Chapter 11
Presentation of Data

Key Terms

Bar chart
Bar graph
Categorical data
Continuous data
Discrete data
Frequency polygon
Histogram
Interval data
Line graph
Nominal data
Ordinal data
Pictogram
Pie chart
Pie graph
Ratio data
Run chart
Scales of measurement
Scatter diagram
Table

Objectives

At the conclusion of this chapter, you should be able to:

- Discuss categorical data: nominal, ordinal, interval, and ratio
- Differentiate between discrete data and continuous data
- Describe and differentiate between tables and the following graphs: bar graphs, pie charts, line graphs, histograms, frequency polygons, pictograms, and scatter diagrams
- Create tables and graphs to display statistical information
- Understand the basic elements in preparing a report

Types of Data

A set of raw data may not necessarily provide a user (such as an administrator, a physician, or an HIM professional) with information that can be easily interpreted. Descriptive statistics are the most common type of statistics that the health information technician will encounter or be responsible for producing. Descriptive statistics describe populations, which can refer to patients, medical services, nursing units, or hospital departments. As mentioned in Chapter 10, these statistics provide an overview of the general features of a set of data. The statistics can assume a number of different forms, the most common being tables and graphs. However, before choosing the appropriate method for displaying a set of data, it is important to determine whether the data are categorical or numerical.

Categorical Data

There are four types or **scales of measurement** of **categorical data:** nominal, ordinal, ratio, and interval. Ratio and interval data are considered metric variables. Metric variables are numeric variables that answer questions of how much or how many.

Nominal Data

Nominal data are the lowest level of measurement. The word *nominal* means "pertaining to a name." In the nominal scale, observations are organized into categories in which there is no recognition of order. Examples of nominal data include true/false, male/female, types of insurance carriers, or patient occupations. Often numbers are used to represent categories. For example, a male may be listed as 1 and a female as 2; or persons may be grouped according to blood type, where 1 represents type A; 2, type B; 3, type AB; and 4, type O. The sequence of the values is not important. The numbers simply serve as labels for some piece of information and are used for convenience only.

Averages cannot be computed on nominal-level data. For example, an average blood type of 2.3 for a given population is meaningless. Instead of calculating the mean for nominal data, the proportion (or "how many") that falls into each category is reported.

The following types of healthcare payment categories are an example of nominal data.

Payment Categories

1 Medicare

2 Medicaid

3 Blue Cross

4 Other Commercial Insurance

5 Self-pay

6 Other

Ordinal Data

Ordinal data are types of data where the values are in ordered categories. The word *ordinal* means "to put something in order." On the ordinal scale, only the order of the numbers is meaningful, not the numbers themselves. This is because the intervals or distances between categories are not necessarily equal. For example, head injuries may be classified according to level of severity, where 4 is fatal; 3, severe; 2, moderate; and 1, minor.

A natural order exists among the groupings, with the largest number representing the most serious level of injury. However, the order could be reversed; there is no hard-and-fast rule. There is no reason why 1 could not represent the fatal injury and 4, the minor injury. In addition, the distance between a fatal and a severe injury may not necessarily be the same as the distance between a moderate and a minor injury. The following list shows how this works in a classification of brain injury.

1 Minor
2 Moderate
3 Severe
4 Fatal

Another good example of ordinal data is the Likert scale used in many surveys: 1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree. In this example, there is a natural order 1 through 5; however, 1 could just as easily be "strongly agree" and 5, "strongly disagree."

Interval Data

Interval data include units of equal size, such as intelligence quotient (IQ) results. There is no zero point. The most important characteristic is that the intervals between values are equal. An example of interval scale is time. Time is measured in terms of 24 hours in a day. The time between each hour is the same. For example, there are 60 minutes between 1:00 a.m. and 2:00 a.m. and between 5:00 p.m. and 6:00 p.m.

Ratio Data

Ratio data or scale is the highest level of measurement. On the ratio scale, there is a defined unit of measure, a real zero point, and the intervals between successive values are equal. Ratio data may be displayed by units of equal size placed on a scale starting with zero and thus can be manipulated mathematically, such as 0, 5, 10, 15, and 20.

Example: An example of the ratio scale is age. The difference between two consecutive years would be the same (the difference between age 1 and 2 is one year; the difference between age 55 and 56 is one year, and so on). There is a "zero point" in that zero would mean an absence of age or birth; and someone who is 100 years old is twice as old as someone who is 50 years old.

Exercise 11.1

Review the following table and answer the questions below.

Discharges by Gender
Annual Statistics, 20XX

Males	1,203
Females	1,235

1. What example of scales of measurement is depicted in the table?
2. Your health information instructor reported that on the last test given, 5 students received an A, 10 received a B, 3 received a C, 1 received a D, and no one received an F. What example of scales of measurement was given?
3. Is it accurate to state that a temperature of 80 degrees F is twice as hot as 40 degrees F?
4. If a physician's office saw 50 patients yesterday and 100 patients today, is it correct to state that twice as many patients were seen today as yesterday?
5. A physician's clinic conducted a survey to determine the level of patient satisfaction with various departments in the clinic. What type of scale is the following survey item?

   > The information clerk at the clinic gave me the correct directions to find the department I was looking for.
   >
   > Please answer this question on a scale from 1 to 5 where 1 = strongly disagree and 5 = strongly agree.

6. A physician on your staff asked you to help her collect information on the effects of drinking alcohol on pregnancy and the birth weight of babies. You were asked to collect the following information.

   Did the mothers drink alcohol during pregnancy (yes or no)

   Birth weight of the baby

   Apgar score at one minute

   Apgar score at five minutes

   The scales of these variables would be:

   a. Nominal, ordinal, interval, ratio
   b. Nominal, ratio, ordinal, ordinal
   c. Ordinal, nominal, ratio, interval
   d. Ratio, ordinal, interval, nominal

Numerical Data

There are two types of numerical statistical data: discrete data and continuous data.

Discrete Data

Discrete data are finite numbers. That is, they can have only specified values. The number of children in a family is an example of discrete data. A family can have two or three children but cannot have 2.25 or 3.5 children. The numbers represent actual measurable quantities rather than labels.

Other examples of discrete data include the number of motor vehicle accidents in a particular community, the number of times a woman has given birth, the number of new cases of cancer in your state within the past five years, and the number of beds available in your hospital.

In discrete data, a natural order exists among the possible data values. In the example of the number of times a woman has given birth, a larger number indicates that she has had more children; the difference between one and two births is the same as the difference between four and five; and the number of births is restricted to whole numbers (a woman cannot give birth 2.3 times). For the most part, measurements on the nominal and ordinal scales are discrete.

Continuous Data

Continuous data represent measurable quantities but are not restricted to certain specified values. A variable that is continuous can take on a fractional value. For example, a patient's temperature may be 102.6° F. Another example is height. One could say that someone is approximately 6 feet tall, refine it to 5 feet 10 inches, and refine it still further to 5 feet $10\frac{1}{2}$ inches. Age is yet another example. You may have been 20 years old on your last birthday, but now you are 20 plus some part of another year.

The only limiting factor for a continuous observation is the degree of accuracy with which it can be measured. For analysis, continuous data often are converted to a range that acts as a category. For example, age can be categorized in ranges (0–20, 21–40, and so on). Measurements on the interval and ratio scales can be grouped; interval and ratio variables are continuous.

Data Display

Data display is critical to data analysis because it reveals patterns and behaviors. When preparing a statistical report, the user must define its objectives and scope:

- What information is needed?
- What information is available?
- Are the data collected routinely by the facility, or must additional data be collected?

If the purpose requires frequencies, percentages, or relationships among variables, the data may be presented in the form of a table or a graph. Basically, statistical tables are used for summarizing data; they simply list values into rows and columns and do not easily capture the audience's attention. On the other hand, graphs and charts can present data for quick visualization of relationships.

Tables

A **table** is an orderly arrangement of values that groups data into rows and columns. Almost any type of quantitative information can be grouped into tables. Columns allow you to read data up and down, and rows allow you to read data across. The columns and rows should be labeled. Many word-processing, spreadsheet, and database software programs offer assistance in the creation of tables. In table 11.1, variables arranged in columns across the page identify the individual patient name, age, clinical service, and length of stay. Each row represents one patient.

There are a number of advantages to using tables, including:

- More information can be presented.
- Exact values can be read to retain precision.
- Supportive details can be provided.
- Less work and fewer costs are required in the preparation.
- Flexibility is maintained without distortion of data.

The essential components of a table include:

- Title: The title must explain as simply as possible what is contained in the table. The title should answer the questions:
  - — What are the data? For example, are these percentages; frequencies?

Table 11.1. Community Medical Center analysis showing patients discharged 12/1/20XX

Name	Age	Clinical Service	Length of Stay
Smith	5	Surgical	1
Valdez	22	Obstetrical	1
Chu	26	Obstetrical	2
MacDuff	18	Obstetrical	3
Johnson	10	Surgical	7
O'Brien	80	Surgical	8
Lewandowski	35	Surgical	11
Jones	52	Medical	15
Shultz	69	Medical	37
Martini	49	Medical	42

Source: Community Medical Center.

- — Who? Who is the table about? For instance, are these males or females; a certain service; a type of disease?
- — Where? For example, is this your hospital; the United States; or your state?
- — When? What is the time period?

- Stub heading: The title or heading of the first column
- Column headings: The headings or titles for the columns
- Stubs: The categories (the left-hand column of a table)
- Cells: The information formed by intersecting columns and rows
- Source footnote: The source for any factual data should be identified in a footnote.

Table 11.2 illustrates the essential components of a table.

Table 11.2. The essential components of a table

Title			
Stub Heading	**Column Heading**	**Column Heading**	**Column Heading**
Stub	Cell	Cell	Cell
Stub	Cell	Cell	Cell
Stub	Cell	Cell	Cell

Source: Reprinted, with permission, from SEER Program, Self-Instructional Manual for Cancer Registrars, Book 7 (Washington, DC: US Department of Health and Human Services, 1994, p. 23).

Table 11.3 shows a sample table with completed components.

Table 11.3. Lung cancer by age and gender at Community Hospital, 20XX

Community Hospital
Lung Cancer by Age and Gender
Annual Statistics, 20XX

Age, years	Male	Female
≤ 30	1	0
31–40	2	1
41–50	2	1
51–60	10	10
61–70	42	44
71+	29	27
Total	**86**	**83**

Although these rules are important in the construction of tables, it is more important to use good judgment. Check the table to be sure that it is logical and self-explanatory. Are headings specific and understandable for every column and row? Are sources identified, if appropriate? Do totals add up in columns and rows? Is the table easy to read? Remember to present the data in a format that illustrates a specific idea.

Frequency Distribution Tables

A frequency distribution shows the values that a variable can take and the number of observations associated with each value. A variable is a characteristic or property that may take on different values. For example, third-party payers, discharge service, and admission day are examples of variables.

> **Example:** The Utilization Review Committee is interested in knowing the admission days for patients in your hospital. To construct a frequency distribution, you would list the days of the week and then enter the observations or number of patients admitted on the corresponding day of the week. Table 11.4 illustrates what this would look like.

A frequency distribution table also may show the proportion, that is, the proportion of patients admitted on any of the days. To determine this, the value is divided by the total. The total should always equal 1.00.

Table 11.5 shows the same frequency distribution as in the example in table 11.4, but with the proportion added. Notice that to arrive at the proportion, the student should divide the number of patients admitted by the total. For example, Sunday shows 20 admissions of the 132 total.

$$\frac{20}{132} = 0.15$$

Table 11.6 shows a frequency distribution table of cigarette consumption in the United States from 1900 to 2005.

Table 11.4. Report illustrating sample frequency distribution table

Sample Frequency Distribution for Admission Day
June 20XX

Day of the Week	No. of Patients Admitted
Sunday	20
Monday	29
Tuesday	28
Wednesday	12
Thursday	13
Friday	22
Saturday	8
Total	**132**

Table 11.5. Report illustrating sample frequency distribution with proportion

Sample Frequency Distribution for Admission Day
June 20XX

Day of the Week	No. of Patients Admitted	Proportion
Sunday	20	0.15
Monday	29	0.22
Tuesday	28	0.21
Wednesday	12	0.09
Thursday	13	0.10
Friday	22	0.17
Saturday	8	0.06
Total	**132**	**1.00**

Table 11.6. Report illustrating frequency distribution

Cigarette Consumption, United States, 1900–2005

Year	No. of Cigarettes Consumed (in billions)
1900	2.5
1905	3.6
1910	8.6
1915	17.9
1920	44.6
1925	79.8
1930	119.3
1935	134.4
1940	181.9
1945	340.6
1950	369.8
1955	396.4
1960	484.4
1965	528.8
1970	536.5
1975	607.2
1980	631.5
1985	594.0
1990	525.0
1995	487.0
2000	430.0
2005	376.0

Source: Tobacco Outlook Report, Economic Research Service, US Dept. of Agriculture. Available at http://www.infoplease.com/ipa/A0908700.html.

To display discrete or continuous data in the form of a frequency distribution table, the range of values of the observations must be broken down into a series of distinct groups that do not overlap. For example, when arranging a frequency distribution table by patient age, age ranges should not be listed as 1–10, 10–20, 20–30, 30–40, and so on because a patient could be placed in two categories if he were age 20: the 10 to 20 age range and the 20 to 30 age range. Thus, age ranges should be listed as 1–10, 11–20, 21–30, 31–40, and so on.

Summarizing the data involves setting up categories and counting the number of cases that fall into each category, thereby creating a frequency distribution. Following are some general rules for choosing the classes or categories into which the data are to be grouped and the range of each:

- Do not use fewer than five or more than 15 categories. However, the choice depends mostly on the number of values to be grouped.
- Categories should be well defined. Choose categories that cover the smallest and largest values and do not produce gaps between categories.
- The categories should be mutually exclusive where each observation is grouped into one—and only one—category. Avoid successive classes that overlap or have common values.
- Whenever possible, make the classes cover equal ranges (or intervals) of values. These ranges also should be made up of numbers that are easy to work with.

Exercise 11.2

The table below lists the patients seen last month at Community Hospital with their age and cholesterol reading. Create a table using common age categories and these ranges for cholesterol:

Desirable ≤ 199
Borderline High 200–239
High ≥ 240

Age	Cholesterol	Age	Cholesterol	Age	Cholesterol	Age	Cholesterol
14	118	44	138	38	165	56	185
80	139	47	204	18	142	20	200
42	187	48	236	62	139	45	241
37	201	25	186	37	202	63	175
23	107	56	201	32	207	70	188
24	109	47	198	17	157	42	239
67	132	20	210	55	238	55	175
55	235	43	248	13	134	61	168
52	185	50	137	44	239	53	173
52	192	34	188	64	165	41	238
47	144	38	245	70	172	60	180
42	158	75	175	44	245	30	207
37	160	55	207	65	187	62	185
33	155	69	192	51	248	49	207
39	221	31	196	43	240	39	147
34	244	51	147	51	188	53	155
75	186	63	200	50	203	46	246
81	160	18	137	20	145	43	222
79	154	37	245	72	175	26	147
67	154	43	256	39	200	46	201
50	192	44	188	19	145	60	152
53	188	52	200	63	145	35	150
26	137	51	147	36	176	53	215
24	140	19	132	33	185	60	165
22	138	73	147	16	137	63	168

Exercise 11.3

The following table shows a frequency distribution of patients with colon cancer treated at Community Hospital. Compute the proportion of patients in each category.

Community Hospital
Ages of Patients with Colon Cancer
Annual Statistics, 20XX

Age	No. of Patients	Proportion
≤ 30	3	
31–40	12	
41–50	18	
51–60	60	
61–70	65	
71+	48	

Graphs

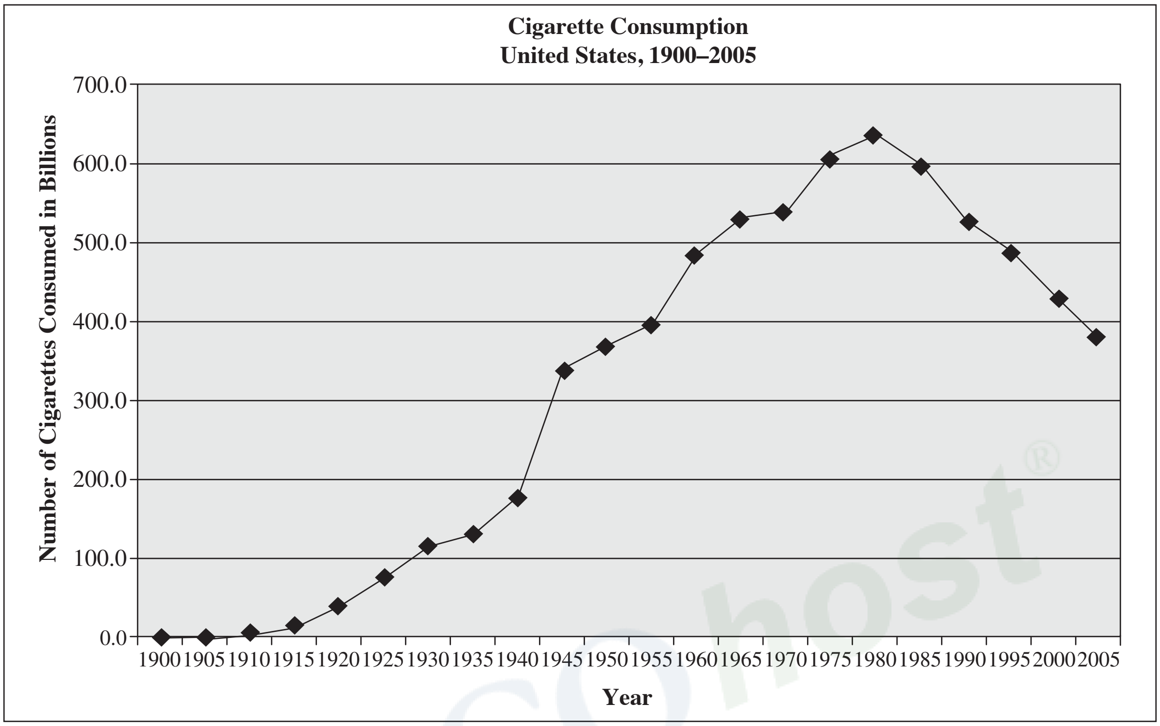
Graphs of various types are the best means for presenting data for quick visualization of relationships. They often supply a lesser degree of detail than tables. However, data presented in a graph can be helpful in displaying statistics in a concise manner. There are advantages to using graphs. They grab the audience's attention and are easy to understand. They can show trends or comparisons.

Graphs should be easy to read, simple in content, and correctly labeled. The presentation of data in the form of a graph is an excellent way to convey the message you want to get across. Instead of presenting an entire statistical report in a table to a group such as the medical staff or administration, you can create a graph to depict the data. Many computer software programs are available that convert data into graphic form automatically and attractively.

When creating graphs, follow these general guidelines:

- The title must relate to what the graph is displaying. Follow the same general guidelines for the title in graphs as given in tables including what are the data, what is the graph about, to whom does it refer, and the time period.
- When several variables are included on the same graph (for example, males and females), each should be identified by using a legend or key.
- Categories should be natural; that is, the vertical axis should always start with zero. The scale of values for the x-axis reads from the lowest value on the left to the highest on the right. The scale of values for the y-axis extends from the lowest value at the bottom of the graph to the highest at the top.
- Scale captions are placed on both axes to identify the values clearly. These are simply titles placed on each axis to identify the values. (See figure 11.1.)

Figure 11.1. Scale captions on a graph



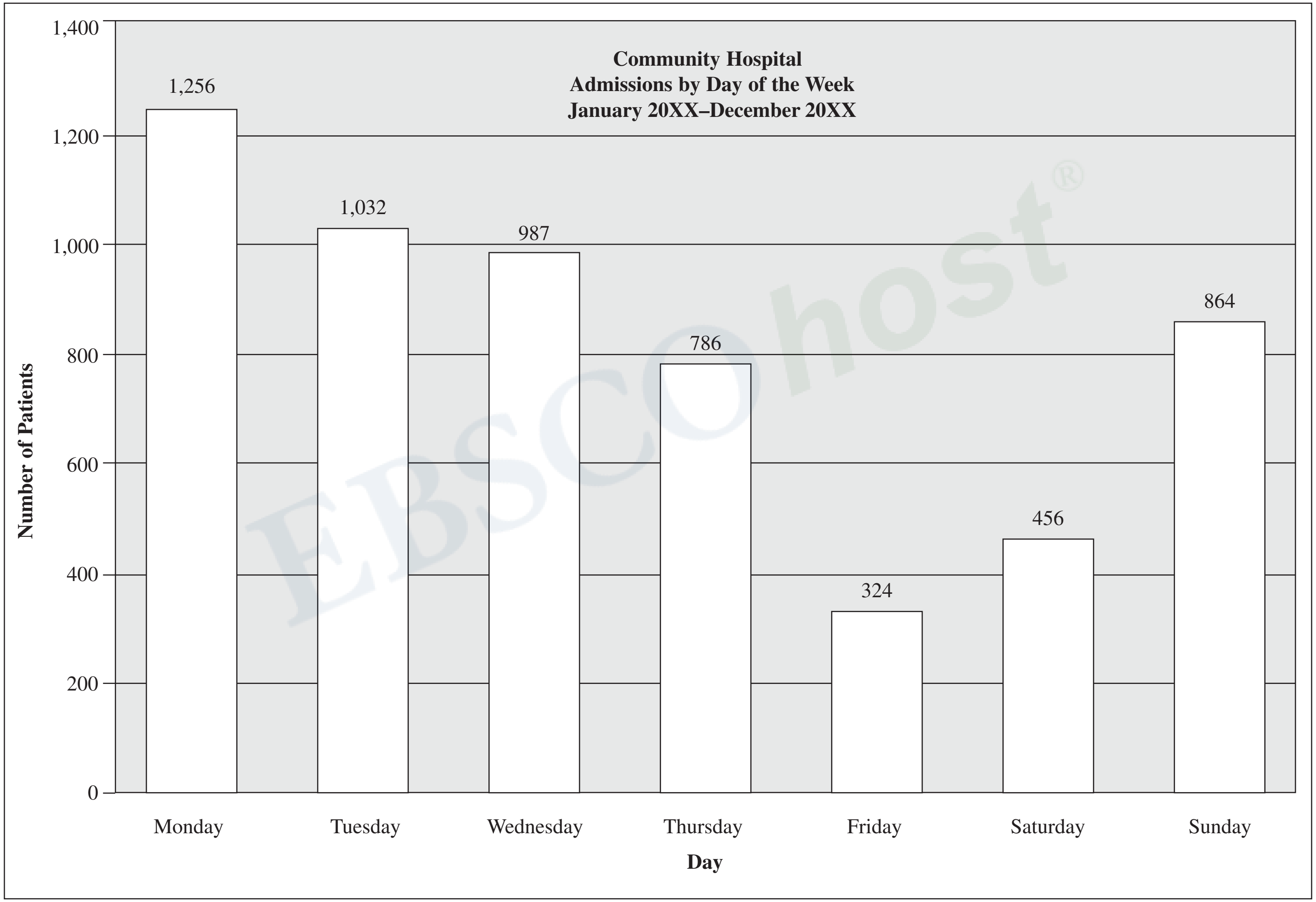
- Graphs should emphasize the horizontal. It is easier for the eye to read along the horizontal axis from left to right. Also, graphs should be greater in length than in height. A useful guideline is to follow the three-quarter-high rule, which states that the graph's height (y-axis) should be three-fourths of its length (x-axis).
- The exact reference to an outside source should be given.

Handy Tip: Selecting the most appropriate graph to accompany your data adds a great deal to the effectiveness of your presentation; however, you should avoid an overabundance of graphs. It is a good idea to produce several versions of a graph and then use the one that is most illuminating (SEER Program 1994).

Bar Graphs

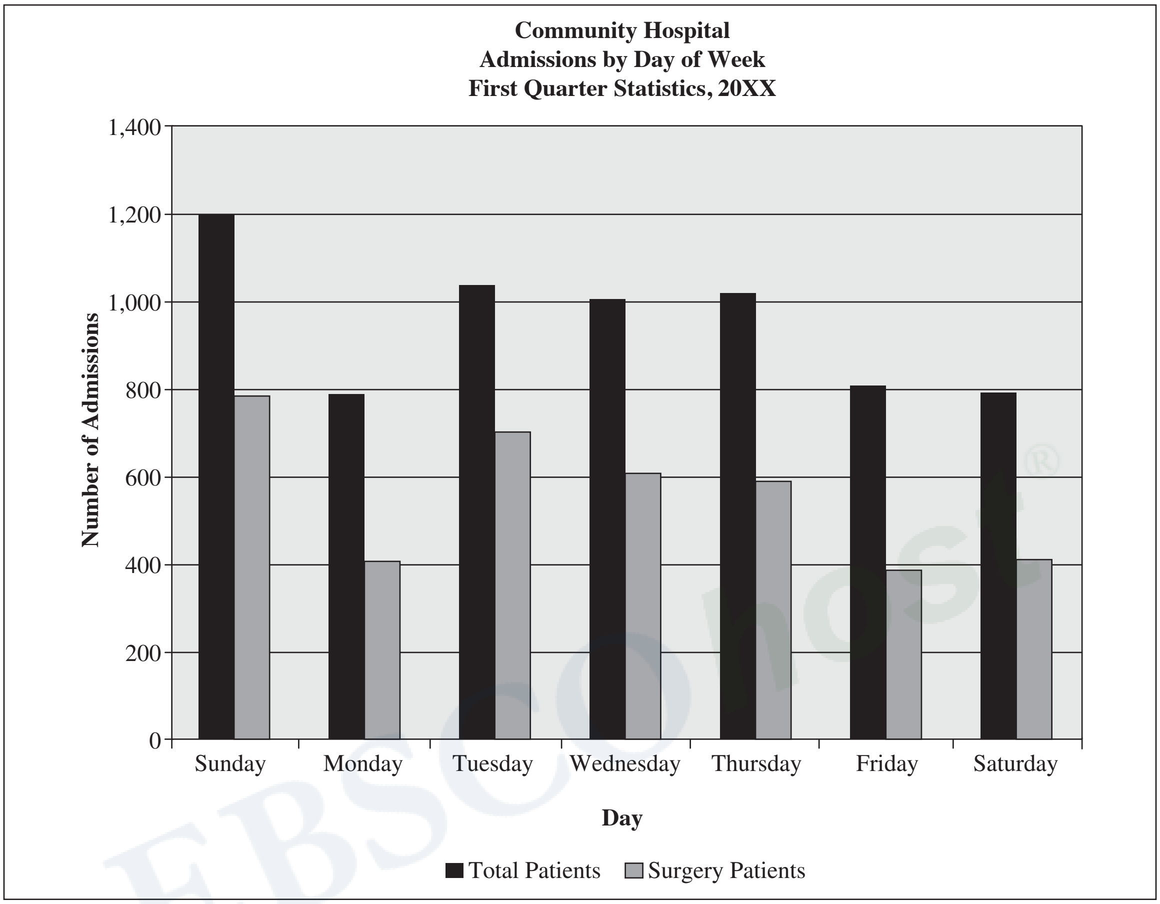
Bar graphs, or **bar charts,** are appropriate for displaying categorical data. The simplest bar graph is a one-variable bar graph. In this type of graph, the various categories of observations are presented along a horizontal axis, or x-axis. (See figures 11.2 and 11.3.) The vertical axis, or y-axis, displays the frequency of the data. Data representing frequencies, proportions, or percentages of categories are often displayed using bar graphs. A grouped bar chart is used to display information from tables containing two or three variables. Figure 11.4 shows an example of a three-variable bar graph.

Figure 11.2. Example of a one-variable bar graph



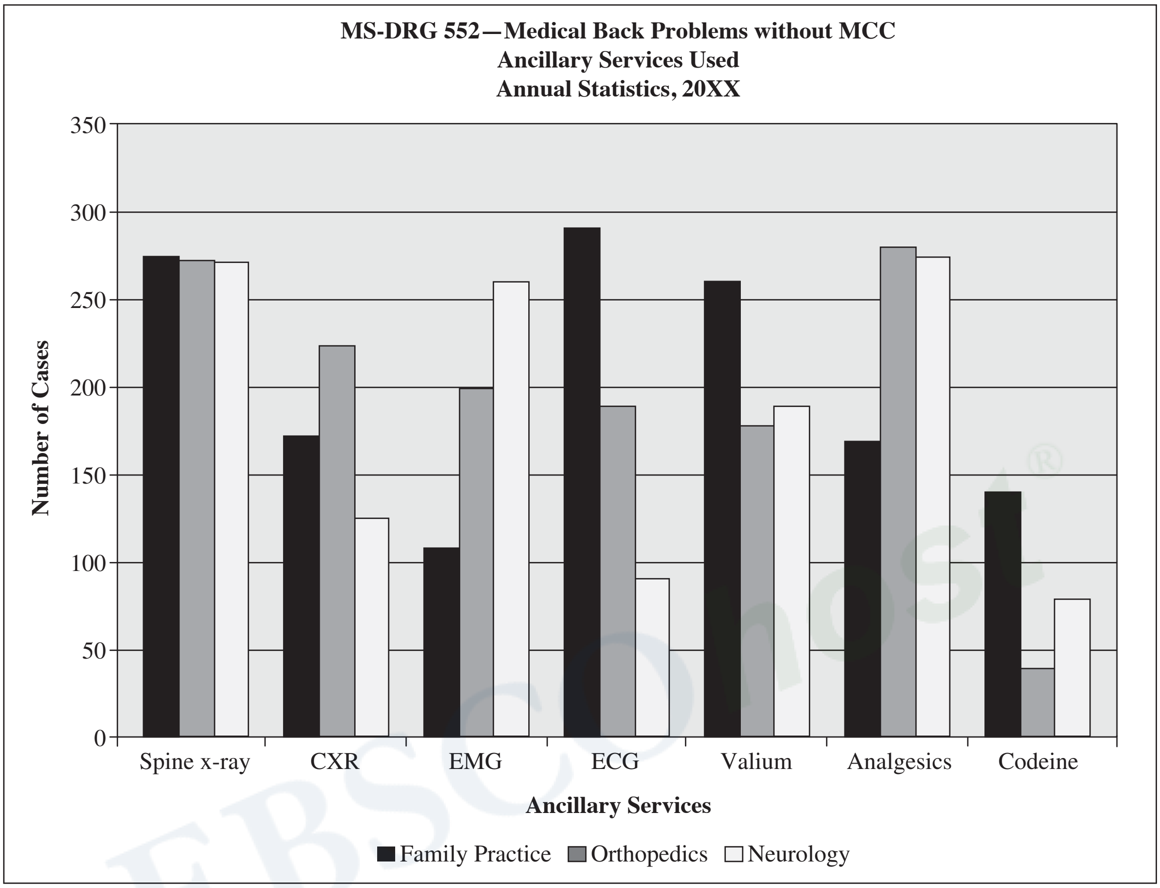
Source: Administrator's annual report.

Figure 11.3. Example of a two-variable bar graph



Source: Administrator's First Quarter Statistics 1/1/20XX to 3/31/20XX.

Figure 11.4. Example of a three-variable bar graph



Pie Charts

A **pie chart,** or **pie graph,** is a method of displaying data as component parts of a whole. It is an easily understood chart in which the sizes of the slices of the pie show the proportional contribution of each part. Use a pie chart when you want to show each category's percentage of the total. A circle is divided into sections such as wedges or slices. These represent percentages of the total (100 percent). To make a pie chart, include all the categories that make up a whole. Therefore, data must be converted into percentages unless you are working with computer software that converts your numbers into percentages. Pie chart wedges may be shaded or colored to help differentiate the sections. In addition, they can be cut out of the pie to help emphasize a percentage. Computer software programs are extremely useful when creating pie graphs. (See figures 11.5 and 11.6 for examples of pie charts.)

Figure 11.5. Pie graph showing nosocomial infection by major service category

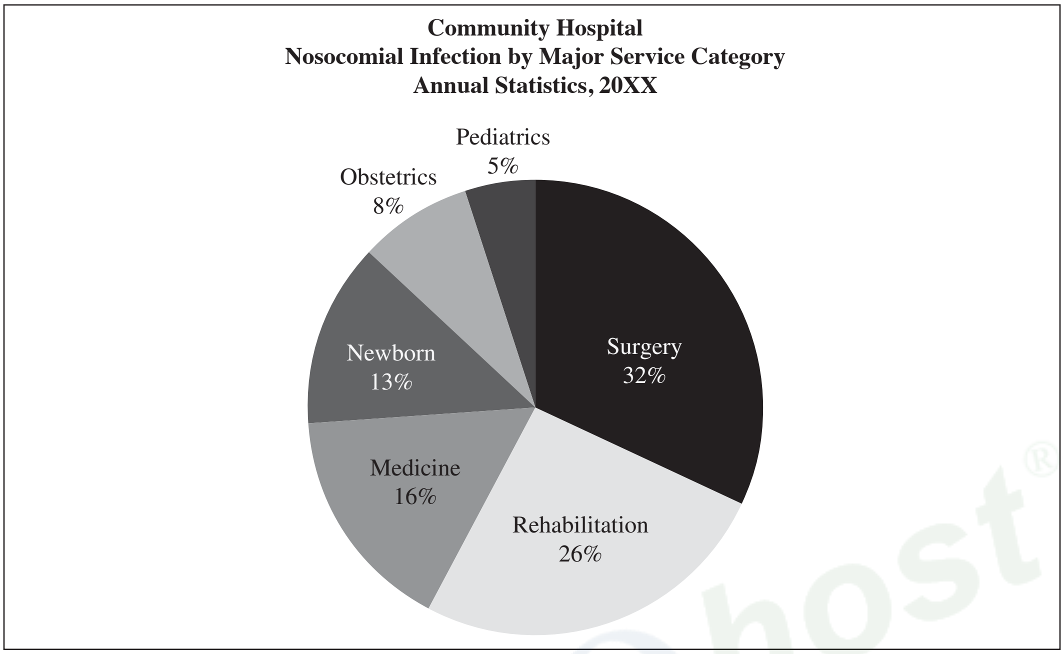
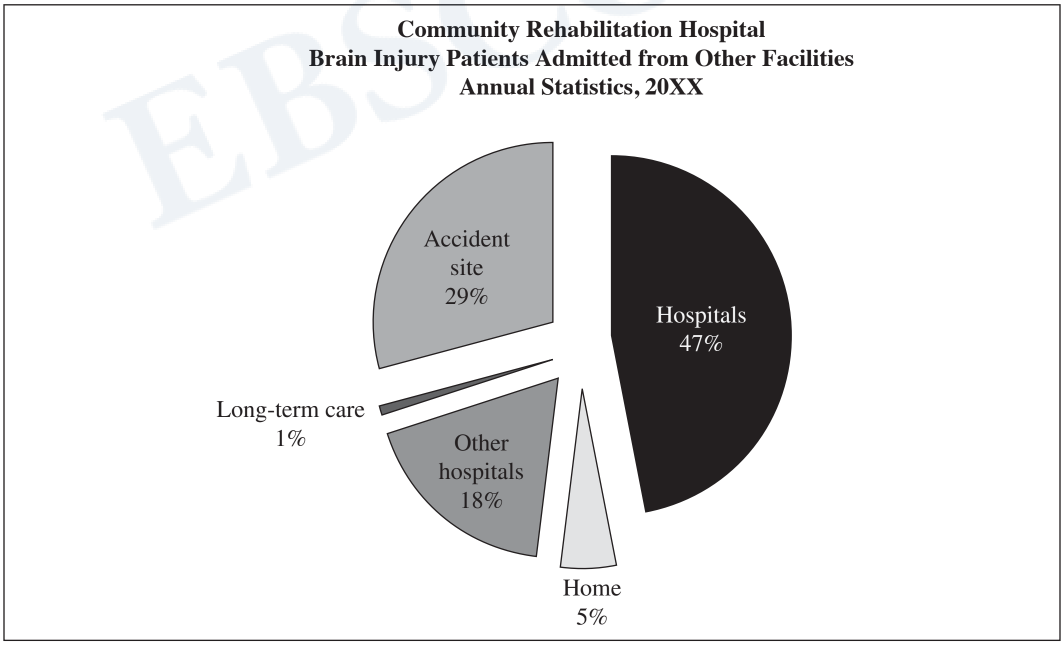


Figure 11.6. Pie graph showing brain injury patients admitted from other facilities



Line Graphs

A **line graph** is often used to show data over time (for example, days, weeks, months, or years). The x-axis shows the time period, and the y-axis shows the values of the variables. A line graph consists of a line connecting a series of points. Line graphs also allow for several variables to be plotted. Line graphs are also referred to as **run charts** in the quality management field. The x-axis depicts the units of time from left to right, and the y-axis measures the values of the variable being shown. (See figures 11.7 and 11.8 for examples of line graphs.)

Histograms

A **histogram** is a graph used to display frequency distributions for continuous numerical data (interval or ratio data). Histograms are created from frequency distribution tables. (See figures 11.9 and 11.10 for examples of histograms.) They look similar to bar graphs except that all the bars in a histogram are touching because they show the continuous nature of the distribution. In histograms the bars should be of equal width. Ordinarily in constructing a histogram, there should not be less than four and usually never more than twelve bars or classes and the frequency groups should not overlap.

Frequency Polygon

A **frequency polygon** is similar to a histogram in that it is a graph depicting the frequency of continuous data; however, a frequency polygon is in line form instead of bar form. The advantage of a frequency polygon is that several of them can be placed on the same graph to make comparisons. A frequency polygon uses the same axes as the histogram; that is, the x-axis displays the scale of the variable and the y-axis displays the frequency. A dot is placed at the midpoint of the class interval or frequency. A line drawn from one point to the next then connects the dots. Because the x-axis represents the entire frequency distribution, the line starts at zero cases and is drawn from the last frequency to the y-axis to end with zero. (See figure 11.11.)

Pictogram

A **pictogram** is an attractive alternative type of bar graph in that it uses pictures to show the frequency of the data. For example, if you want to show the top five cancer site deaths, you might use stick people. If you need to show exact numbers, a pictogram will probably not be a good choice for your presentation; however, they are very good at catching the attention of your audience and will give them a good sense of your data. (See figure 11.12.)

Figure 11.7. Example of a one-variable line graph

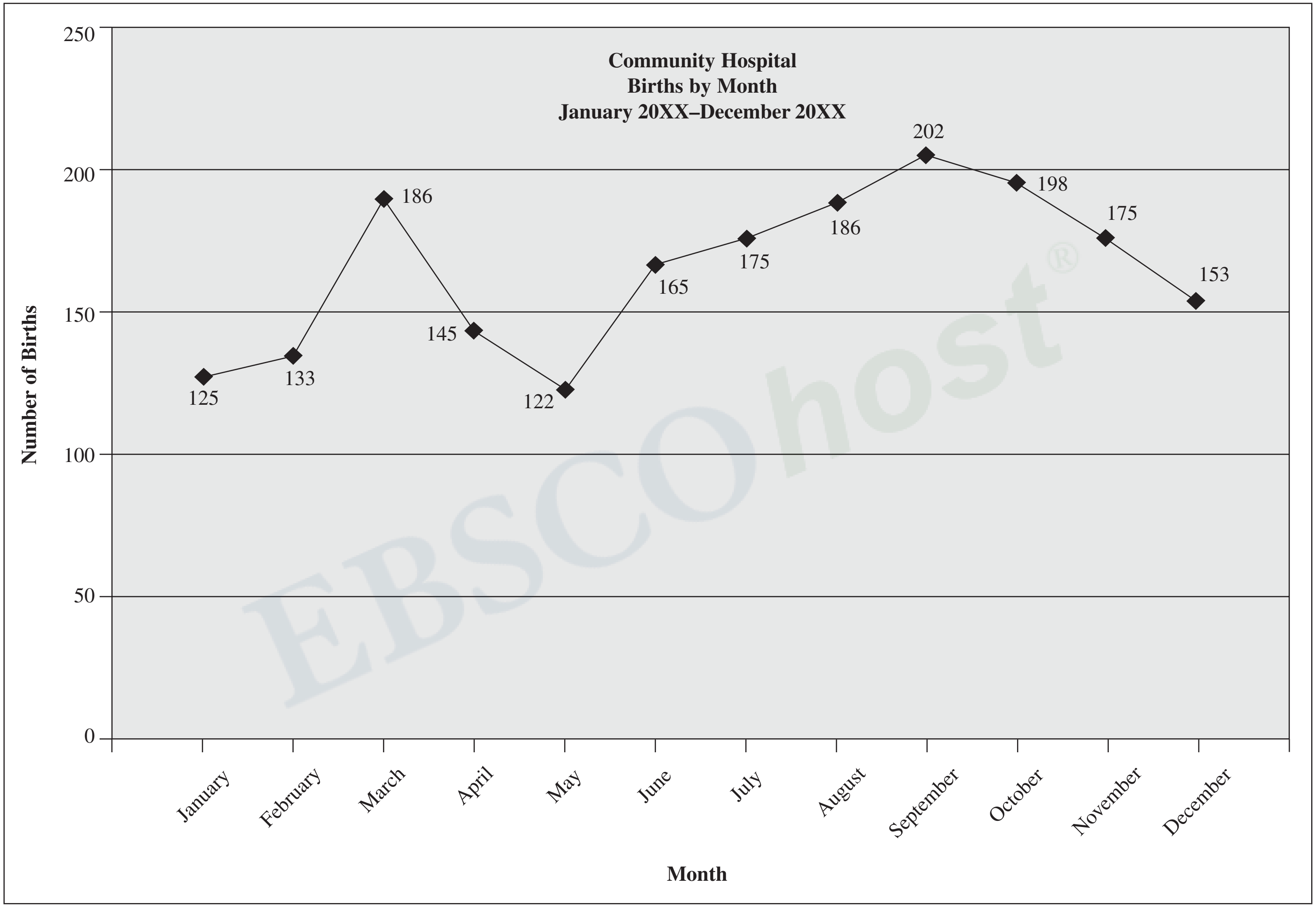


Figure 11.8. Example of a two-variable line graph

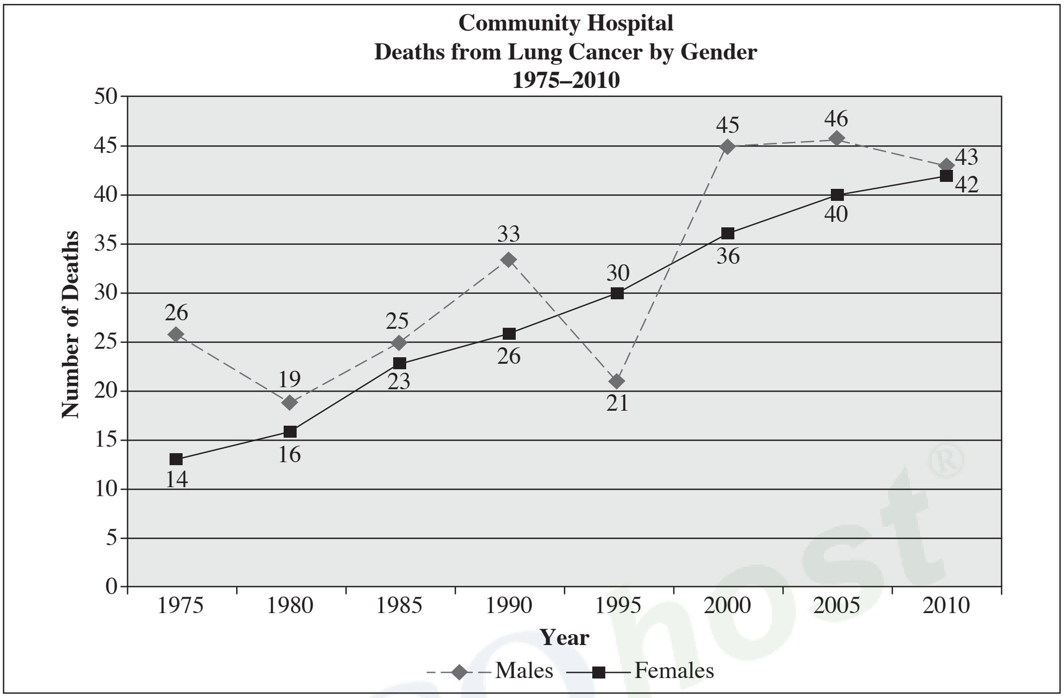


Figure 11.9. Sample histogram #1

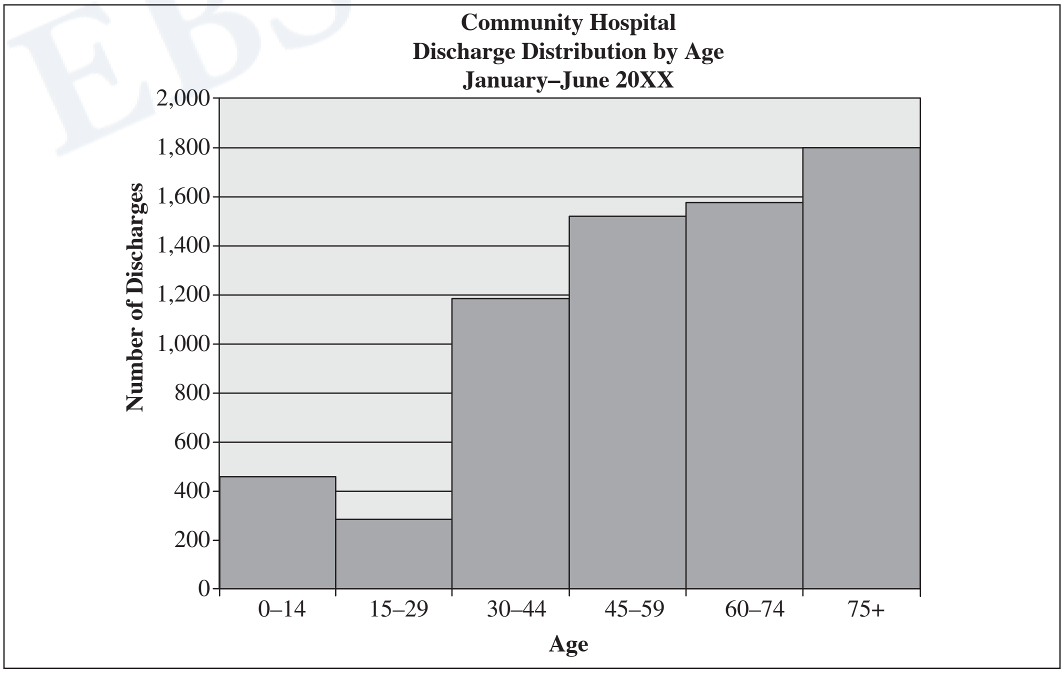


Figure 11.10. Sample histogram #2

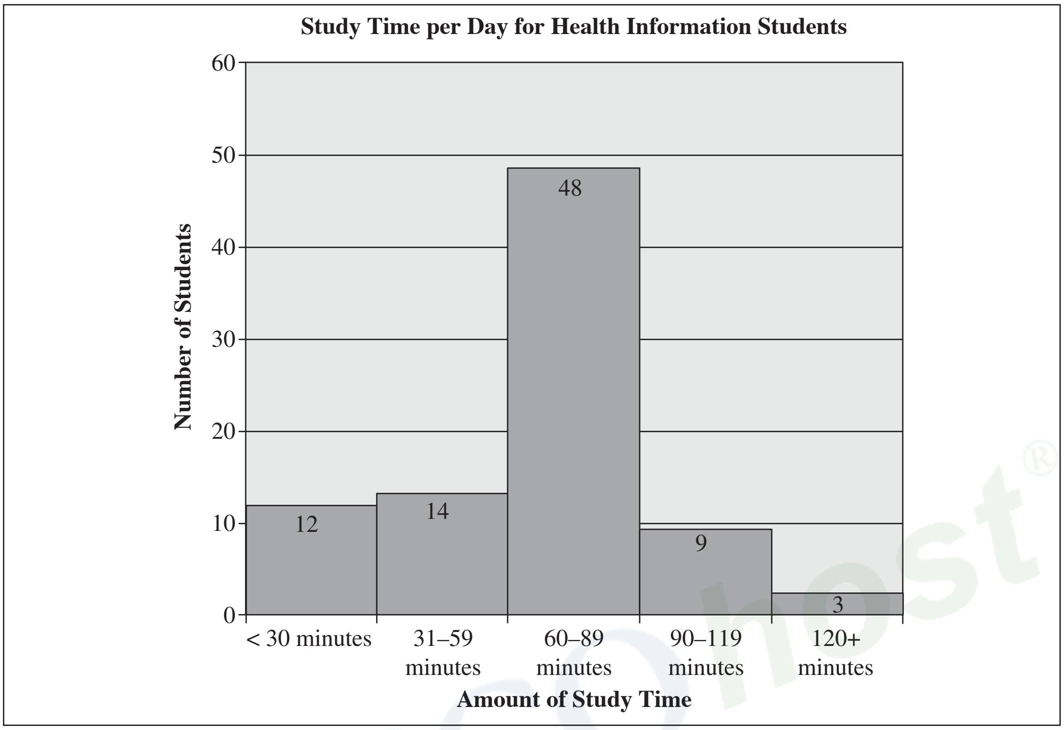


Figure 11.11. Frequency polygon

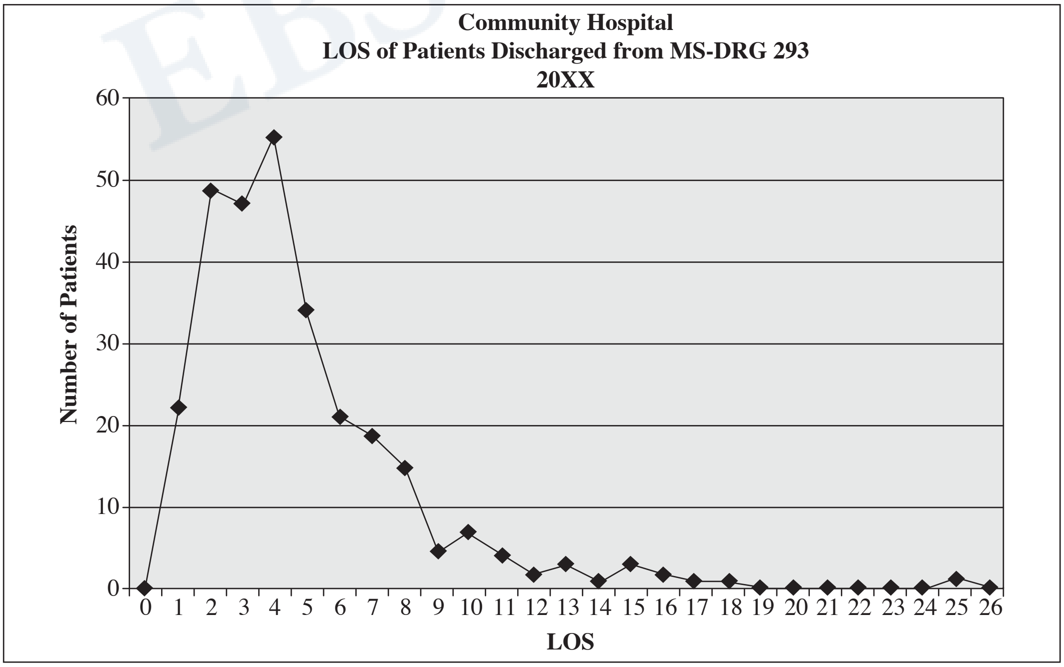
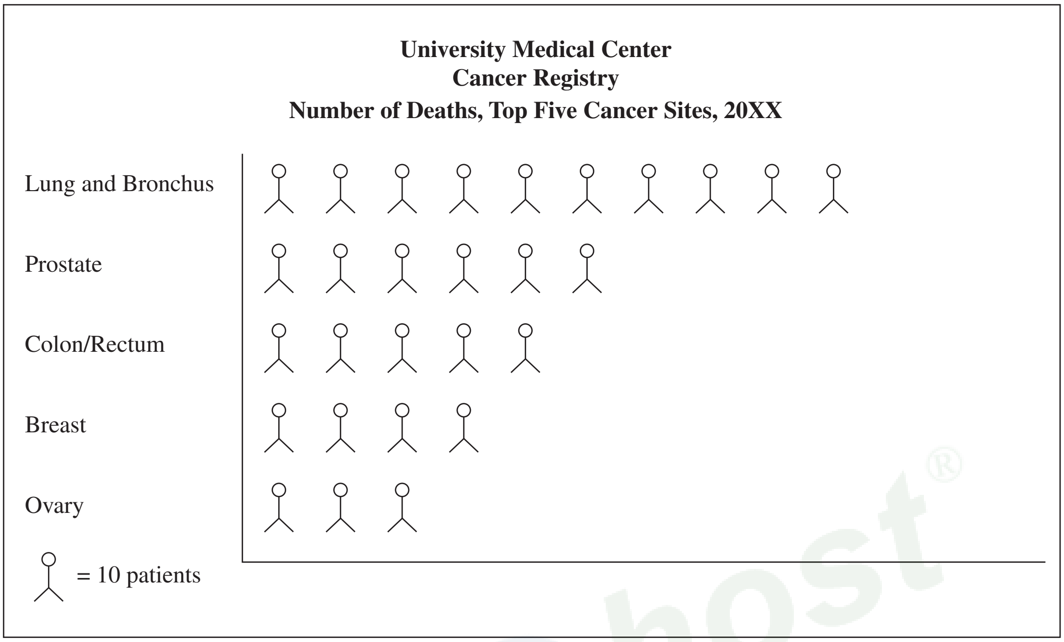


Figure 11.12. Sample pictogram



Scatter Diagram

A **scatter diagram** (also called a scattergram or scatter plot) is used to graphically show the relationship between two numerical variables. A scatter diagram is used to determine whether there is a correlation, or relationship, between two characteristics. Correlation implies that as one variable changes, the other also changes. This does not always mean that there is a cause-and-effect relationship between two variables because there may be other variables that could cause the change. If the two characteristics are somehow related, the pattern of points will show a tight clustering in a certain direction. The closer the points look like a line in appearance, the more the two characteristics are likely to be correlated. (See figure 11.13.)

The slope of the values in figure 11.13 is positive. Notice that small values of the x-axis correspond to small values of the y-axis and large values of the x-axis correspond to large values of the y-axis; thus, a positive linear relationship is thought to exist. The scatter diagram in figure 11.13 shows a weak correlation because the scatter points are not clustered together tightly.

In contrast, figure 11.14 shows a scatter diagram with a negative linear relationship. That is, the small values of the x-axis correspond to large values of the y-axis and large values of the x-axis correspond to small values of the y-axis. Additionally, the scatter diagram in figure 11.14 shows a strong correlation because the cluster of points is tight.

Figure 11.15 illustrates a scatter diagram with no linear relationship because the scatter points are plotted randomly on the graph.

Figure 11.13. Sample scatter diagram showing a positive linear relationship

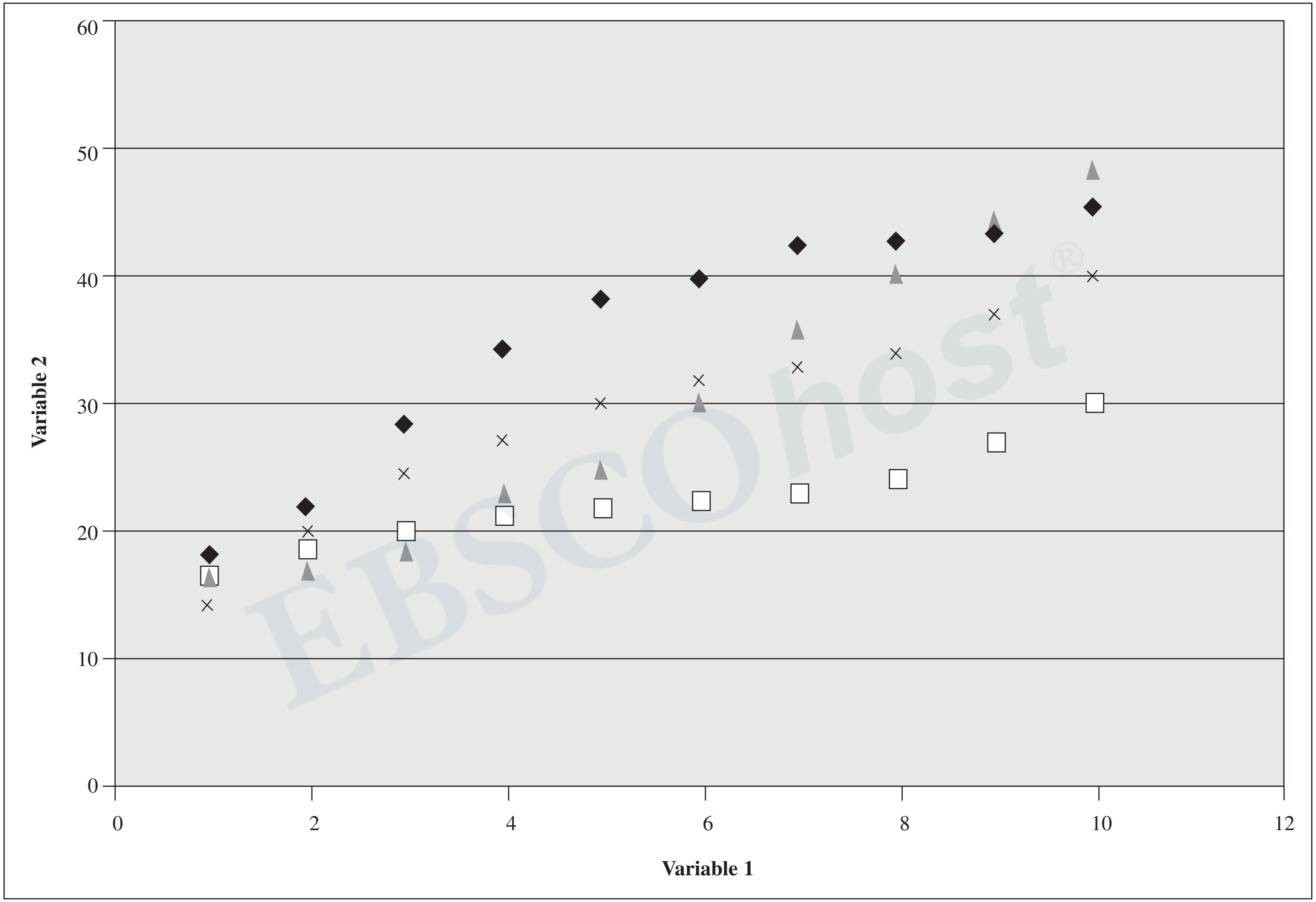


Figure 11.14. Sample scatter diagram showing a negative linear relationship

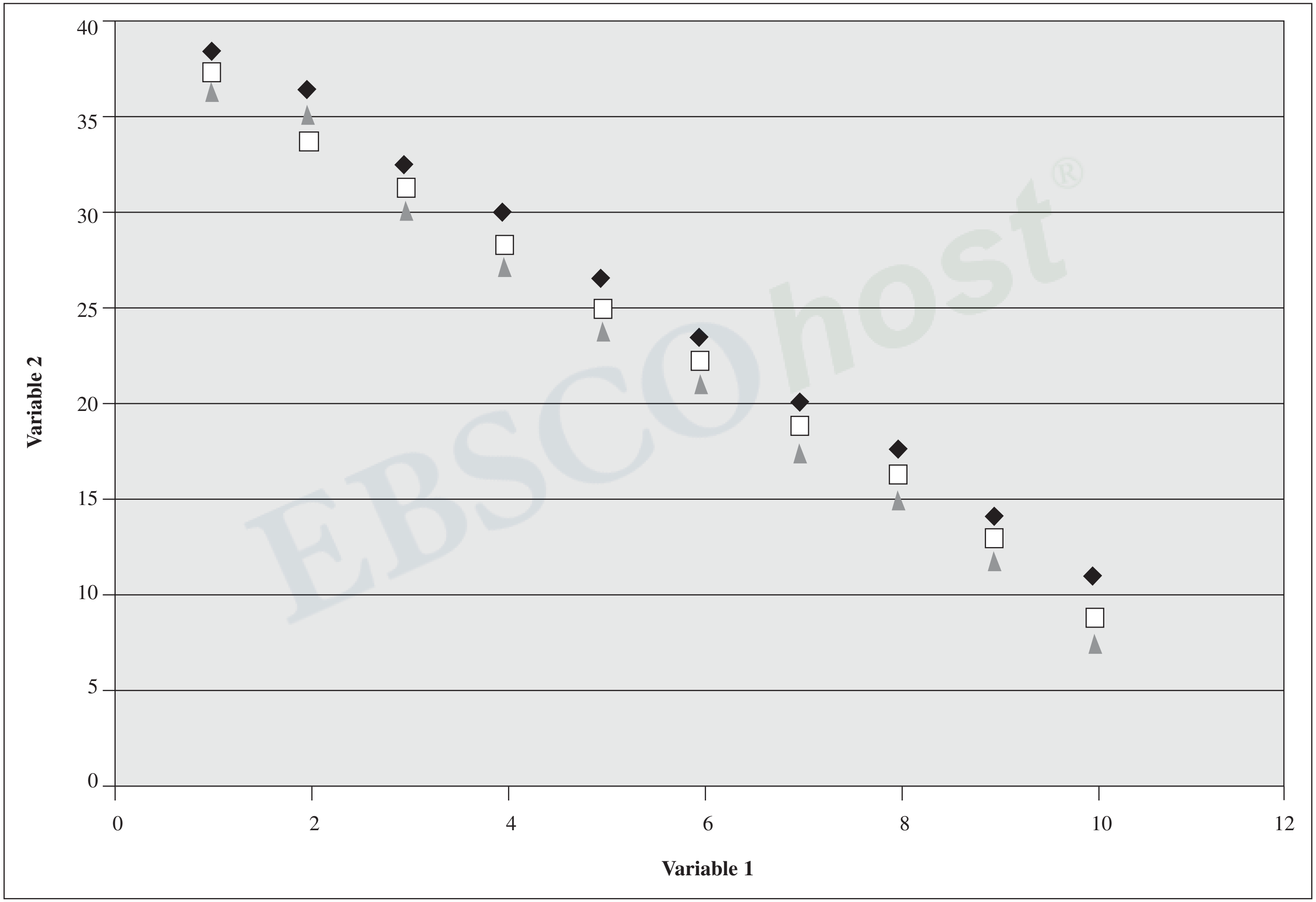
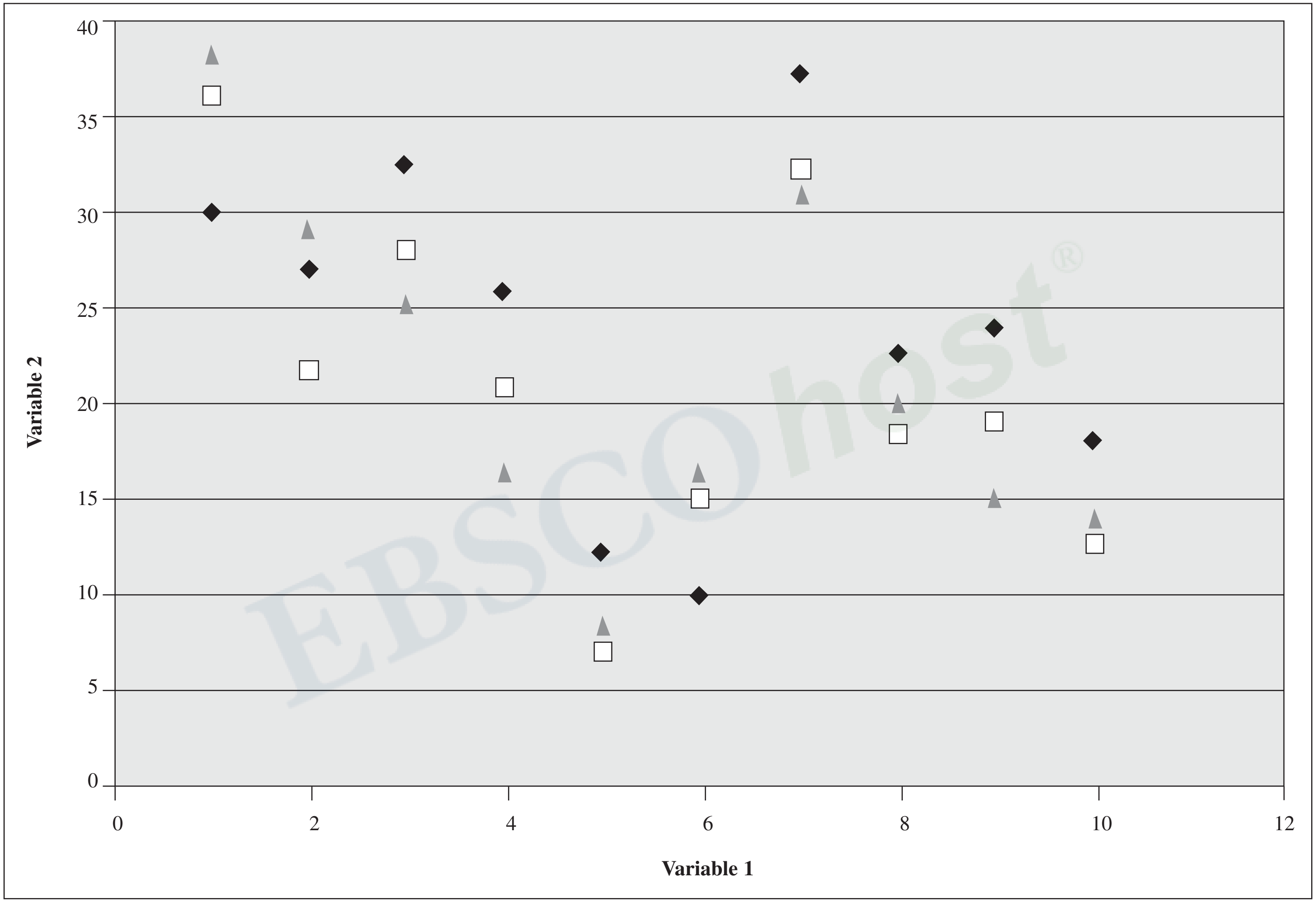


Figure 11.15. Sample scatter diagram showing no linear relationship



Exercise 11.4

Complete the following exercises.

1. Indicate whether a table or a graph is the preferred method of presentation in the following situations:
   a. Distribution by site, sex, race, and time period of all cancers in your healthcare facility
   b. Survival trends over time by sex for lung cancer
   c. Display of prostate cancer stage of disease for a presentation at a professional conference
   d. Detailed treatment distribution of breast cancer for a physician on the staff of your hospital
2. Indicate which of the following categories (A, B, and C) are mutually exclusive and clearly defined.

A	B	C
0–15	≤ 10.0	0–10
15–30	10.1–20.0	11–20
30–45	20.1–30.0	21–30
45–60	30.1–40.0	31–40
60+	40.1–50.0	41–50
	50.1+	51+

3. In September 2011, Community Hospital discharged 120 patients.
   - 82 patients were discharged home
   - 10 patients were discharged home with follow-up home health
   - 6 patients died
   - 11 patients were transferred to a skilled nursing facility
   - 3 patients were transferred to another acute care facility
   - 8 patients were transferred to a rehabilitation hospital

   Complete a pie chart of this information.

Exercise 11.5

Analyze the report on page 221, then prepare the data displays indicated in the questions below. The data displays may be neatly hand drawn or created using a software program.

1. Create a histogram to display the distribution of total discharge days by age.
2. Create a bar graph to display the admission by day of week for Medicare patients in comparison to the admission by day of week for all patients.
3. Create a pie chart to display the percentage of patients discharged by major service category.
4. Create a table for length of stay distribution.

Exercise 11.5 (continued)

Administrator's Semiannual Reference Report
January–June 20XX

ALL PATIENTS, INCLUDING ONE-DAY STAYS (SEPARATE)

	ADMISSIONS					DISCHARGES			
	TOTAL PTS.	% OF PTS.	SURG. PTS.	AVG. PREOP	ONE-DAY STAYS	TOTAL PTS.	% OF PTS.	AVG. LOS	ONE-DAY STAYS
SUNDAY	1,187	17.9	774	1.7	146	809	12.1	8.1	46
MONDAY	755	11.3	426	2.8	124	576	8.7	6.2	144
TUESDAY	1,085	16.3	689	2.6	135	934	14.0	7.2	115
WEDNESDAY	1,035	15.5	622	3.5	141	934	14.0	7.7	147
THURSDAY	1,024	15.3	597	2.6	139	955	14.3	7.0	132
FRIDAY	808	12.1	359	3.9	145	965	14.5	7.7	141
SATURDAY	773	11.6	417	3.0	39	1,490	22.4	6.6	144

LENGTH OF STAY DISTRIBUTION

	TOTAL PTS.	% CASES
SAME DAY	114	1.7
1 DAY	755	11.3
2–4 DAYS	1,343	20.2
5–7 DAYS	1,555	23.3
8–14 DAYS	1,469	22.0
15–42 DAYS	1,217	18.3
43+ DAYS	210	3.2

SUMMARY BY MAJOR SERVICE CATEGORY

	TOTAL PTS.	% OF PTS.	DIS DAYS	% DAYS	ALOS
MEDICINE	2,005	30.0	21,052	30.6	10.5
SURGERY	1,401	21.0	7,845	11.4	5.6
GYNECOLOGY	631	9.4	6,057	8.8	9.6
OBSTETRICS	530	7.9	2,703	3.9	5.1
NEWBORN	520	7.8	2,600	3.7	5.0
PEDIATRICS	450	6.7	4,140	6.0	9.2
PSYCHIATRY	518	7.7	8,537	12.4	16.5
OTHER	608	9.1	15,798	22.9	26.0

ADMISSION BY DAY OF THE WEEK BY PAYMENT STATUS

	SELF	BLUE CROSS	COMMERCIAL	GOV'T	WORK COMP	M-CAID	M-CARE	OTHER	TOTAL
SUNDAY	31	413	188	0	2	41	273	2	950
MONDAY	19	300	103	0	11	46	280	1	760
TUESDAY	21	400	206	1	9	45	345	2	1,029
WEDNESDAY	20	503	240	2	22	35	223	3	1,048
THURSDAY	30	365	154	0	8	24	199	1	781
FRIDAY	28	40	179	0	0	42	294	0	583
SATURDAY	30	509	246	1	6	55	301	2	1,150
TOTAL PTS.	179	2,892	1,316	4	58	288	1,915	11	
% OF PTS.	2.6	43.4	19.7	0.6	0.8	4.3	28.7	0	
TOT DIS DAYS	1,109	26,895	16,818	36	609	2,670	20,491	104	
% OF DAYS	1.6	39.1	24.4	0	0.8	4	30	0	
AVG. LOS	6.2	9.3	12.8	9.0	10.5	9.3	11	9.5	

(continued on next page)

Exercise 11.5 (continued)

SUMMARY BY AGE

	TOTAL PTS.	% OF PTS.	TOT DIS DAYS	% DAYS	ALOS
0–14	429	6.4	1,749	2.5	4.1
15–18	229	3.4	817	1.2	3.6
19–34	1,144	17.2	9,746	14.2	8.5
35–49	1,488	22.3	14,647	21.3	9.8
50–64	1,570	23.6	18,101	26.3	11.5
65+	1,803	27.1	23,672	34.4	13.1
TOTAL	**6,663**		**68,732**		**10.3**

Exercise 11.6

University Hospital Cancer Registry records show the following incidence of cancer in females for the past year. Construct an appropriate graph of the data.

University Hospital
Cancer Registry
10 Most Prevalent Cancer Sites—Females
20XX

Site	Number of Cases
Breast	120
Colon and rectum	42
Uterus	25
Thyroid	21
Lymphoma	20
Melanoma	19
Lung and bronchus	15
Ovary	12
Pancreas	8
Leukemia	6

Exercise 11.7

University Hospital reported the following incidence of lung and bronchus cancer patients treated at the hospital during the past 15 years. Construct a line graph of the data.

University Hospital
Cancer Registry Data
Lung and Bronchus Cancer
by Year and Gender

Year	Males	Females
1994	112	48
1995	121	47
1996	130	49
1997	123	50
1998	121	54
1999	131	55
2000	150	60
2001	155	65
2002	173	72
2003	171	75
2004	172	80
2005	171	83
2006	170	87
2007	168	93
2008	165	120
2009	169	118
2010	175	121
2011	172	120

Preparing Reports

Writing reports for your workplace is not the same as writing an article for a professional journal or preparing a report for an assignment in one of your classes, but the goal is the same. Communication is the goal and it is achieved when you write your report in the style your audience prefers. Often your healthcare administration will let you know how reports are prepared and presented in your facility, or you could review previous reports that have been given to committees or your administration to use as a guide. Some reports are more formal than others. For example, for a committee meeting you may just provide some data in the form of graphs or tables to share with the members, whereas for a Cancer Conference, where information may be shared with the community, a more formal report will be in order.

Here are some general guidelines to follow:

- Include a title for the report.
- For formal reports or one with many graphs and tables, include a table of contents.
- Include the tables and graphs.
  — Tables and graphs are great tools for presenting data. Tables show summarized and more detailed data and graphs are useful for presenting relationships in visual form. The question of which to use depends on the audience.

  — Take a few minutes before you prepare a report to think about who will be reading or seeing your presentation. Will you be presenting information to your administrator about the need for new equipment in your department; will it be to a team who is deciding whether or not to investigate the need for a new service in your facility; or will it be to a committee evaluating the quality of care provided in your hospital? Determine what you are trying to say to this person or group. Determine what details must be included, then decide what types of tables and/or graphs you want to provide.

  — Tables have several advantages over graphs:
    - More information can be presented in a table.
    - Exact values in tables can be helpful.
    - Ordinarily less work is involved in creating a table.

  — Graphs, on the other hand, also have advantages:
    - Graphs are more attention-grabbing than tables.
    - Graphs show trends more clearly.
    - Graphs bring out facts that will stimulate thinking.
- Prepare a narrative report if you are asked to provide one or if it will make the presentation more understandable.
  — Tables and graphs are just a part of the decision-making process. Adding narrative discussions to reports helps people better understand the data.

  — Narrative description can explain what the values mean.

  — Narrative reports can include historical information, for instance, what the data has shown over a specific period of time.

  — The narrative can include factors that may influence the data such as seasonal changes in the patient population or reasons for significant increases or decreases in the data.

  — Make sure your data are correct because inaccurate data may lead to inaccurate decisions.

  — Be sure to include the sources of the data.

- Write to the style of your workplace.
  - — Be objective. Report all the pertinent information, both positive and negative points.
  - — Use bias-free language. Avoid words such as "awesome" or "incredible."
  - — Write in an impersonal style. Do not start your sentences with "I compared . . .", but rather, "A comparison showed . . ."
  - — Be concise and strive for clarity.
  - — Proofread your document; brush up on your grammatical skills.

Chapter 11 Test

Complete the following exercises.

1. What is one of the simplest types of categorical data where the values fall into unordered categories?
   a. Ordinal
   b. Nominal
   c. Ratio
   d. Interval
2. A graphic display can help healthcare professionals understand data. True or false?
3. What type of numerical data contains only a finite number of results?
   a. Continuous
   b. Discrete
4. In creating a frequency distribution table, which of the following statements is not a basic rule to follow?
   a. Choose classes that cover the smallest and largest values.
   b. Make certain that each item can go into only one class.
   c. As a general rule, use between 10 and 15 classes.
   d. Do not produce gaps between classes.
5. Line graphs can be used to illustrate the relationship between continuous quantities. True or false?
6. When creating histograms, which is a true statement?
   a. Form classes of equal width.
   b. Always form frequency groups that do not overlap.
   c. Establish between five and 15 frequency groups.
   d. All of the above

(continued on next page)

Chapter 11 Test (continued)

7. Which graph displays vertical bars to depict frequency distributions for continuous data?
   a. Histogram
   b. Line graph
   c. Pie graph
   d. Frequency distribution table
8. Bar graphs are used to display comparisons between nominal data. True or false?
9. What do the wedges or divisions in a pie graph represent?
   a. Frequency groups
   b. Various data
   c. Percentages
   d. Classes
10. Which of the following graphs would be best to use to display the percentages of diagnoses seen at your mental health center?
    a. Frequency polygon
    b. Pie graph
    c. Bar graph
    d. Line graph
11. Which of the following graphs would be best for the cancer registrar to use to display the five-year survival rates of lung cancer patients in the years 20XX to 20XX at your hospital?
    a. Frequency polygon
    b. Bar graph
    c. Line graph
    d. Histogram
12. Which of the following graphs would be best to use to display the number of discharges by medical service for the past year?
    a. Line graph
    b. Bar graph
    c. Histogram
    d. Frequency polygon