

advise her. With her input and your help, the decision process has been reduced to the following costs, alternatives, and probabilities:

Cost of land: \$2 million.

Probability of rezoning: .60.

If the land is rezoned, there will be additional costs for new roads, lighting, and so on, of \$1 million.

If the land is rezoned, the contractor must decide whether to build a shopping center or 1,500 apartments that the tentative plan shows would be possible. If she builds a shopping center, there is a 70 percent chance that she can sell the shopping center to a large department chain for \$4 million over her construction cost, which excludes the land; and there is a 30 percent chance that she can sell it to an insurance company for \$5 million over her construction cost (also excluding the land). If, instead of the shopping center, she decides to build the 1,500 apartments, she places probabilities on the profits as follows: There is a 60 percent chance that she can sell the apartments to a real estate investment corporation for \$3,000 each over her construction cost; there is a 40 percent chance that she can get only \$2,000 each over her construction cost. (Both exclude the land cost.)

If the land is not rezoned, she will comply with the existing zoning restrictions and simply build 600 homes, on which she expects to make \$4,000 over the construction cost on each one (excluding the cost of land).

Draw a decision tree of the problem and determine the best solution and the expected net profit.



Service



Excel:  
Shouldice  
Hosp

## CASE: SHOULDICE HOSPITAL—A CUT ABOVE

"Shouldice Hospital, the house that hernias built, is a converted country estate which gives the hospital 'a country club' appeal."

A quote from *American Medical News*

Shouldice Hospital in Canada is widely known for one thing—hernia repair! In fact, that is the only operation it performs, and it performs a great many of them. Over the past two decades this small 90-bed hospital has averaged 7,000 operations annually. Last year, it had a record year and performed nearly 7,500 operations. Patients' ties to Shouldice do not end when they leave the hospital. Every year the gala Hernia Reunion dinner (with complimentary hernia inspection) draws in excess of 1,000 former patients, some of whom have been attending the event for over 30 years.

A number of notable features in Shouldice's service delivery system contribute to its success. (1) Shouldice accepts only patients with the uncomplicated external hernias, and it uses a superior technique developed for this type of hernia by Dr. Shouldice during World War II. (2) Patients are subject to early ambulation, which promotes healing. (Patients literally walk off the operating table and engage in light exercise throughout their stay, which lasts only three days.) (3) Its country club atmosphere, gregarious nursing staff, and built-in socializing make a surprisingly pleasant experience out of an inherently unpleasant medical problem. Regular times are set aside for tea, cookies, and socializing. All patients are paired up with a roommate with similar background and interests.

### THE PRODUCTION SYSTEM

The medical facilities at Shouldice consist of five operating rooms, a patient recovery room, a laboratory, and six examination rooms. Shouldice performs, on average, 150 operations per week, with patients generally staying at the hospital for three days. Although operations are performed only five days a week, the remainder of

the hospital is in operation continuously to attend to recovering patients.

An operation at Shouldice Hospital is performed by one of the 12 full-time surgeons assisted by one of seven part-time assistant surgeons. Surgeons generally take about one hour to prepare for and perform each hernia operation, and they operate on four patients per day. The surgeons' day ends at 4 P.M., although they can expect to be on call every 14th night and every 10th weekend.

### THE SHOULDICE EXPERIENCE

Each patient undergoes a screening exam prior to setting a date for his or her operation. Patients in the Toronto area are encouraged to walk in for the diagnosis. Examinations are done between 9 A.M. and 3:30 P.M. Monday through Friday, and between 10 A.M. and 2 P.M. on Saturday. Out-of-town patients are mailed a medical information questionnaire (also available over the Internet), which is used for the diagnosis. A small percentage of the patients who are overweight or otherwise represent an undue medical risk are refused treatment. The remaining patients receive confirmation cards with the scheduled dates for their operations. A patient's folder is transferred to the reception desk once an arrival date is confirmed.

Patients arrive at the clinic between 1 and 3 P.M. the day before their surgery. After a short wait, they receive a brief preoperative examination. They are then sent to an admissions clerk to complete any necessary paperwork. Patients are next directed to one of the two nurses' stations for blood and urine tests and then are shown to their rooms. They spend the remaining time before orientation getting settled and acquainting themselves with their roommates.

Orientation begins at 5 P.M., followed by dinner in the common dining room. Later in the evening, at 9 P.M., patients gather in the lounge area for tea and cookies. Here new patients can talk with

### exhibit 4.7

#### Operations with 90 Beds (30 patients per day)

CHECK-IN DAY	BEDS REQUIRED						
	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Monday	30	30	30				
Tuesday		30	30	30			
Wednesday			30	30	30		
Thursday				30	30	30	
Friday							
Saturday							
Sunday	30	30			30		30
Total	60	90	90	90	60	30	30

patients who have already had their surgery. Bedtime is between 9:30 and 10 P.M.

On the day of the operation, patients with early operations are awakened at 5:30 A.M. for preoperative sedation. The first operations begin at 7:30 A.M. Shortly before an operation starts, the patient is administered a local anesthetic, leaving him or her alert and fully aware of the proceedings. At the conclusion of the operation, the patient is invited to walk from the operating table to a nearby wheelchair, which is waiting to return the patient to his or her room. After a brief period of rest, the patient is encouraged to get up and start exercising. By 9 P.M. that day, he or she is in the lounge having cookies and tea and talking with new, incoming patients.

The skin clips holding the incision together are loosened, and some are removed, the next day. The remainder are removed the following morning just before the patient is discharged.

When Shouldice Hospital started, the average hospital stay for hernia surgery was three weeks. Today, many institutions push "same day surgery" for a variety of reasons. Shouldice Hospital firmly believes that this is not in the best interests of patients, and is committed to its three-day process. Shouldice's postoperative rehabilitation program is designed to enable the patient to resume normal activities with minimal interruption and discomfort. Shouldice patients frequently return to work in a few days; the average total time off is eight days.

"It is interesting to note that approximately 1 out of every 100 Shouldice patients is a medical doctor."

#### FUTURE PLANS

The management of Shouldice is thinking of expanding the hospital's capacity to serve considerable unsatisfied demand. To this effect, the vice president is seriously considering two options. The first involves adding one more day of operations (Saturday) to the existing five-day schedule, which would increase capacity by 20 percent. The second option is to add another floor of rooms to the hospital, increasing the number of beds by 50 percent. This would require more aggressive scheduling of the operating rooms.

The administrator of the hospital, however, is concerned about maintaining control over the quality of the service delivered. He

thinks the facility is already getting very good utilization. The doctors and the staff are happy with their jobs, and the patients are satisfied with the service. According to him, further expansion of capacity might make it hard to maintain the same kind of working relationships and attitudes.

#### QUESTIONS

Exhibit 4.7 is a room-occupancy table for the existing system. Each row in the table follows the patients that checked in on a given day. The columns indicate the number of patients in the hospital on a given day. For example, the first row of the table shows that 30 people checked in on Monday and were in the hospital for Monday, Tuesday, and Wednesday. By summing the columns of the table for Wednesday, we see that there are 90 patients staying in the hospital that day.

- 1 How well is the hospital currently utilizing its beds?
- 2 Develop a similar table to show the effects of adding operations on Saturday. (Assume that 30 operations would still be performed each day.) How would this affect the utilization of the bed capacity? Is this capacity sufficient for the additional patients?
- 3 Now look at the effect of increasing the number of beds by 50 percent. How many operations could the hospital perform per day before running out of bed capacity? (Assume operations are performed five days per week, with the same number performed on each day.) How well would the new resources be utilized relative to the current operation? Could the hospital really perform this many operations? Why? (Hint: Look at the capacity of the 12 surgeons and the five operating rooms.)
- 4 Although financial data are sketchy, an estimate from a construction company indicates that adding bed capacity would cost about \$100,000 per bed. In addition, the rate charged for the hernia surgery varies between about \$900 and \$2,000 (U.S. dollars), with an average rate of \$1,300 per operation. The surgeons are paid a flat \$600 per operation. Due to all the uncertainties in government health care legislation, Shouldice would like to justify any expansion within a five-year time period.