CHAPTER 1

Basic Statistical Data Used in Acute Care Facilities

Key Terms

- Autopsy
- Average daily census
- Average length of stay (ALOS)
- Bed count day
- Bed turnover rate
- Census
- Consultation
- Daily inpatient census
- Death rate
- Dichotomous variables
- Direct maternal death
- Discharge days
- Fetal autopsy rate
- Fetal death
- Fetal death rate
- Frequency distribution
- Gross autopsy rate
- Gross death rate
- Hospital-acquired infection
- Hospital autopsy rate
- Indirect maternal death
- Inpatient bed occupancy rate
- Inpatient service day
- Length of stay (LOS)
- Maternal death rate
- Net autopsy rate
- Net death rate
- Newborn autopsy rate
- Newborn death rate
- Outpatients
- Postoperative infection rate
- Proportion
- Rate
- Ratio
- Surgical operation
- Surgical procedure
- Total length of stay
- Variable

Learning Objectives

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

1. Define key terms.
2. Define hospital rates and indicators.
3. Calculate hospital measures of morbidity, mortality, and volume indicators.

It is often said that hospitals and other types of health care facilities are data rich but information poor. There are many types of databases within the facility, many contained within the organization's information warehouse. Information warehouses contain both clinical and financial information. It is the job of the health information management professional to turn the data contained in these databases into information that can be used by physicians, administrators, and other interested parties. The health information management professional can become an invaluable member of the health care team by providing data that are presented in a meaningful way and by presenting data that have been analyzed to serve a specific medical or clinical need. Some typical questions might be:

- What are the top 25 medical and top 10 surgical diagnosis-related groups (DRGs) for inpatient discharges from our facility?
- Which medical/surgical services admit the most patients?
- Is the average length of stay (ALOS) for these DRGs significantly different from the national ALOS for these DRGs?
- How do our charges compare with national charges? How does our reimbursement compare with our costs?
- What geographical area does the health care facility serve?
- How many patients by payer were admitted to the facility? What is the number of inpatient service days by payer? What are the average charges by payer?
- How do lengths of stay (LOSs) compare by physician?
- How many patients acquired nosocomial infections?

In the course of this text, we will answer these questions. We will learn how to present data in graphic form and how to use descriptive statistics to describe patient populations. Our goal is to collect, analyze, and interpret clinical information for both clinical and administrative health care decision makers. We will begin our discussion of commonly reported hospital rates and hospital volume indicators.

Introduction to Frequency Distributions

In health care, we deal with vast quantities of clinical data. Because it is very difficult to look at data in raw form, data are summarized into frequency distributions. 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 can take on different values. Height, weight, gender, and third-party payer are examples of variables.

For example, suppose we are studying the variable patient LOS in the pediatric unit. To construct a frequency distribution, we first list all the values that LOS can take, from the lowest observed value to the highest. We then enter the number of observations (frequencies) corresponding to a given LOS. Table 1.1 illustrates what the resulting frequency distribution looks like. Notice that all values for LOS between the lowest and highest are listed, even though there may not be any observations for some of the values. Each column of the distribution is properly labeled, and the total is given in the bottom row. We can also display a frequency distribution by categories into which a variable may fall. Table 1.2 shows a frequency distribution for the number of patients discharged from Critical

Table 1.1 **Frequency Distribution of Patient Length of Stay (LOS), Pediatric Unit**

LOS in Days	No. of Patients
1	2
2	2
3	0
4	6
5	6
6	11
7	6
8	5
9	3
10	1
Total	42

Table 1.2 **Frequency Distribution of Number of Patients Discharged from Critical Care Hospital by Religion, July 20xx**

Religion	Number of Discharges	Proportion
Protestant	422	.48
Catholic	315	.36
Jewish	20	.02
Other	127	.14
Total	884	1.00

Care Hospital by religion, a variable composed of categories. The proportion for each category is also displayed in the table. The sum of the proportions for each category is equal to 1.0. We will examine frequency distributions in greater detail in Chapter 5.

Ratios, Proportions, and Rates

Variables often have only two possible categories, such as alive or dead, or male or female. Variables having only two possible categories are called **dichotomous**. The frequency measures used with dichotomous variables are ratios, proportions, and rates. All three measures are based on the same formula:

$$\text{ratio, proportion, rate} = \frac{x}{y} \times 10^n$$

In this formula, x and y are the two quantities being compared, and x is divided by y. 10^n is read as "10 to the n^{th} power." The size of 10^n may equal 1, 10, 100, 1000, or more, depending on the value of n:

$$10^0 = 1$$
$$10^1 = 10$$
$$10^2 = 10 \times 10 = 100$$
$$10^3 = 10 \times 10 \times 10 = 1000$$

Ratios and Proportions

A ratio is a comparison between two different things. In a **ratio**, the values of a variable (such as gender: x = female, y = male) are expressed so that x and y are completely independent of each other. For example, the gender of patients discharged from a hospital is compared as:

$$\frac{\text{female}}{\text{male}}, \text{ or } \frac{x}{y}$$

In this example, the ratio represents the number of female discharges compared to the total number of male discharges.

How then would you calculate the female-to-male ratio for a hospital that discharged 457 women and 395 men during the month of July? The procedure for calculating a ratio is outlined in Exhibit 1.1.

A proportion is a particular type of ratio. A **proportion** is a ratio in which x is a portion of the whole, $x + y$. In a proportion, the numerator is always included in the denominator. Exhibit 1.2 outlines the procedure for determining the proportion of hospital discharges for the month of July that was female.

Rates

Rates are a third type of frequency measure. In health care, **rates** are often used to measure an event over time and are sometimes used as performance improvement measures. The basic formula for a rate is

$$\frac{\text{Number of cases or events occurring during a given time period} \times 10^n}{\text{Number of cases or population at risk during same time period}}$$

or

$$\frac{\text{Total number of times something did happen} \times 10^n}{\text{Total number of times something could happen}}$$

In inpatient facilities, there are many commonly computed rates. In computing the Caesarean section (C-section) rate, we count the number of C-sections performed during a given period of time; this value is placed in the numerator. The

Exhibit 1.1 **Calculation of a Ratio: Discharges for July 20xx**

1. Define x and y.
   x = number of female discharges
   y = number of male discharges
2. Identify x and y.
   $x = 457$
   $y = 395$
3. Set up the ratio x/y.
   457/395
4. Reduce the fraction so that either x or y equals 1.
   1.16/1

There were 1.16 female discharges for every male discharge.

Exhibit 1.2 **Calculation of a Proportion: Discharges for July 20xx**

1. Define x and y.
   x = number of female discharges
   y = number of male discharges
2. Identify x and y.
   $x = 457$
   $y = 395$
3. Set up the proportion
   $x/(x + y)$ or $457/(457 + 395) = 457/852$
4. Reduce the fraction so that either x or $x + y$ equals 1.
   0.54/1.00

The proportion of discharges that were female is 0.54.

number of cases, or population at risk, is the number of women who delivered during the same time period; this number is placed in the denominator. The denominator represents the total number of times a C-section could have occurred.

By convention, inpatient hospital rates are calculated as the rate per 100 cases ($10^n = 10^2 = 10 \times 10 = 100$) and are expressed as a percentage. The method for calculating the hospital C-section rate is presented in Exhibit 1.3.

In the example, 33 of the 263 deliveries at Hospital X during the month of May were C-sections. In the formula, the numerator is the number of C-sections performed in May (a given period of time) and the denominator is the total number of deliveries (the population at risk) performed in the same time frame, including C-sections. In calculating the rate, the numerator is always included in the denominator. Also, when calculating the rate, the numerator is first multiplied by 100 and then divided by the denominator.

Because hospital rates rarely result in a whole number, they usually must be rounded either up or down to the next whole number. The hospital should set a policy on whether rates are to be reported to one or two decimal places. The division should be carried out to at least one more decimal place than desired.

In rounding, when the last number is five or greater, the preceding number should be increased by one. In contrast, when the last number is less than five, the

Exhibit 1.3 **Calculation of C-Section Rate for July 20xx**

For the month of July, 23 C-sections were performed; during the same time period, 149 women delivered. What is the C-section rate for the month of July?

1. Define the variable of interest (numerator) and population or number of cases at risk (denominator).

   Numerator: total number of C-sections performed in July

   Denominator: total number of women who delivered in July, including C-sections

2. Identify the numerator and denominator.

   Numerator: 23

   Denominator: 149

3. Set up the rate.

   $(23 \times 100)/149$

4. Multiply the numerator times 100 ($10^n = 10^2$), then divide by the denominator.

   $(2300/149) = 15.4\%$.

The C-section rate for the month of July is 15.4%.

preceding number should remain the same. For example, when rounding 25.56% to one decimal place, the rate becomes 25.6%. When rounding 1.563% to two decimal places, the rate becomes 1.56%. Rates of less than 1% are usually carried out to three decimal places and rounded to two. For rates less than 1%, a zero should precede the decimal to emphasize that the rate is less than 1% (for example, 0.56%).

Hospital Statistics

Hospitals collect data about both inpatients and outpatients on a daily basis. They use these statistics to monitor the volume of patients treated daily, weekly, monthly, or within some other specified time frame. These statistics give health care decision-makers the information they need to plan facilities and to monitor inpatient and outpatient revenue streams. For these reasons, health information management (HIM) professionals must be well versed in data collection and reporting methods. Because most of data collection and reporting are now automated, it is important to understand the underlying concepts from which these data are generated.

Standard definitions have been developed to ensure that all health care providers collect and report data in a consistent manner. The *Glossary of Health Care Terms*, developed by the American Health Information Management Association (AHIMA), is a resource commonly used to describe the types of health care events for which data are collected (The glossary is currently published as an appendix in *Calculating and Reporting Healthcare Statistics*, Horton, 2004.) The glossary includes definitions of terms related to health care corporations, health maintenance organizations (HMOs), and other health-related programs and facilities. Some basic terms that HIM professionals should be familiar with include:

- **Hospital inpatient**: A person who is provided room, board, and continuous general nursing service in an area of the hospital where patients generally stay at least overnight.
- **Hospital newborn inpatient**: An infant born in the hospital at the beginning of the current inpatient hospitalization. Newborns are usually counted separately because their care is so different from that of other patients. Infants born on the way to the hospital or at home are considered hospital inpatients, not hospital newborn inpatients.
- **Inpatient hospitalization**: The period in a person's life when they are an inpatient in a single hospital without interruption except by possible intervening leaves of absence.
- **Inpatient admission**: The formal acceptance by a hospital of a patient who is to be provided with room, board, and continuous nursing services in an area of the hospital where patients generally stay overnight.

- **Inpatient discharge**: The termination of a period of inpatient hospitalization through the formal release of the inpatient by the hospital. This designation includes patients who are discharged alive (by physician order), who are discharged against medical advice, or who died while hospitalized. Unless otherwise indicated, inpatient discharges include deaths.
- **Hospital outpatient**: A hospital patient who receives services in one or more of the outpatient facilities when not currently an inpatient or home care patient. An outpatient may be classified as either an emergency outpatient or a clinic outpatient. An emergency outpatient is admitted to the hospital's emergency department for diagnosis and treatment of a condition that requires immediate medical, dental, or other type of emergency service. A clinic outpatient is admitted to a clinical service of the clinic or hospital for diagnosis and treatment on an ambulatory basis.

Inpatient Census Data

Even though much of the data collection process has been automated, an ongoing responsibility of the HIM professional is to verify the census data that are collected daily. The census reports patient activity for a 24-hour reporting period. Included in the census report is the number of inpatients admitted and discharged for the previous 24-hour period as well as the number of intra-hospital transfers. An intra-hospital transfer is a patient who is moved from one patient care unit (for example, the ICU) to another (the surgical unit). The usual 24-hour reporting period begins at 12:01 a.m. and ends at 12:00 midnight. In the census count, adults and children are reported separately from newborns.

However, before compiling census data, it is important to understand the related terminology. The **census** refers to the number of hospital inpatients present at any one time. For example, the census in a 300-bed hospital may be 250 patients at 2:00 p.m. on May 1, but 245 only one hour later. Because the census may change throughout the day as admissions and discharges occur, hospitals designate an official census-taking time. In most facilities, the official count takes place at midnight.

The result of the official count taken at midnight is the **daily inpatient census**. This refers to the number of inpatients present at the official census-taking time each day. Also included in the daily inpatient census are any patients who were admitted and discharged the same day. For example, if a patient was admitted to the cardiac care unit at 1:00 p.m. on May 1 and died at 4:00 p.m. on May 1, he would be counted as a patient who was both admitted and discharged the same day.

Because patients admitted and discharged the same day are not present at census-taking time, the hospital must account for them separately. If it did not, it would lose credit for the services it provided to these patients. The daily inpatient census reflects the total number of patients treated during the 24-hour period. Exhibit 1.4 displays a sample daily inpatient census report.

Exhibit 1.4 **Sample Daily Inpatient Census Report, Adults and Children**

May 2	
Number of patients in hospital at midnight, May 1	230
+ Number of patients admitted May 2	+35
– Number of patients discharged, including deaths, May 2	–40
Number of patients in hospital at midnight May 2	225
+ Number of patients both admitted and discharged, including deaths	+ 5
Daily inpatient census at midnight, May 2	230
Total inpatient service days, May 2	230

A unit of measure that reflects the services received by one inpatient during a 24-hour period is an **inpatient service day**. The number of inpatient service days for a 24-hour period is equal to the daily inpatient census, that is, one service day for each patient treated. In Exhibit 1.5, the total number of inpatient service days for May 2 is 230.

Inpatient service days are compiled daily, weekly, monthly, and annually. They reflect the volume of services provided by the health care facility—the greater the volume of services, the greater the revenues to the facility. Daily reporting of the number of inpatient service days is an indicator of the hospital's financial condition.

As mentioned earlier, the daily inpatient census is equal to the number of inpatient service days provided for a single day. The total number of inpatient service days for a week, a month, or some other period of time can be divided by the total number of days in the given period to get the average daily inpatient census.

As an example, consider that a hospital might have a daily inpatient census of 240 for day one, 253 for day two, and 237 for day three. The total number of inpatient service days for the three-day period would be 730. When that total is divided by three days, the average daily census is 243.3. The **average daily census** is the average number of inpatients treated during a given period of time. The general formula for calculating the average daily census is:

$$\frac{\text{Total number of inpatient services for a given period}}{\text{Total number of days in the same period}}$$

In calculating the average daily census, adults and children (A&C) are reported separately from newborns (NBs). This is because the intensity of services provided to adults and children is greater than it is for newborns. To calculate the average daily census for adults and children, the general formula is modified as follows:

$$\frac{\text{Total number of inpatient service days for A\&C for a given period}}{\text{Total number of days for the same period}}$$

The formula for the average daily census for newborns is:

$$\frac{\text{Total number of inpatient service days for NBs for a given period}}{\text{Total number of days for the same period}}$$

For example, the total number of inpatient service days provided to adults and children for the week of May 1 is 1729, and the total for newborns is 119. Using the preceding formulae, the average daily census is 1729/7 = 247 for adults and children and 119/7 = 17 for newborns. The average daily census for all hospital inpatients for the week of May 1 is (1729 + 119)/7 = 264. Table 1.3 presents the various formulae for calculating the average daily census.

Inpatient Bed Occupancy Rate

Another indicator of the hospital's financial position is the inpatient bed occupancy rate, also called the percentage of occupancy. The **inpatient bed occupancy rate** is the percentage of official beds occupied by hospital inpatients for a given period of time. In general, the greater the occupancy rate, the greater the revenues for the hospital. For a bed to be included in the official count, it must be set up, staffed, equipped, and available for patient care. The total number of inpatient service days is used in the numerator because it is equal to the daily inpatient cen-

Table 1.3 **Calculation of Average Daily Census Statistics**

Indicator	**Numerator (x)**	**Denominator (y)**
Average daily inpatient census	Total number of inpatient service days for a given period	Total number of days for the same period
Average daily inpatient census for adults and children (A&C)	Total number of inpatient service days for A&C for a given period	Total number of days for the same period
Average daily inpatient census for newborns (NBs)	Total number of inpatient service days for NBs for a given period	Total number of days for the same period

sus, or the number of patients treated daily. The denominator is the total number of bed count days. **Bed count days** are calculated by multiplying the number of days in the given period by the number of beds available during the time frame of interest.

The occupancy rate compares the number of patients treated over a given period of time to the total number of beds available for that same period of time. If 200 patients occupied 280 beds on May 2, the inpatient bed occupancy rate would be $(200/280) \times 100 = 71.4\%$. If the rate was calculated for two or more days, the number of beds would be multiplied by the number of days in that particular time frame.

If we were to calculate the rate for seven days, we would divide the total number of inpatient service days by the total bed count days for that period. For example, if 1729 inpatient service days were provided during the week of May 1, the number of beds (280) would be multiplied by the number of days (7), and the inpatient bed occupancy rate for that week would be $[1729/(280 \times 7)] \times 100 = 88.2\%$.

The denominator in the previous formula is actually the total possible number of inpatient service days. That is, if every available bed in the hospital were occupied every single day, this value would be the maximum number of inpatient service days that could be provided. This is an important concept, especially when the official bed count changes for a given reporting period. For example, if the bed count changes from 280 to 300 beds, the bed occupancy rate must reflect this change. The total number of inpatient beds multiplied by the total number of days in the reporting period is called the total number of bed count days.

The general formula for the inpatient bed occupancy rate is:

$$\frac{\text{Total number of inpatient service days for a given period} \times 100}{\text{Total number of inpatient bed count days for the same period}}$$

For example, in May the total number of inpatient service days provided was 7582. The bed count for the month of May changed from 280 to 300 beds on May 20. To calculate the inpatient bed occupancy rate for May, it is necessary to determine the total number of bed count days. May has 31 days, so the total number of bed count days is calculated as:

$$\begin{aligned} \text{Number of beds, May 1–May 19} &= 280 \times 19 \text{ days} = 5320 \text{ bed count days} \\ \text{Number of beds, May 20–May 31} &= 300 \times 12 \text{ days} = \underline{3600 \text{ bed count days}} \\ 5320 + 3600 &= 8920 \text{ bed count days} \end{aligned}$$

The inpatient bed occupancy rate for the month of May is $(7582/8920) \times 100 = 85.0\%$.

As with the average daily census, the inpatient bed occupancy rate for adults and children is reported separately from that of newborns. To calculate the total

Table 1.4 **Calculation of Inpatient Bed Occupancy Rates**

Rate	Numerator × 100	Denominator
Inpatient bed occupancy rate	Total number of inpatient service days for a given period	Total number of inpatient bed count days for the same period
Inpatient bed occupancy rate for adults and children (A&C)	Total number of inpatient service days for A&C for a given period	Total number of inpatient bed count days for A&C for the same period
Inpatient bed occupancy rate for newborns (NBs)	Total number of NBs inpatient service days for a given period	Total number of bassinet bed count days for the same period

number of bed count days for newborns, the official count for newborn bassinets is used. Table 1.4 reviews how to calculate inpatient bed occupancy rates.

It is possible for the inpatient bed occupancy to be greater than 100%. This occurs when the hospital faces an epidemic or disaster. In this type of situation, hospitals set up temporary beds that are not normally included in the official bed count. As an example, Critical Care Hospital experienced an excessive number of admissions in January because of an outbreak of influenza. In January, the official bed count was 150 beds. On January 5, the daily inpatient census was 156. Therefore, the inpatient bed occupancy rate for January 5 was $(156/150) \times 100 = 104\%$.

Bed Turnover Rate

The **bed turnover rate** is a measure of hospital utilization. It includes the number of times each hospital bed changes occupants. The formula for the bed turnover rate is:

$$\frac{\text{Total number of discharges (including deaths) for a given time period}}{\text{Average bed count for the same period}}$$

For example, Critical Care Hospital experienced 2060 discharges and deaths for the month of April. Its bed count for April averaged 677. The bed turnover rate is therefore $2060 / 677 = 3.0$. The interpretation is that, on average, each hospital bed had three occupants during April.

Length of Stay Data

The **length of stay (LOS)** is calculated for each patient after he or she is discharged from the hospital. It refers to the number of calendar days from the day of patient admission to the day of discharge. When the patient is admitted and discharged in the same month, the LOS is determined by subtracting the date of admission from the date of discharge. For example, the LOS for a patient admitted on May 12 and discharged on May 17 is five days (17 – 12 = 5).

When the patient is admitted in one month and discharged in another, the calculations must be adjusted. One way to calculate the LOS in this case is to subtract the date of admission from the total number of days in the month the patient was admitted and then add the total number of hospitalized days for the month in which the patient was discharged. For example, the LOS for a patient admitted on May 28 and discharged on June 6 is nine days, (May 31 – May 28) + June 6.

When a patient is admitted and discharged on the same day, the LOS is one day. A partial day's stay is never reported as a fraction of a day. The LOS for a patient discharged the day after admission also is one day. Thus, the LOS for a patient who was admitted to the ICU on May 10 at 9:00 a.m. and died at 3:00 p.m. the same day is one day. Likewise, the LOS for a patient admitted on May 12 and discharged on May 13 is one day.

When the LOS for all patients discharged for a given period of time is summed, the result is the **total length of stay**. If five patients are discharged from the pediatric unit on May 9, the total LOS is calculated as follows:

Patient	**LOS**
1	5
2	3
3	1
4	8
5	10
Total Length of Stay	27

In the preceding example, the total LOS is 5 + 3 + 1 + 8 + 10 = 27 days. The total LOS is also referred to as the number of days of care provided to patients discharged or died, or the **discharge days**.

The total LOS divided by the number of patients discharged is the **average length of stay** (ALOS). Using the data in the previous example, the ALOS for the five patients discharged from the pediatric unit is 27/5 = 5.4 days. The general formula for calculating ALOS is:

$$\frac{\text{Total length of stay for a given period}}{\text{Total number of discharges (including deaths) for the same period}}$$

As with the other measures already discussed, the ALOS for adults and children is reported separately from the ALOS for newborns. Table 1.5 reviews the formulae for ALOS.

Table 1.5 **Calculation of LOS Statistics**

Indicator	Numerator	Denominator
Average LOS	Total length of stay (discharge days) for a given period	Total number of discharges, including deaths, for the same period
Average LOS for adults and children (A&C)	Total length of stay for A&C discharges (discharge days) for a given period	Total number of A&C discharges, including deaths, for the same period
Average LOS for newborns (NBs)	Total length of stay for all NB discharges (discharge days) for a given period	Total number of NB discharges, including deaths, for the same period

Exhibit 1.5 displays an example of a hospital statistical summary prepared by the HIM department on the basis of census and discharge data.

Hospital Death Rates

The **death rate** is based on the number of patients discharged—alive and dead—from the facility. Deaths are considered discharges because they are the end point of a period of hospitalization. In contrast to the rates discussed in the preceding section, newborns are not counted separately from adults and children.

Exhibit 1.5 **Statistical Summary, Critical Care Hospital for Period Ending July 20xx**

	July 20xx		Year-to-Date	
Admissions	**Actual**	**Budget**	**Actual**	**Budget**
Medical	728	769	5,075	5,082
Surgical	578	583	3,964	3,964
OB/GYN	402	440	2,839	3,027
Psychiatry	113	99	818	711
Physical Medicine & Rehab	48	57	380	384
Other Adult	191	178	1,209	1,212
Total Adult	2,060	2,126	14,285	14,380
Newborn	294	312	2,143	2,195
Total Admissions	2,354	2,438	16,428	16,575

Exhibit 1.5 *Continued*

	July 20xx		Year-to-Date	
Average Length of Stay	**Actual**	**Budget**	**Actual**	**Budget**
Medical	6.1	6.4	6.0	6.1
Surgical	7.0	7.2	7.7	7.7
OB/GYN	2.9	3.2	3.5	3.1
Psychiatry	10.8	11.6	10.4	11.6
Physical Medicine & Rehab	27.5	23.0	28.1	24.3
Other Adult	3.6	3.9	4.0	4.1
Total Adult	6.3	6.4	6.7	6.5
Newborn	5.6	5.0	5.6	5.0
Total ALOS	6.2	6.3	6.5	6.3
	July 20xx		**Year-to-Date**	
Patient Days	**Actual**	**Budget**	**Actual**	**Budget**
Medical	4,436	4,915	30,654	30,762
Surgical	4,036	4,215	30,381	30,331
OB/GYN	1,170	1,417	10,051	9,442
Psychiatry	1,223	1,144	8,524	8,242
Physical Medicine & Rehab	1,318	1,310	10,672	9,338
Other Adult	688	699	4,858	4,921
Total Adult	12,871	13,700	95,140	93,036
Newborn	1,633	1,552	12,015	10,963
Total Patient Days	14,504	15,252	107,155	103,999
	July 20xx		**Year-to-Date**	
Other Key Statistics	**Actual**	**Budget**	**Actual**	**Budget**
Average Daily Census	485	482	498	486
Average Beds Available	677	660	677	660
Clinic Visits	21,621	18,975	144,271	136,513
Emergency Visits	3,822	3,688	26,262	25,604
Inpatient Surgery Patients	657	583	4,546	4,093
Outpatient Surgery Patients	603	554	4,457	3,987

GROSS DEATH RATE The **gross death rate** is the proportion of all hospital discharges that resulted in death. It is the basic indicator of mortality in a health care facility. The gross death rate is calculated by dividing the total number of deaths occurring in a given time period by the total number of discharges, including deaths, for the same time period. The formula for calculating the gross death rate is:

$$\frac{\text{Total number of inpatient deaths (including NBs) for a given period} \times 100}{\begin{array}{c}\text{Total number of discharges, including A\&C and NB deaths,}\\ \text{for the same period}\end{array}}$$

For example, Critical Care Hospital experienced 21 deaths (adults, children, and newborns) during the month of May. There were 633 total discharges, including deaths. Therefore, the gross death rate is $(21/633) \times 100 = 3.3\%$.

NET DEATH RATE The **net death rate** is an adjusted death rate. It is calculated in the belief that certain deaths should not "count against the hospital." It is an adjusted rate because patients who die within 48 hours of admission are not included in the net death rate. The reason for excluding them is that 48 hours is not enough time to positively affect patient outcome. In other words, the patient was not admitted to the hospital in a manner timely enough for treatment to have an effect on his or her outcome. However, in view of currently available technology, some people believe that the net death rate is no longer a meaningful indicator. The formula for calculating the net death rate is:

$$\frac{\begin{array}{c}\text{Total number of inpatient deaths (including NBs) minus deaths}\\ < \text{48 hours for a given period} \times 100\end{array}}{\begin{array}{c}\text{Total number of discharges (including A\&C and NB deaths) minus deaths}\\ < \text{48 hours for the same period}\end{array}}$$

Continuing with the preceding example, 3 of the 21 deaths at Critical Care Hospital occurred within 48 hours of admission. Therefore, the net death rate is $[(21 - 3)/(633 - 3)] \times 100 = 2.9\%$.

NEWBORN DEATH RATE Even though newborn deaths are included in the hospital's gross and net death rates, the newborn death rate may be calculated separately. Newborns include only infants born alive in the hospital. The **newborn death rate** is the number of newborns that died in comparison to the total number of newborns discharged, alive and dead. To qualify as a newborn death, the newborn must have been delivered alive. A stillborn infant is not included in either the newborn death rate or the gross or net death rates. The formula for calculating the newborn death rate is:

$$\frac{\text{Total number of NB deaths for a given period} \times 100}{\text{Total number of NB discharges (including deaths) for the same period}}$$

FETAL DEATH RATE Stillborn deaths are called fetal deaths. A **fetal death** is a death that occurs prior to the fetus' complete expulsion or extraction from the mother in a hospital facility, regardless of the length of the pregnancy. Thus, stillborns are neither admitted nor discharged from the hospital. A fetal death occurs when the fetus fails to breathe or show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or movement of the voluntary muscles.

Fetal deaths also are classified into categories based on the fetus' length of gestation or weight:

- **Early fetal death**: Less than 20 weeks gestation, or a weight of 500 grams or less.
- **Intermediate fetal death**: At least 20 but less than 28 weeks gestation, or a weight between 501 and 1000 grams.
- **Late fetal death**: 28 weeks gestation, or a weight of more than 1000 grams.

To calculate the **fetal death rate**, the total number of intermediate and late fetal deaths for the period is divided by the total number of live births and intermediate and late fetal deaths for the same period. The formula for calculating the fetal death rate is:

$$\frac{\text{Total number of intermediate and late fetal deaths for a given period} \times 100}{\begin{array}{c}\text{Total number of live births plus total number of intermediate and} \\ \text{late fetal deaths for the same period}\end{array}}$$

For example, during the month of May, Critical Care Hospital experienced 269 live births and 13 intermediate and late fetal deaths. The fetal death rate is therefore $[13/(269 + 13)] \times 100 = 4.6\%$.

MATERNAL DEATH RATE (HOSPITAL INPATIENT) Hospitals also calculate the maternal death rate. A **maternal death** is the death of any woman from any cause related to, or aggravated by, pregnancy or its management, regardless of the duration or site of the pregnancy. Maternal deaths resulting from accidental or incidental causes are not included in the maternal death rate.

Maternal deaths are classified as direct or indirect. A **direct maternal death** is the death of a woman resulting from obstetrical complications of the pregnancy, labor, or puerperium (the period lasting from birth until six weeks after delivery). Direct maternal deaths are included in the maternal death rate. An **indirect**

maternal death is the death of a woman from a previously existing disease or a disease that developed during pregnancy, labor, or the puerperium that was not due to obstetric causes, although the physiologic effects of pregnancy were partially responsible for the death.

The **maternal death rate** may be an indicator of the availability of prenatal care in a community. The hospital also may use it to help identify conditions that could lead to a maternal death. The formula for calculating the maternal death rate is:

$$\frac{\text{Total number of direct maternal deaths for a given period} \times 100}{\begin{array}{c}\text{Total number of maternal discharges, including deaths,}\\ \text{for the same period}\end{array}}$$

For example, during the month of May, Critical Care Hospital experienced 275 maternal discharges. Two of these patients died. The maternal death rate for May is therefore (2/275) × 100 = 0.73%. Table 1.6 summarizes hospital-based mortality rates.

Table 1.6 **Calculation of Hospital-Based Mortality Rates**

Rate	**Numerator × 100**	**Denominator**
Gross death rate	Total number of inpatient deaths, including NBs, for a given time period	Total number of discharges, including A&C and NB deaths, for the same period
Net death rate (Institutional death rate)	Total number of inpatient deaths, including NBs, minus deaths < 48 hours for a given time period	Total number of discharges, including A&C and NB deaths, minus deaths < 48 hours for the same period
Newborn death rate	Total number of NB deaths for a given period	Total number of NB discharges, including deaths, for the same period
Fetal death rate	Total number of intermediate and late fetal deaths for a given period	Total number of live births plus total number of intermediate and fetal deaths for the same period
Maternal death rate	Total number of direct maternal deaths for a given period	Total number of maternal (obstetric) discharges, including deaths, for the same period

Autopsy Rates

An **autopsy** is an examination of a dead body to determine the cause of death. Autopsies are very useful in the education of medical students and residents. In addition, they can alert family members to conditions or diseases for which they may be at risk.

Autopsies are of two types:

- **Hospital inpatient autopsy**: An examination of the body of a patient who died while being treated in the hospital. The patient's death marks the end of his or her stay in the hospital. A pathologist or some other physician on the medical staff who has been given responsibility performs this type of autopsy in the facility.
- **Hospital autopsy**: An examination of the body of an individual who at some time in the past had been a hospital patient but was not an inpatient at the time of death. A pathologist or some other physician on the medical staff who has been given responsibility performs this type of autopsy.

The following sections describe the different types of autopsy rates.

GROSS AUTOPSY RATE A **gross autopsy rate** is the proportion or percentage of deaths that are followed by the performance of an autopsy. The formula for calculating the gross autopsy rate is:

$$\frac{\text{Total inpatient autopsies for a given period} \times 100}{\text{Total number of inpatient deaths for the same period}}$$

For example, during the month of May, Critical Care Hospital experienced 21 deaths. Autopsies were performed on four of these patients. Therefore, the gross autopsy rate is $(4/21) \times 100 = 19.0\%$.

NET AUTOPSY RATE The bodies of patients who have died are not always available for autopsy. For example, a coroner or medical examiner may claim a body for an autopsy for legal reasons. In these situations, the hospital calculates a **net autopsy rate**. In calculating the net autopsy rate, bodies that have been removed by the coroner or medical examiner are excluded from the denominator. The formula for calculating the net autopsy rate is:

$$\frac{\text{Total number of autopsies on inpatient deaths for a period} \times 100}{\begin{array}{c}\text{Total number of inpatient deaths minus unautopsied coroners' or} \\ \text{medical examiners' cases for the same period}\end{array}}$$

Continuing with the example in the preceding section, the medical examiner claimed three of the four patients scheduled for autopsy. The numerator remains the same because four autopsies were performed. However, because three of the deaths were identified as medical examiner's cases and removed from the hospital, they are subtracted from the total of 21 deaths. Thus, the net autopsy rate is $[4/(21 - 3)] \times 100 = 22.2\%$.

HOSPITAL AUTOPSY RATE A **hospital autopsy rate** is an adjusted rate that includes autopsies on anyone who once may have been a hospital patient. The formula for calculating the hospital autopsy rate is:

$$\frac{\text{Total number of hospital autopsies for a given period} \times 100}{\text{Total number of deaths of hospital patients whose bodies are available for hospital autopsy for the same period}}$$

The hospital autopsy rate can include either or both of the following:

- Inpatients who died in the hospital, except those removed by the coroner or medical examiner. When the hospital pathologist or another designated physician acts as an agent in the performance of an autopsy on an inpatient, the death and the autopsy are included in the percentage.
- Other hospital patients, including ambulatory care patients, hospital home care patients, and former hospital patients who died elsewhere but whose bodies were made available for autopsy by the hospital pathologist or other designated physician. These autopsies and deaths are included when the percentage is computed.

Generally, it is impossible to determine the number of bodies of former hospital patients who may have died during a given time period. In the formula, the phrase "available for hospital autopsy" involves several conditions, including:

- The autopsy must be performed by the hospital pathologist or a designated physician on the body of a patient treated in the hospital at some time.
- The report of the autopsy must be filed in the patient's health record and with the hospital laboratory or pathology department.
- The tissue specimens must be maintained in the hospital laboratory.

Exhibit 1.6 explains how to calculate the hospital autopsy rate.

NEWBORN AUTOPSY RATE Autopsy rates usually include autopsies performed on newborn infants unless a separate rate is requested. The formula for calculating the **newborn autopsy rate** is:

$$\frac{\text{Total number of autopsies on NB deaths for a given period} \times 100}{\text{Total number of NB deaths for the same period}}$$

Exhibit 1.6 **Calculation of Hospital Autopsy Rate**

In June, 33 inpatient deaths occurred. Three of these were medical examiner's cases. Two of the bodies were removed from the hospital and so were not available for hospital autopsy. One of the medical examiner's cases was autopsied by the hospital pathologist. Fourteen other autopsies were performed on hospital inpatients who died during the month of June. In addition, autopsies were performed in the hospital on:

- A child with congenital heart disease who died in the emergency department
- A former hospital inpatient who died in an extended care facility and whose body was brought to the hospital for autopsy
- A former hospital inpatient who died at home and whose body was brought to the hospital for autopsy
- A hospital outpatient who died while receiving chemotherapy for cancer
- A hospital home care patient whose body was brought to the hospital for autopsy
- A former hospital inpatient who died in an emergency vehicle on the way to the hospital

Calculation of total hospital autopsies:

1	autopsy on medical examiner's case
+14	autopsies on hospital inpatients
+ 6	autopsied on hospital patients whose bodies were available for autopsy
21	autopsies performed by the hospital pathologist

Calculation of number of deaths of hospital patients whose bodies were available for autopsy:

33	inpatient deaths
– 2	medical examiner's cases
+ 6	deaths of hospital patients
37	bodies available for autopsy

Calculation of hospital autopsy rate:

$$\frac{\text{Total number of hospital autopsies for period} \times 100}{\text{Total number of deaths of hospital patients with bodies available for hospital autopsy for the period}}$$

$$(21 \times 100)/37 = 56.8\%$$

FETAL AUTOPSY RATE Hospitals also sometimes calculate the **fetal autopsy rate**. Fetal autopsies are performed on stillborn infants who have been classified as either intermediate or late fetal deaths. This is the proportion or percentage of autopsies done on intermediate or late fetal deaths out of the total number of intermediate or late fetal deaths. The formula for calculating the fetal autopsy rate is:

$$\frac{\begin{array}{c}\text{Total number of autopsies on intermediate and late fetal deaths}\\ \text{for a given period} \times 100\end{array}}{\text{Total number of intermediate and late fetal deaths for the same period}}$$

Table 1.7 summarizes the different autopsy rates.

Hospital Infection Rates

The most common morbidity rates calculated for hospitals are related to **hospital-acquired** infections. The hospital must monitor the number of infections that occur in its various patient care units continuously. Infection can adversely affect the course of a patient's treatment and possibly result in death. The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) requires hospi-

Table 1.7 **Calculation of Hospital Autopsy Rates**

Rate	Numerator × 100	Denominator
Gross autopsy rate	Total number of autopsies on inpatient deaths for a given period	Total number of inpatient deaths for the same period
Net autopsy rate	Total number of autopsies on inpatient deaths for a given period	Total number of inpatient deaths minus unautopsied coroner or medical examiner cases for the same period
Hospital autopsy rate	Total number of autopsies on inpatient deaths for a given period	Total number of deaths of hospital patients whose bodies are available for hospital autopsy for the same period
Newborn (NB) autopsy rate	Total number of autopsies on NB deaths for a given period	Total number of NB deaths for the same period
Fetal autopsy rate	Total number of autopsies on intermediate and late fetal deaths for a given period	Total number of intermediate and late fetal deaths for the same period

tals to follow written guidelines for reporting all types of infections. Examples of the different types of infections are respiratory, gastrointestinal, surgical wound, skin, urinary tract, septicemias, and infections related to intravascular catheters.

The hospital infection rate can be calculated for the entire hospital or for a specific unit in the hospital. It also can be calculated for the specific types of infections. Ideally, the hospital should strive for an infection rate of 0.0%. The formula for calculating the nosocomial infection rate is:

$$\frac{\text{Total number of hospital infections for a given period} \times 100}{\text{Total number of discharges (including deaths) for the same period}}$$

For example, Critical Care Hospital discharged 725 patients during the month of June. Thirty-two of these patients had hospital-acquired infections. The infection rate is therefore $(32/725) \times 100 = 4.4\%$.

POSTOPERATIVE INFECTION RATE Hospitals often track their postoperative infection rate. The **postoperative infection rate** is the proportion or percentage of infections in clean surgical cases out of the total number of surgical operations performed. A clean surgical case is one in which no infection existed prior to surgery. The postoperative infection rate may be an indicator of a problem in the hospital environment or of some type of surgical contamination.

The person calculating the postoperative infection rate must know the difference between a surgical procedure and a surgical operation. A **surgical procedure** is any separate, systematic process on or within the body that can be complete in itself. A physician, dentist, or some other licensed practitioner performs a surgical procedure, with or without instruments, for the following reasons:

- To restore disunited or deficient parts
- To remove diseased or injured tissues
- To extract foreign matter
- To assist in obstetrical delivery
- To aid in diagnosis

A **surgical operation** involves one or more surgical procedures that are performed on one patient at one time using one approach to achieve a common purpose. An example of a surgical operation is the resection of a portion of both the intestine and the liver in a cancer patient. This involves two procedures—the removal of a portion of the liver and the removal of a portion of the colon—but it is considered only one operation because there is only one approach or incision. In contrast, an esophagoduodenoscopy (EGD) and a colonoscopy performed at the same time is an example of two procedures with two different approaches. In the former, the approach is the upper gastrointestinal tract; in the latter, the approach is the lower gastrointestinal tract. In this case, the two procedures do not have a common approach or purpose.

The formula for calculating the postoperative infection rate is:

$$\frac{\text{Number of infections in clean surgical cases for a given period} \times 100}{\text{Total number of surgical operations for the same period}}$$

Consultation Rate

A **consultation** occurs when two or more physicians collaborate on a particular patient's diagnosis or treatment. The attending physician requests the consultation and explains his or her reason for doing so. The consultant then examines the patient and the health records and makes recommendations in a written report. The formula for calculating the consultation rate is:

$$\frac{\text{Total number of patients receiving consultations for a given period} \times 100}{\text{Total number of discharges and deaths for the same period}}$$

Case-Mix Statistical Data

Case mix is a method of grouping patients according to a predefined set of characteristics. Diagnosis-related groups (DRGs) are used to determine case mix in hospitals. The case-mix index (CMI) is the average DRG weight for patients discharged from the hospital. The CMI is a measure of the resources used in treating the patients in each hospital or group of hospitals. It is calculated for all patients discharged but may also be calculated and displayed as discharges by payer (Exhibit 1.7), or the discharges of a particular physician (Exhibit 1.8).

Exhibit 1.7 **Case Mix Index by Payor, Critical Care Hospital, 20xx**

Payor	CMI	N
Commercial	1.8830	283
Gov Managed Care	0.9880	470
Managed Care	1.4703	2,336
Medicaid	1.3400	962
Medicare	2.0059	1,776
Other	1.3251	148
Self-Pay	1.3462	528
Total	1.5671	6,503

Exhibit 1.8 **Case Mix Index by Physician, General Medicine, 20xx**

Physician	CMI	N
A	1.0235	71
B	1.6397	71
C	1.1114	86
Total	1.2501	228

Exhibit 1.9 provides an example of a case-mix calculation for 10 DRGs at Critical Care Hospital. The CMI is calculated by multiplying the number of cases for each DRG by the relative weight of the DRG. The results are then summed (1511.2332) and divided by the total number of cases ($n = 484$). By convention, the CMI is calculated to five decimal points and rounded to four.

The CMI can be used to indicate the average reimbursement for the hospital. From Exhibit 1.7, the CMI is 1.5670, indicating that reimbursement is approximately 56.7% greater than the hospital's base rate. If the CMI is greater than 1.0,

Exhibit 1.9 **Calculation Case Mix Index for Ten DRGs, Critical Care Hospital, 20xx**

DRG	N	Relative Weight (RW)	N × RW
24	84	1.4367	120.6828
125	41	1.0947	44.8827
127	61	1.0265	62.6165
174	41	1.0025	41.1025
182	43	0.8223	35.3589
202	45	1.3120	59.0400
320	26	0.8853	23.0178
416	31	1.5918	49.3458
475	61	3.6000	219.6000
483	51	16.7762	855.5862
Total	484		1511.2332
CMI			3.1224

Exhibit 1.10 **Benchmark Data, Critical Care Hospital Versus National Average for DRG 127, Heart Failure and Shock, 20xx**

	ALOS	Mortality Rate	Average Charges
Critical Care Hospital	4.6	0.3%	$12,042
National Average	5.4	5.0%	$ 9,694

the hospital's average payment is greater than its base rate; conversely, if the CMI is less than 1.0, the hospital's average payment is less than its base rate.

The CMI also is used as a proxy measure of the severity of illness of Medicare patients. In Exhibit 1.7, we can see that Medicare patients, as expected, have the highest CMI, 2.0059. Medicare patients are usually sicker than the population under age 65.

Other data analyzed by DRG include LOS and mortality rates. LOS and mortality data are benchmarked against the hospital's peer group and national data. The process of benchmarking is comparing the hospital's performance to an external standard or benchmark. An excellent source of information for benchmarking purposes is the Healthcare Cost Utilization Project database (HCUPnet), which is available online at *http://hcupnet.ahrq.gov*. A comparison of hospital and national data for DRG 127 appears in Exhibit 1.10.

Gross analysis of the data indicates that Critical Care Hospital's ALOS and mortality rate are better than the national average. At the same time, their average charges are somewhat higher than the national average.

Statistical Data Used in Ambulatory Care Facilities

Ambulatory care includes health care services provided to patients who are not hospitalized (that is, who are not considered inpatients or residents and do not stay in the health care facility overnight). Such patients are referred to as **outpatients**. Most ambulatory care services today are provided in freestanding physicians' offices, emergency care centers, and ambulatory diagnostic surgery centers that are not owned or operated by acute care organizations. However, hospitals do provide many hospital-based health care services to outpatients. Hospital outpatients receive services in one or more areas within the hospital, including clinics, same-day surgery departments, diagnostic departments, and emergency departments.

Outpatient statistics include records of the number of patient visits and the types of services provided. Many different terms are used to describe outpatients and ambulatory care services, including:

- **Hospital ambulatory care**: Hospital-directed preventive, therapeutic, and rehabilitative services provided by physicians and their surrogates to patients who are not hospital inpatients or home care patients.
- **Outpatient**: A patient who receives care without being admitted for inpatient or residential care.
- **Hospital outpatient**: A patient who receives services in one or more of the facilities owned and operated by a hospital.
- **Emergency outpatient**: A patient who is admitted to the emergency department or equivalent service of a hospital for diagnosis and treatment of a condition that requires immediate medical services, dental services, or related health care services.
- **Clinic outpatient**: A patient who is admitted to a clinical service of a clinic or hospital for diagnosis or treatment on an ambulatory basis.
- **Referred outpatient**: A patient who is provided special hospital-based diagnostic or therapeutic services on an ambulatory basis. The services are ordered by a referring physician and the responsibility for medical care remains with that physician rather than with the hospital.
- **Outpatient visit**: A provision of services to an outpatient in one or more units or facilities located in or directed by the provider maintaining the outpatient health care services.
- **Encounter**: A contact between a patient and a health care professional who has primary responsibility for assessing and treating a patient at a given contact and for exercising independent medical judgment.
- **Occasion of service**: A specified, identifiable service involved in the care of a patient or consumer that is not an encounter. Occasions of service may be the result of an encounter, for example, to fulfill physicians' orders for tests or procedures ordered as part of an encounter.
- **Ambulatory surgery centers**: Hospital-based or freestanding surgical facilities that perform elective surgical procedures on patients who are classified as outpatients and who are typically released from the facility on the same day the surgery was performed. Also referred to as short-stay surgery, one-day surgery, same-day surgery, or come-and-go surgery services.

Conclusion

Rates, ratios, and proportions are commonly used to describe hospital populations. Hospital-based rates are used for a variety of purposes. First, they describe the general characteristics of the patients treated at the facility. Hospital administrators use the data to monitor the volume of patients treated monthly, weekly, or within some other specified time frame. The statistics give health care decision-makers the information they need to plan facilities and to monitor inpatient and outpatient revenue streams. With the knowledge of how clinical data are collected and analyzed, the HIM professional can become an invaluable member of the health care team.

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Appendix 1-A

Exercises for Solving Problems

Knowledge Questions

1. Define the key terms listed at the beginning of this chapter.
2. Describe the differences and similarities between rates, ratios, and proportions.

Multiple Choice

1. What term would be applied to a comparison of the number of female patients to the number of male patients who were discharged from DRG YYY?
   a. Ratio
   b. Percentage
   c. Proportion
   d. Rate
2. There are 6 males in a class of 20 students. What is the best term to describe the comparison?
   a. Ratio
   b. Percentage
   c. Proportion
   d. Rate
3. Which of the following descriptive statistics is calculated by applying this equation: $\frac{x}{y} \times 10^n$?
   a. Ratio
   b. Proportion
   c. Rate
   d. All of the above
4. The number of inpatients present at the census-taking time each day plus the number of inpatients who were both admitted and discharged after the census-taking time the previous day is the:
   a. Inpatient census
   b. Daily inpatient census
   c. Inpatient service day
   d. Inpatient bed occupancy ratio
5. Which of the following is not a type of inpatient hospital discharge?
   a. Death
   b. Intra-hospital transfer from MICU to medicine service
   c. Discharge against medical advice
   d. Discharge transfer to a long-term care facility
6. Which of the following is a unit of measure equal to the services received by one inpatient during a 24-hour period?
   a. Inpatient census
   b. Inpatient service day
   c. Daily inpatient census
   d. Average daily inpatient census
7. What does the hospital gross death rate include?
   a. Deaths of hospital inpatients only
   b. All inpatient deaths and stillborn infants

  c. Deaths of all inpatients and deaths occurring in the emergency department
  d. Deaths of all inpatients, DOAs, and deaths occurring in the emergency department
8. When computing the C-section rate, the denominator is the total number of ________.
  a. Births
  b. Deliveries
  c. Obstetrical discharges
  d. Newborns
9. At midnight, December 1, the inpatient census at Watson Hospital was 378. On December 2, 18 patients were discharged alive, 1 patient died, 22 patients were admitted, and 2 patients were admitted and discharged the same day. How many inpatient service days were provided on December 2?
  a. 375
  b. 377
  c. 381
  d. 383
10. At Critical Care Hospital, 238 operations were performed in January. Fifteen of these patients developed infections within 10 days of surgery. During January, 432 patients were admitted and 470 patients were discharged. What is the postoperative infection rate for the month?
  a. 0.06%
  b. 3.19%
  c. 3.47%
  d. 6.30%
11. On December 1, Critical Care Hospital had a bed capacity of 520. On December 15, 45 beds were closed. During the month of December, there were 13,050 inpatient service days, 15,450 days rendered to discharged patients, and 945 discharges and deaths. What is the inpatient bed occupancy rate for December?
  a. 80.9%
  b. 84.5%
  c. 84.7%
  d. 85.0%
12. In August, Critical Care Hospital discharged 1575 patients and admitted 1650 patients. The hospital provided 10,215 days of service to inpatients and 9763 days of service to discharged patients. What is the average daily census at Critical Care Hospital for the month of August?
  a. 315
  b. 323
  c. 330
  d. 334
13. Using the information from Question 10, what is the average length of stay at Critical Care Hospital for the month of August?
  a. 5.9 days
  b. 6.2 days
  c. 6.5 days
  d. 6.8 days

Problems

1. For the month of August, Critical Care Hospital (a 425-bed hospital) provided 12,220 days of service to hospital inpatients. Calculate the average daily census and the inpatient bed occupancy rate for the month.
2. For the month of March, Critical Care Hospital experienced 19

deaths, 9 of which occurred within 48 hours of admission. It also experienced 522 live discharges. Calculate the gross death rate and the net death rate for the month.

3. For the month of March, Critical Care Hospital experienced 150 deliveries, 7 of which were C-sections. Calculate the C-section rate.
4. Beginning January 1, 2005, Critical Care Hospital had 175 inpatient beds. On June 15, the bed count was increased to 200. There were 67,106 inpatient service days provided to hospital inpatients, and 68,012 days of service provided to discharged patients. The hospital experienced 9601 admissions and 9488 discharges. Calculate the average daily census for the year. Also, calculate the ALOS and the bed occupancy rate for the year.
5. During 2005, Critical Care Hospital experienced 31 late and intermediate fetal deaths and 1000 live births. Calculate the fetal death rate.
6. Twenty patients were discharged from the MICU during the week of January 1. Five of these patients had a hospital-acquired infection. What is the acquired infection rate for the MICU for the week of January 1?
7. During the month of April, 822 patients were discharged from Critical Care Hospital. A total of 122 patients had consults from specialty physicians. What is the consultation rate for the month of April?
8. Dr. Green discharged 21 patients from General Medicine Service during the month of August. Table 1-A.1 presents the number of patients discharged by DRG. Calculate the CMI for Dr. Green.
9. Review the hypothetical data on deaths in the MICU in Table 1-A.2 and answer the questions below:
   a. What is the ratio of male deaths to female deaths?
   b. What proportion of the patients who died were admitted from the Emergency Department? What proportion were transfers from other hospitals?
   c. The total number of patients discharged from DRG 475 was 61. What is the gross death rate for DRG 475?
   d. The total number of patients discharged from DRG 483 was 51. What is the gross death rate for DRG 483?

Table 1-A.1 **Dr. Green's Discharges by DRG, General Medicine Service, 20xx**

DRG	DRG Title	RW	N	N*DRG
079	Respiratory Infections & Inflammations Age > 17 w/CC	1.5974	2	
085	Pleural Effusion w/CC	1.1927	1	
087	Pulmonary Edema	1.3430	3	
089	Simple Pneumonia & Pleurisy Age > 17 w/CC	1.0463	1	
121	Circulatory Disorders w/AMI & Major Complications, Discharged Alive	1.6169	1	
130	Peripheral Vascular Disorders w/CC	.9505	1	
143	Chest Pain	.5480	1	
174	GI Hemorrhage w/CC	1.0025	2	
182	Esophagitis, Gastroenteritis & Miscellaneous Digestive Disorders Age > 17 w/CC	.8223	2	
240	Connective Tissue Disorder w/CC	1.3153	1	
243	Medical Back Problems	.7525	1	
316	Renal Failure	1.2987	1	
395	Red Blood Cell Disorders Age > 17	.8307	1	
416	Septicemia Age > 17	1.5918	1	
450	Poisoning & Toxic Effects of Drugs Age > 17 w/o CC	.4246	1	
475	Respiratory System Diagnosis w/Ventilator Support	3.6000	1	

Table 1-A.2 **Critical Care Hospital, Deaths in the MICU by DRG**

DRG	DRG Title	Adm Source	Gender	LOS
001	Craniotomy Age >17 W Cc	SNF	Male	2
014	Intracranial Hemorrhage & Stroke W Infarct	Other	Male	3
014	Intracranial Hemorrhage & Stroke W Infarct	Emerdept	Female	3
020	Nervous System Infection Except Viral Meningitis	Other	Female	15
075	Major Chest Procedures	Hospital	Male	6
105	Cardiac Valve & Oth Major Cardiothoracic Proc W/O Card Cath	Hospital	Female	23
123	Circulatory Disorders W Ami, Expired	Hospital	Male	7
123	Circulatory Disorders W Ami, Expired	Other	Male	1
123	Circulatory Disorders W Ami, Expired	Other	Male	4
123	Circulatory Disorders W Ami, Expired	Emerdept	Male	5
172	Digestive Malignancy W Cc	Emerdept	Male	1
172	Digestive Malignancy W Cc	Physician	Male	1

DRG	DRG Title	Adm Source	Gender	LOS
188	Other Digestive System Diagnoses Age >17 W Cc	SNF	Female	1
191	Pancreas, Liver & Shunt Procedures W Cc	Hospital	Male	9
202	Cirrhosis & Alcoholic Hepatitis	Physician	Female	15
202	Cirrhosis & Alcoholic Hepatitis	Other	Male	1
202	Cirrhosis & Alcoholic Hepatitis	Emerdept	Male	24
205	Disorders Of Liver Except Malig,Cirr,Alc Hepa W Cc	Physician	Male	20
331	Other Kidney & Urinary Tract Diagnoses Age >17 W Cc	Physician	Male	44
357	Uterine & Adnexa Proc For Ovarian Or Adnexal Malignancy	Physician	Female	24
416	Septicemia Age >17	Hospital	Female	4
416	Septicemia Age >17	Other	Male	2
449	Poisoning & Toxic Effects Of Drugs Age >17 W Cc	Other	Male	1
473	Acute Leukemia W/O Major O.R. Procedure Age >17	Physician	Male	5
475	Respiratory System Diagnosis With Ventilator Support	Physician	Male	25
475	Respiratory System Diagnosis With Ventilator Support	Physician	Female	1
475	Respiratory System Diagnosis With Ventilator Support	Hospital	Female	1
475	Respiratory System Diagnosis With Ventilator Support	Other	Female	1
475	Respiratory System Diagnosis With Ventilator Support	Hospital	Female	21
475	Respiratory System Diagnosis With Ventilator Support	Other	Male	5
475	Respiratory System Diagnosis With Ventilator Support	Hospital	Female	8
475	Respiratory System Diagnosis With Ventilator Support	Emerdept	Female	10
475	Respiratory System Diagnosis With Ventilator Support	Clinic	Male	13
475	Respiratory System Diagnosis With Ventilator Support	SNF	Female	1
475	Respiratory System Diagnosis With Ventilator Support	Emerdept	Male	5
475	Respiratory System Diagnosis With Ventilator Support	Clinic	Female	4
475	Respiratory System Diagnosis With Ventilator Support	Emerdept	Male	3
475	Respiratory System Diagnosis With Ventilator Support	Other	Female	12
475	Respiratory System Diagnosis With Ventilator Support	Other	Female	5
483	Trac W Mech Vent 96+Hrs Or Pdx Except Face, Mouth & Neck Dx	Hospital	Female	30
483	Trac W Mech Vent 96+Hrs Or Pdx Except Face, Mouth & Neck Dx	Hospital	Male	19
483	Trac W Mech Vent 96+Hrs Or Pdx Except Face, Mouth & Neck Dx	Hospital	Male	22
483	Trac W Mech Vent 96+Hrs Or Pdx Except Face, Mouth & Neck Dx	Physician	Female	46
483	Trac W Mech Vent 96+Hrs Or Pdx Except Face, Mouth & Neck Dx	Other	Female	28