation rate.

When assessing the use of the OR, these alternative measures have been used, including:

- Total minutes the OR is in use.
- Total utilized time divided by total available time.

- Idle time of nurses as percent of total available OR time.
- Turnover time.
- Idle time of anesthesiologists as a percent of total available OR time.
- Hours utilized within the block time divided by available block hours (Williams, 1971; Gordon and others, 1988; Breslawski and Hamilton, 1991; Dexter and others, 2003).

Surgical Suite Scheduling Methods

The OR scheduling systems in hospitals use the various methods briefly described below.

First Come/First Served (FC/FS). One of the two most common methods for scheduling surgical suites, the FC/FS scheduling method allocates surgery times to the first surgeon requesting them. A limit on the number of times allocated to that surgeon, or to the estimated surgical time may be imposed; though not in all hospitals. The problems with FC/FS scheduling are:

- A high cancellation rate due to overbooking.
- Different levels of OR use among surgical specialties, possibly causing frustration on the part of surgeons who perceive that as unfair.
- Simultaneous overtime and idle time: canceled cases lead to idle time, and surgical complications create overtime (Hackey, Casey, and Narasimhan, 1984; Dexter and Traub, 2002).

The major advantages of this approach are the ease of scheduling and greater flexibility.

Block Scheduling. With block scheduling, the second most popular system, a block of OR time is allocated to each surgeon or group of surgeons. Blocks are usually one-half to a full day in length. The block is reserved for the surgeon's or group's exclusive use until a cutoff date, usually a day or two before surgery, at which time unused time is made available to other surgeons (Magerlein and Martin, 1978; Dexter and others, 1999).

The big advantage of the block system is that it increases utilization through better afternoon use of the surgical suite usage. The system also allows surgeons to know surgical start times well in advance, and "guarantees" them. Any afternoon overruns are attributable to the surgeon performing, thereby giving him or her nowhere to shift responsibility for his or her delay. Finally, block scheduling reduces

surgeons' competition over surgical scheduling, and may reduce administrative work, cancellations, and the overall surgery waiting list.

The major drawback of the system is that unused block time is often held by surgeons up until the cutoff day, even when they may have no need for it. This leads inevitably to costly idle time. In addition, blocked OR time may delay urgent surgery cases until the patient's surgeon has a block scheduled. An example of block schedule is shown in Exhibit 8.2.

Dynamic Block Scheduling. This method is a variation of block scheduling in which individual surgeons' or surgery groups' use of block time is regularly reviewed (quarterly or semi-annually). The assigned amount of block time is adjusted based on the basis of the analysis.

Longest Case First (LCF). LCF scheduling allocates the longest procedures to the earliest slots available. This system inherently allows certain specialists (such as thoracic surgeons) to always get early morning slots, which can frustrate other specialists. The system assumes that the longer the surgery, the higher the variability in surgical time. Therefore, as the day goes on, later cases can be shifted in the schedule to complete the surgical workload on time, or as closely as possible to that.

Shortest Case First (SCF). SCF is used to maintain an even load in the PACU; the shortest procedures are done in the morning. An LCF system generally causes underutilization and idle time in the PACU in the early morning hours.

Top Down/Bottom Up. This method is also a modified block scheduling system, in which the day is divided into two blocks. Long cases are scheduled FC/FS during the morning block, and short cases are scheduled FC/FS at the end of the day. If idle time develops in the long block, the next patient who arrives for a short procedure is assigned in the gap. If time in the long block runs out, then a long case can be scheduled at the beginning of the short case block. Surgeons with multiple surgeries are scheduled in the same room to reduce idle time between surgeries.

Multiple Room System. Surgeons are usually assigned to a room; however, under a multiple room system, surgeons are scheduled to rotate from room to room. The system attempts to eliminate surgeon waiting time between cases during cleanup, room setup, and anesthesia preparation. Because the time between cases has been

EXHIBIT 8.2. AN EXAMPLE OF OR BLOCK SCHEDULE.

RM	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
CYSTO	0730	0730	0730	0730	0730
	1330	1130	1330	1130/1215	1130
	1530	1530	1530	1530	1300
	1730	1730	1730	1730	1730
2	0730 Urology Surgeon #1	0730 ENT Surgeon #1	0730 Urology Associates	0730 General Surgeon #1	0730 Oral Surgery
	1130 General Surgeon #2	1130		0930	1400 Associates
	1530	1530	1530	1530	1530
	1730	1730	1730	1730	1730
3	0730 ENT Surgeon #2	0730 General Surgeon #2	0730-1200 Oral	0730/0815 ENT Surgeon #1	0730 ENT Surgeon #3
	1330	0930	0730-1130 Surgery Associates	1330	1530
	1530	1530	1330	1530	1530
	1730	1730	1730	1730	1730
4	0730 ENT Surgeon #3	0730 ENT Surgeon #2	0730 General Surgeon #2	0730/0815 ENT Surgeon #4	0730 ENT Surgeon #1
	1230	1130	1130	1130/1215	1330
	1530	1530	1530	1530	1530
	1730	1730	1730	1730	1730
5	0730 Ortho Assoc. #1	0730 Ortho Assoc. #2	0730 Ortho Assoc. #1	0730/0815 Ortho Assoc. #2	0730 Ortho Assoc. #4
	1530	1300	1530	1530	1530
	1730	1530	1730	1730	1730
6	0730 Ortho Assoc. #4	0730 Ortho Assoc. #3	0730 Ortho Assoc. #2	0730/0815 Ortho Assoc. #1	0730 Ortho Surgeon #1
	1530	1530	1530	1530	1130 Ortho Surgeon #2
	1730	1730	1730	1730	1530

CYSTO

ORAL

ENT

ENT

ORTHO

ORTHO

7	0730 Neuro Associates	0730 Neuro Associates	0730 Neuro Associates	0730/0815 Neuro Surgeon #1	0730 General Surgeon #2	<u>NEURO</u>
	1530	1530	1500	1530	1130	
	1730	1730	1530	1730	1300 General Surgeon #3	
8	0730 Neuro Associates	0730 Neuro Associates	0730 Neuro Associates	0730/0815 Neuro Surgeon #2	0730	<u>NEURO</u>
	1530	1530	1530	1530	1530	
	1730	1730	1730	1730	1730	
9	0730 OPEN	0730 General Surgeon #1	0730 Surgical Assoc. #3	0730/0815 0930 General Surgeon #6	0730 General Surgeon #4	<u>GEN</u>
	1300	1330 Ortho Surgeon #3	1330	1530	1130 General Surgeon #5	
	1530	1530	1530	1530	1530	
10	0730 Gen. Surgeon #2	0730 Surgical Assoc. #1	0730 Surgical Assoc. #2	0730/0815 Gen. Surgeon #6	0730 General Surgeon #1	<u>GEN</u>
	1330	1530	1530	1130/1215 Gen. Surgeon #5	1500	
	1530	1730	1730	1530	1530	
11	0730 OPEN	0730 Plastic Surgeon #1	0730	0730/0815 Plastic Surgery Associates	0730 Surgical Assoc. #1	<u>PLAS</u>
	1530	1130 Gen. Surgeon #3	1130 Gen. Surgeon #5	1530	1200	
	1730	1530	1530	1730	1530	

estimated at between 20 and 45 minutes, the multiple room system can save considerable costs for surgeon and lower staff overtime.

Assessment of Scheduling Alternatives

According to a simulation test of FC/FS, SCF, and LCF, longest-time-first scheduling provided the highest use (measured as the ratio of the number of minutes utilized to the number of minutes in the work day) and the lowest overtime. Shortest-time-first was the poorest of the three systems according to the simulation (Breslawski and Hamilton, 1991; Dexter and Traub, 2002). However, each scheduling system meets certain objectives of the organization better than others. For instance, if the only goal is to reduce staff overtime, it is easy to select a system—either the top down/bottom up block or the longest-time-first. Unfortunately, the decision is not usually so easy; in most cases the organization has a series of decision criteria.

The OR manager must assess the stated mission of the OR to establish the decision criteria, rank the criteria by importance, and eliminate alternatives that do not satisfy the most important ones. This step must be repeated, applying each scheduling method to the criteria in most important to least important order. That process, can produce a satisfactory decision.

Estimation of Procedure Times

Several of the systems above schedule procedures according to their length. But how are we to know which procedure will constitute a long and which a short procedure? Moreover, the scheduling intervals' significant consequences for the utilization and effectiveness of the surgical suite must be considered. For instance, if time estimates are consistently low, the OR will be overloaded, with consequent cancellations, overtime, and frustrated surgeons, staff, and patients. On the other hand, excessive time estimates lead to costly idle time. Accurate estimates are needed to reduce daily variability in the OR scheduled load.

Magerlein and Martin (1978) identify the three methods for estimating procedure times: surgeon's estimates, OR scheduler's estimates, and historical averages. Most hospitals use either surgeons' or OR scheduler estimates. Although surgeons' estimates are often used, only a few attempts have been made to validate them (Denbor and Kubic, 1963; Phillips, 1975; Goldman, Knappenberger, and Sharon, 1970; Bendix, 1976), and those attempts have significant limitations and ambiguous findings. In general, the shorter the expected procedure is, the more accurate is the surgeon's estimate. Neither OR scheduler estimates

nor historical averages have been validated, (Rose and Davies, 1984; Kelley, Easham, and Bowling, 1985).

With computerized surgical suite scheduling systems, the use of databases to predicting case block length is now more common. Databases can adjust historical averages for case complexity. Shukla, Ketcham and Ozcan (1990) compared four data based models for predicting case block length on the basis of: a) procedure, b) procedure and surgeon, c) procedure and case complexity, and d) procedure, case complexity, and surgeon. Their research demonstrated that hospitals can improve OR block scheduling systems by developing predetermined block time by considering the differences among surgeons and among case complexities. The study showed that surgeons tend to overestimate a surgery's required time, possibly to avoid any delays extending beyond their time blocks. Database systems facilitate reliable and equitable scheduling, reducing the surgeons' motivation to overestimate their time blocks. Health care managers must convince the surgeons that improving OR efficiency benefits not only the hospital but the surgeons themselves, since they would then have more time available to operate.

Summary

In this chapter, we discussed staff scheduling mostly pertaining to nursing staff and patient scheduling mainly for the surgical suite. Staff scheduling allocates the budgeted FTEs to the proper patients in the proper units at the proper times. The scheduling choice can affect turnover, absenteeism, and overall job satisfaction. Moreover, scheduling relates directly to the quality of patient care by affecting coverage and continuity of care, as well as staff morale. If not done skillfully, scheduling of either can waste resources and reduce the revenue of the health care organization.

The surgical suite is a major revenue-generating and cost center of the hospitals, thus must be managed carefully. Surgeons are confronted daily with delays and turnover times, but they may not understand their consequences for costs and the surgical suite's perishable capacity. It is the health care manager's duty to analyze ongoing inefficiencies and their root causes, and then educate the surgical staff, including surgeons, anesthesiologists, nurses and others, about methods that would work effectively for the surgical suite. Measures that are paramount for achieving efficiency include periodic examining of block utilization, turnover rates, delays and delay reasons, and updating surgery estimation times. Health care managers should give them constant attention.

Exercises

Exercise 8.1

Use the information from Exercise 7.7; first determine the final core-level FTEs for the ICU and CCU departments, where RNs and LPNs work on a 4/40 and NAs on a 5/40 scheduling plan; then reevaluate the final core-level staffing requirements if all staff work on either a 5/40 or a $(2 * 8 + 2 * 12)/40$ scheduling plan, and make recommendations.

Exercise 8.2

Prepare a cyclical work schedule for a behavioral care practice with three staff members.

Exercise 8.3

Prepare a cyclical work schedule for a small group practice with nine staff members. (Hint: Use three-week or four- and five-week combinations.)