

State of Illinois
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MRSA Trends in Illinois Hospitals

2002-2007

MRSA Trends in Illinois Hospitals: 2002-2007

Introduction

Increasing reports and growing public concern about Methicillin-resistant *Staphylococcus aureus* (MRSA) have prompted the Illinois Department of Public Health (IDPH) to publish the following report describing the burden of MRSA in Illinois hospitals. This report provides information about patients with MRSA infections in Illinois hospitals and makes an overall national comparison.

Due to the nature of the data available to the Department at this time, the report is limited to describing MRSA in hospital discharges. This does not provide the number of people hospitalized already infected with MRSA, nor does it describe the scope of MRSA in the community. However, national data samples estimate that only about 14percent of invasive MRSA infections occur in the community, with the rest occurring in hospitals and health care facilities such as nursing homes and dialysis centers¹.

MRSA occurs most frequently among patients who undergo invasive medical procedures or have weakened immune systems. MRSA in health care settings can cause serious and potentially life threatening infections, such as blood stream infections, surgical site infections, and pneumonia.

MRSA Transmission in Healthcare Settings

Patients who already have a MRSA infection or who carry the bacteria on their bodies but do not have symptoms are the most common sources of transmission. The main mode of MRSA transmission is from patient to patient through human hands, especially health care worker hands. Frequent hand washing with soap and water or an alcohol-based hand sanitizer is the best way to prevent the spread of MRSA, both in the hospital and in the community (U.S. Centers for Disease Control and Prevention, 2007).

Prevention of MRSA

Although MRSA has become more prevalent in health care settings, it is preventable. The first step to preventing MRSA is the prevention of health care-associated infections in general. Infection control guidelines produced by the U.S. Centers for Disease Control and Prevention (CDC) are central to the prevention and control of health care infections, and ultimately MRSA, in health care settings. To learn more about infection control guidelines, visit the CDC's Web site at <http://www.cdc.gov/ncidod/dhqp>. If you or a family member is anticipating a hospital stay, you should ask to see your hospital's infection control policies.

MRSA Hospitalizations in Illinois

This report presents information from the Illinois Hospital Discharge Dataset for 2002-2007, with special emphasis on the last three years. The Hospital Discharge Dataset identifies hospitalized patients with MRSA infections that are acquired in the community, as well as infections acquired during hospitalization. Therefore, the primary utility of the dataset is to follow overall trends in the burden of MRSA in Illinois hospitals. The report also will describe what types of patients are most likely to be affected by MRSA infections.

Other data sources, including the Hospital Report Card Act and the Illinois Department of Public Health surveillance activities, will provide additional insights into the extent to which MRSA infections occur as a direct result of hospitalization, as well as the epidemiology of community-associated MRSA infection.

¹ Klevens RM, Morrison MA, Nadle J et. al. Journal of American Medical Association 2007; 298 (15): 1803-1804.

Figure 1. Overall number of hospital discharges with MRSA diagnosis, 2002 - 2007

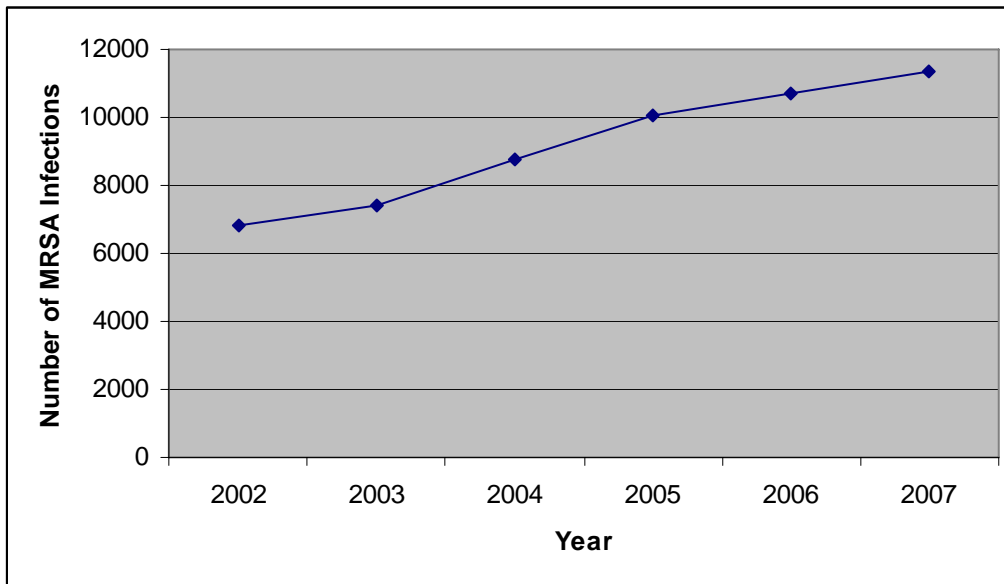


Figure 1 shows the total number of MRSA infections from 2002 through 2007. In 2002, there were 6,841 cases of MRSA diagnosed by Illinois hospitals. This number has increased steadily each year, with 11,372 cases diagnosed in 2007, a 66.2 percent increase in total cases over the six-year period.

Figure 2. Number of MRSA infections per 1,000 hospital discharges, 2002-2007

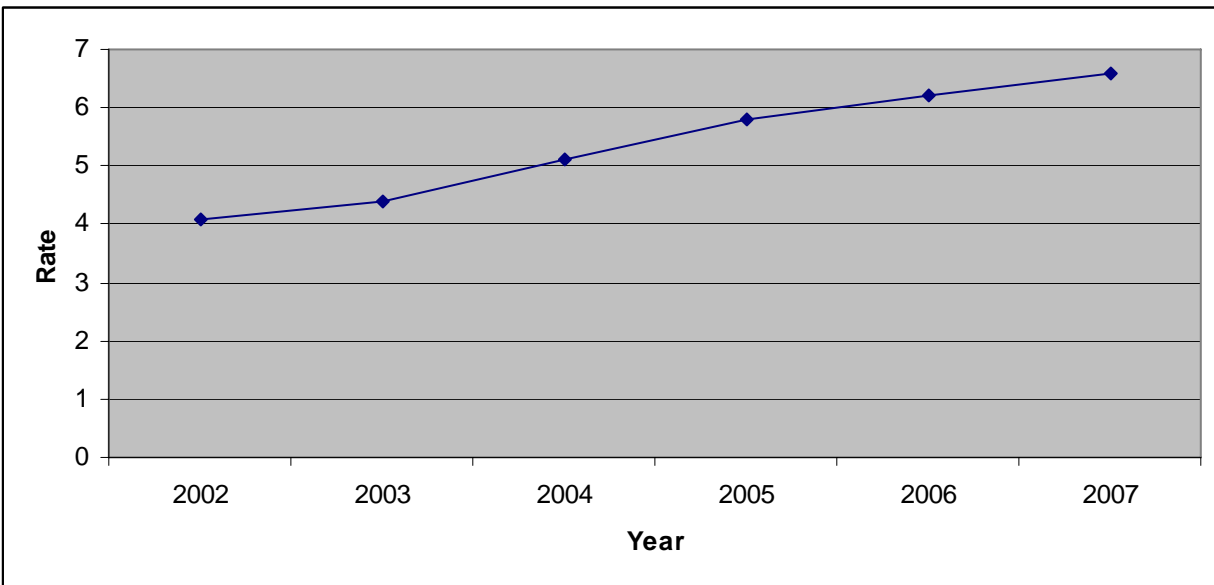


Figure 2 shows MRSA infections per 1,000 discharges in Illinois for the years 2002-2007. Overall, MRSA rates among patients at Illinois hospitals during this time period increased from 4.1/1,000 discharges to 6.6/1000 discharges, a trend paralleling numerous national reports. In 2004, the last year for which national data have been published, the MRSA infection rate in Illinois hospitals (5.1 cases per 1,000 discharges) was lower than the national rate (7.5 infections per 1,000 discharges).² During 2007, the last year for which data are available for Illinois, there were 11,372 MRSA infections among 1,713,279 discharges: 0.7 percent of all hospital discharges were diagnosed with MRSA infection.

² Elixhauser, A (AHRQ) and Steiner, C. (AHRQ). Infections with Methicillin-Resistant Staphylococcus Aureus (MRSA) in U.S. Hospitals, 1993-2005. HCUP Statistical Brief #35. July 2007. Agency for Healthcare Research and Quality, Rockville, MD. <http://www.hcup-us.ahrq.gov/reports/statbriefs/sb35.pdf>.

Table 1. Age and sex distribution of MRSA infections among hospitalized patients, 2002-2007

Age range	Year					
	2002	2003	2004	2005	2006	2007
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
0-4	120 (1.8)	196 (2.7)	331 (3.8)	412 (4.1)	555 (5.2)	729 (6.4)
5-17	90 (1.3)	146 (2.0)	206 (2.3)	346 (3.4)	400 (3.7)	475 (4.2)
18-34	459 (6.7)	602 (8.2)	866 (9.9)	1,238 (12.3)	1,408 (13.1)	1,671 (14.7)
35-49	975 (14.2)	1,192 (16.1)	1,526 (17.4)	1,967 (19.5)	2,170 (20.3)	2,244 (19.7)
50-64	1,290 (18.9)	1,394 (18.9)	1,735 (19.7)	1,967 (19.5)	2,252 (21.0)	2,277 (20.0)
65 and older	3,907 (57.1)	3,854 (52.2)	4,121(46.9)	4,148 (41.2)	3,929 (36.7)	3,976 (35.0)
Sex						
Female	3,414 (49.9)	3,737 (50.6)	4,277 (48.7)	4,861 (48.2)	5,086 (47.5)	5,584 (49.1)
Male	3,427 (50.1)	3,647 (49.4)	4,508 (51.3)	5,215 (51.8)	5,628 (52.5)	5,788 (50.9)

Table 1 shows the number (N) of MRSA infections stratified by age group for the years 2002-2007. The number of MRSA infections increased each year among all age groups during this time period, with the exception of the 65 and older group, for whom numbers fluctuated. School- aged children (5-17) had the lowest burden of MRSA infections among hospitalized patients, and the greatest burden of MRSA infections occurred among older individuals, especially those older than 65. During 2007, the latest year for which discharge data are available, more than half of all MRSA infections occurred among individuals aged 50 and older, with the majority of these infections (63.6%) occurring in patients aged 65 years or older.

The sex distribution of MRSA cases remained equally distributed during this period (2002-2007), with females accounting for 47 percent to 50 percent of MRSA discharges during this time period. A graphic summary of information regarding the age and sex distribution of patients hospitalized with MRSA during 2007 is presented in Figures 3 and 4.

Figure 3. Age distribution for all hospitalized patients with MRSA infections, 2007

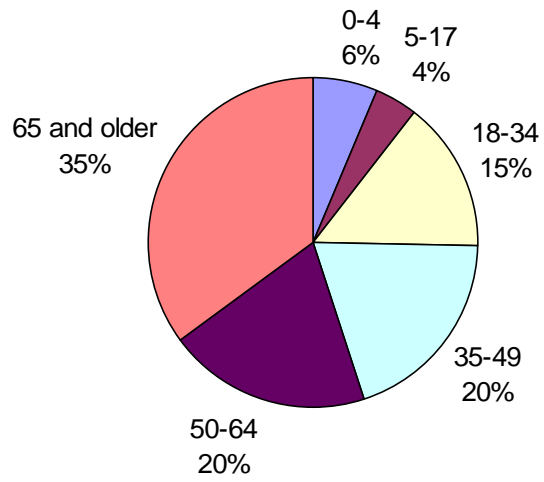


Figure 4. Sex distribution for all hospitalized patients with MRSA infections, 2007

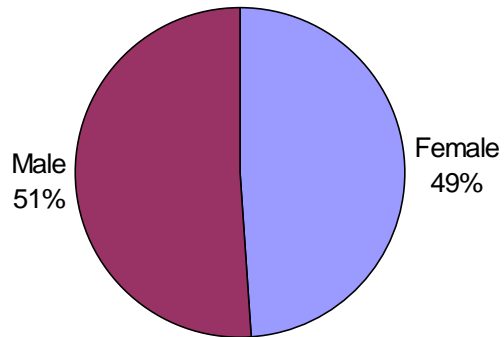
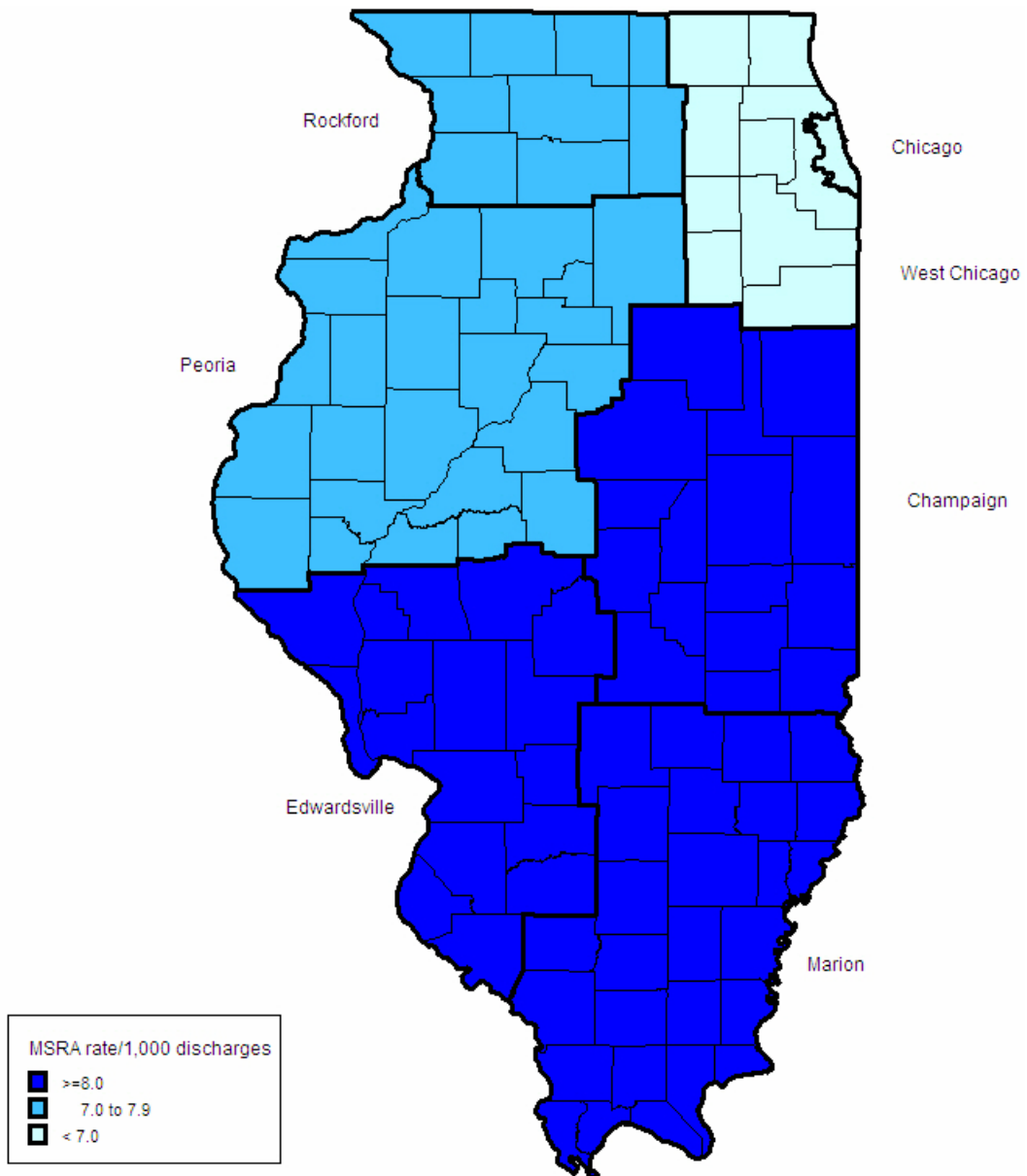


Figure 5. Rate of hospitalization with MRSA diagnosis per 1,000 discharges by region, 2007



Source: Illinois Department of Public Health, Hospital Discharge Data

Region	MRSA Infections	MRSA Rate per 1,000 Discharges
Chicago	2,510	5.6
West Chicago	4,517	6.0
Champaign	810	8.4
Marion	659	9.5
Edwardsville	1,233	9.0
Peoria	1,073	7.9
Rockford	570	7.8
Statewide	11,372	6.6

As displayed in Figure 5, rates of MRSA infection range from 5.6 to 9.5 infections per 1,000 discharges among hospitalized patients in different regions of Illinois during 2007, with the lowest rates in the West Chicago and Chicago regions. In contrast, the total yearly burden of MRSA infection is higher in West Chicago and Chicago, based on a higher volume of patient discharges in these regions compared to other areas of the state.

Table 2. Total number and rate (number per 1,000 discharges) of MRSA infections by type of hospital, 2005-2007

Hospital Type	Year					
	2005		2006		2007	
	Cases	Rate	Cases	Rate	Cases	Rate
Teaching Status						
Teaching	2,368	5.6	2,377	5.6	2,656	6.2
Non-teaching	7,710	5.9	8,377	6.4	8,716	6.8
Location						
Largest urban areas	6,841	5.4	7,305	5.7	7,583	6.0
Other urban areas	1,925	6.8	1,971	7.0	2,269	7.9
Rural	1,312	7.7	1,438	8.6	1,520	9.2
Bed size						
<100 beds	912	8.4	1,040	9.8	1,108	10.7
100-300 beds	3,991	6.1	4,249	6.5	4,213	6.8
>300 beds	5,175	5.4	5,425	5.6	6,051	6.1

Table 2 shows that, based on discharge coding, MRSA rates were lowest in teaching hospitals, large urban hospitals, and hospitals with more than 300 beds. Throughout this time period, the largest disparity in MRSA rates was between large (>300 bed) and small (<100 bed) hospitals, with lower rates occurring in large hospitals. However, the largest increase in the overall burden of MRSA infections (1,006 cases) was observed in non-teaching hospitals.

Table 3. Total number and rate (number per 1,000 discharges) of MRSA bloodstream infections and MRSA pneumonia, 2005-2007

Year	Bloodstream (Sepsis)		Pneumonia		Other Sites		Total	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
2005	892	0.5	1,039	0.6	8,137	4.7	10,078	5.8
2006	762	0.4	941	0.5	9,011	5.2	10,714	6.2
2007	817	0.5	757	0.4	9,798	5.7	11,372	6.6

Table 3 shows the number of MRSA infections involving the bloodstream, lung (pneumonia), and all other sites combined during the period 2005-2007. Rates of MRSA bloodstream and pneumonia infections were relatively stable during this time period, but there was an increase in the rate of MRSA infections involving other sites. For individuals with MRSA infections not designated as causing pneumonia or bloodstream infection, additional analysis (as described in Methods, Appendix 2) indicates

that the most common associated diagnoses were skin and soft tissue infections. The number of skin and soft tissue infections associated with MRSA diagnosis more than doubled from 2004 to 2006, increasing from 1,585 to 3,191.

Table 4. MRSA infection among patients with surgical procedures, 2005-2007

Type of Inpatient Stay (Admission)	Year		
	2005	2006	2007
All admissions			
Total number of inpatient stays	1,725,033	1,724,612	1,713,279
Number of MRSA infections	10,078	10,714	11,372
Rate per 1,000 stays	5.8	6.2	6.6
Stays not involving a surgical procedure			
Total	727,128	720,241	714,556
Number of MRSA infections	3,522	3,800	4,097
Rate per 1,000 stays	4.8	5.3	5.7
Stays involving a surgical procedure			
Total	997,905	1,004,371	998,723
Number of MRSA infections	6,556	6,914	7,275
Rate per 1,000 stays	6.6	6.9	7.3
Stays involving invasive cardiovascular surgery			
Total	201,801	203,324	201,386
Number of MRSA infections	2,625	2,475	2,468
Rate per 1,000 stays	13.0	12.2	12.3
Stays involving invasive neurosurgery			
Total	52,047	52,338	53,109
Number of MRSA infections	163	184	175
Rate per 1,000 stays	3.1	3.5	3.3
Stays involving invasive orthopedic surgery			
Total	87,705	89,229	92,591
Number of MRSA infections	428	462	478
Rate per 1,000 stays	4.9	5.2	5.2

Table 4 shows MRSA infection rates among all patients having any surgical procedure, as well as those having major orthopedic, cardiovascular, and neurosurgical procedures during 2005-2007. For 2007, the last year for which data are available, 0.7 percent (7,275) of 998,723 discharges involving a surgical procedure had MRSA infection. Among all patients having a major cardiovascular, orthopedic or neurosurgical procedure, MRSA infections were most prevalent among cardiovascular surgery patients.

Table 5. MRSA infection among patients with chronic medical conditions, including patients requiring hemodialysis, 2005-2007

Type of Diagnosis	Year		
	2005	2006	2007
All admissions			
Total number of inpatient stays	1,725,033	1,724,612	1,713,279
Number of MRSA infections	10,078	10,714	11,372
Rate per 1,000 stays	5.8	6.2	6.6
Hemodialysis performed			
Total	33,138	34,264	34,946
Number of MRSA infections	404	335	293
Rate per 1,000 stays	12.2	9.8	8.4
Stays with asthma diagnosis			
Total	111,092	114,601	113,656
Number of MRSA infections	602	699	814
Rate per 1,000 stays	5.4	6.1	7.2
Stays with smoking-related diagnoses			
Total	174,320	174,523	171,766
Number of MRSA infections	1,514	1,401	1,344
Rate per 1,000 stays	8.7	8.0	7.8
Stays with diabetes diagnosis			
Total	277,147	278,137	280,331
Number of MRSA infections	2,287	2,321	2,295
Rate per 1,000 stays	8.3	8.3	8.2

As shown in Table 5, MRSA rates for individuals with diabetes, chronic lung disease due to smoking, and renal disease requiring hemodialysis were higher throughout 2005-2007 than the overall rate of infection for all hospitalized patients. The MRSA rate for hemodialysis patients was nearly twice the average rate for all patients during 2005. In 2007, the MRSA rate for hemodialysis patients remained high, but declined more than 30 percent from the 2005 rate, to 8.4 cases per 1,000 discharges.

Table 6. Comparison of individuals with and without MRSA infection, 2005

	MRSA		No MRSA	
	Total (%)		Total (%)	
Number of inpatient stays	10,078	(0.6)*	1,714,955	(99.4)*
Hospital mortality	270	(2.7)	32,577	(1.9)
Distribution by payer				
Medicaid	1,742	(17.3)	345,344	(20.1)
Privately insured	2,620	(26.0)	620,746	(36.2)
Uninsured	902	(9.0)	115,774	(6.8)
Medicare	4,814	(47.7)	633,091	(36.9)
Payer totals	10,078	(100)	1,714,955	(100)
Average total hospital charges in \$	26,407.52		21,093.43	
Length of stay, mean days	7.4		4.6	

Table 7. Comparison of individuals with and without MRSA infection, 2006

	MRSA		No MRSA	
	Number (%)		Number (%)	
Number of inpatient stays	10,714	(0.6)*	1,713,898	(99.4)*
Hospital mortality	218	(2.0)	31,978	(1.9)
Distribution by payer				
Medicaid	2,039	(19.0)	357,791	(20.9)
Privately insured	2,985	(27.9)	613,738	(35.8)
Uninsured	1,129	(10.5)	117,360	(6.8)
Medicare	4,561	(42.6)	625,009	(36.5)
Payer totals	10,714	(100)	1,713,898	(100)
Average total hospital charges in \$	26,237.00		22,801.04	
Length of stay, mean days	6.8		4.5	

* In Tables 6-8, the percentages of patient stays is the ratio of MRSA cases to all stays for the year and non-MRSA cases to all stays for the same year. The percentages shown for hospital mortality are the percentage of deaths in MRSA cases and deaths in non-MRSA cases. Distributions by payer and admission source are calculated as the percentage of each category of the total MRSA and non-MRSA cases for the year.

Table 8. Comparison of individuals with and without MRSA infection, 2007

	MRSA infection	No MRSA infection
	N (%)	N (%)
Number of inpatient stays	11,372 (0.7)*	1,701,907 (99.3)*
Hospital mortality	213 (1.9)	30,938 (1.8)
Distribution by payer		
Medicaid	2,285 (20.0)	350,654 (20.6)
Privately insured	3,387 (29.8)	620,594 (36.5)
Uninsured	1,156 (10.2)	121,448 (7.1)
Medicare	4,544 (40.0)	609,211 (35.8)
Payer totals	11,372 (100)	1,701,907 (100)
Average total hospital charges, US\$	26,419.12	24,696.71
Length of stay, mean days	6.3	4.5

Tables 6-8 compare patients with MRSA infections to those without MRSA infections during the period 2005-2007. Mortality of patients with MRSA was higher than mortality for patients without MRSA during 2005. For 2006 and 2007, the death rate among patients with MRSA diagnoses declined to approximately the same rate as for non-MRSA patients.

These tables also show that the number of individuals hospitalized with MRSA increased for all payer groups except for Medicare patients. Parallel to the age distribution described above, patients covered by Medicare accounted for the greatest proportion of MRSA diagnoses throughout this time period.

Consistent with the acuity of many MRSA infections, MRSA hospitalizations were more likely to be admitted from the emergency department, to be transferred from another hospital, or transferred from long-term care settings, compared to non-MRSA hospitalizations.

Hospitalizations involving a MRSA infection cost more than non-MRSA stays. The average length of stay for a patient with MRSA infection was 1.8 to 2.8 days longer than non-MRSA stays, but this gap narrowed over time. The average length of stay for MRSA infections declined from 7.4 to 6.3 days, while the length of stay for non-MRSA hospitalizations remained essentially unchanged.

Discussion

The magnitude and trend of MRSA infections among hospitalized patients in Illinois had not been reported before 2008. Consistent with national data, analysis of hospital discharge data indicates that the burden of MRSA infections in Illinois hospitals has increased significantly from 2002 through 2007.

This increase in MRSA is observed in all areas of Illinois, regardless of regional population density or hospital bed size or teaching status. These findings are consistent with numerous published reports from individual hospitals, as well as a recent national survey³ that identified high prevalence of MRSA in hospitals of all types throughout the United States.

Although the discharge dataset does not distinguish between community and hospital acquired infections, health care-associated MRSA infections are likely to account for the majority of MRSA infections among hospitalized patients in Illinois. Recent estimates indicate that 30 percent of hospitalized patients with MRSA have community-associated infections⁴. Applying this estimate to Illinois data, approximately 3,400 MRSA infections in patients being discharged from hospitals were attributable to CA-MRSA in 2006.

Skin and soft tissue infections associated with MRSA increased dramatically during 2004-2006; this is most likely due to a number of factors, including increases in CA-MRSA, as well as shifts in the bacterial causes of surgical site infections. Of note, the majority of MRSA infections are not due to bloodstream infections or pneumonia. Widespread use of evidence-based interventions aimed at limiting bloodstream and lung infections associated with catheters and ventilators may have limited the number of such infections at these sites.

MRSA infections were associated with age. This is consistent with previously published data showing an association between age and the incidence of serious *Staphylococcus aureus* infection as well as the rate of methicillin resistance. Individuals with diagnoses related to smoking, diabetes and hemodialysis also had higher MRSA rates than the general population. Hemodialysis patients are especially vulnerable to infections, including MRSA, as they require vascular access for prolonged periods.

Several aspects of these data warrant cautious optimism. During the last year for which national comparative data are available, MRSA rates among hospitalized patients in Illinois (5.1/1000 discharges) are lower than the national average (7.5/1000 discharges). This is consistent with the latest national data (2004) that indicates that the Midwest has lower MRSA rates than most other parts of the country. In 2004, the mortality rate for MRSA (percent of patients with MRSA infections that die prior to hospital discharge) was reported to be 4.7 percent for the nation as a whole; the MRSA mortality rate was lower in Illinois (3.4%) during 2004. Mortality associated with MRSA infections in Illinois declined to 1.9 percent in 2007, and was nearly identical to the mortality rate for patients without MRSA infections. Despite the overall increase in MRSA, MRSA rates were lower in 2007 than in 2005 for cardiovascular surgery and hemodialysis patients. In addition, the rate of increase of MRSA infections slowed during 2005-2007 compared with 2003-2005, which may indicate a coming change in MRSA trends.

This report is subject to several limitations. As it is restricted to MRSA associated with hospitalizations, it does not provide insights into MRSA managed in outpatient settings. In addition, the Hospital Discharge Dataset does not currently include information about race/ethnicity of hospitalized patients (this information will be included in discharge data beginning in 2008.)

³ Jarvis WR, Schlosser J, Chinn R et al. American Journal of Infection Control 2007; 35(10): 631-637.

⁴ Klevens, 2007.

The accuracy of ICD-9 coding for MRSA has not been established definitively. A study aiming to address this issue was conducted in Illinois in 2008, the results of which will be compiled and published in the coming months. Previous analyses have suggested considerable variation in the accuracy of ICD-9 codes for tracking infections, compared to the gold standard – infection control practitioner review of medical record and laboratory data.

Based on the limited information available from the dataset, reasons for differences in observed rates (e.g. between urban and rural hospitals) cannot be determined. Factors that may affect variations in rates include different coding practices, differences in CA-MRSA rates, differences in how MRSA infections are managed (inpatient vs. outpatient), and differences in infection control practices that limit MRSA transmission. In addition, differences in “capture” of MRSA codes at hospitals may vary (only nine of 25 ICD-9 codes are captured in the Hospital Discharge Dataset); therefore MRSA diagnoses may not be captured as frequently for severely ill patients with multiple diagnoses. Despite these limitations, consistency with national findings implies that trend data are robust.

In summary, this report indicates that the burden of MRSA in Illinois hospitals is substantial and that the Hospital Discharge Dataset can be a useful tool to follow important trends. These findings also highlight the importance of devoting resources to infection control and prevention activities aimed at decreasing transmission of MRSA in hospitals. Additional insights into the epidemiology of CA-MRSA as well as individual hospital performance in limiting MRSA transmission will become available from other data sources, including Communicable Disease surveillance reports and Hospital Report Card Act reporting.

Appendix 1

Illinois Hospital Discharge Dataset

The requirement for the submission of discharge data by Illinois hospitals to the state was enacted in 1984. This law, the Health Finance Reform Act, created a state agency called the Illinois Health Care Cost Containment Council that began receiving data in late 1986. This activity continues to this time, now managed by the Illinois Department of Public Health. This dataset includes diagnosis and procedure codes, payer (or self-pay), priority of the admission, point of entry, disposition of the patient, dates of service, charges, and birth date, sex and ZIP code of the patient. These data are treated as confidential information and handled according to Health Insurance Portability and Accountability Act guidelines. These data were initially used to create hospital-specific charge comparison reports for release to the public. Over time, other studies and reports were created on health care issues such as delivery, asthma, heart disease, pneumonia, and coronary bypass.

The collected data are based on the uniform bill (in its several iterations) and are health care billing data, not clinical data. For this reason the data are limited to the services billed by the submitting hospital, which may not include all diagnostic activities such as laboratory and radiologic studies. However, as diagnosis and procedure codes are used intensively in determining payment, this information is generally coded carefully by hospitals. It should be noted that evidence for validity of administrative coding with regards to infections is not as good as for some other conditions. It should also be noted that charges submitted are defined as the normal and usual charge master amount. This does not reflect any reduced payments negotiated with patients or payers and does not reflect the actual cost of health care provided.

Appendix 2

MRSA Study Methods

ICD-9 diagnosis code V09.0 was used to select cases for this study. As MRSA can be used only as a secondary diagnosis, all cases for the time period having V09.0 as a secondary diagnosis were included. Within this population of cases, varieties of aggregations are presented for discharges occurring in calendar years 2002 through 2006. It should be noted that these cases include an unknown number of suspected cases of MRSA that may have been found to be negative by further laboratory tests completed after these data were reported.

The rate per 1,000 discharges was calculated by multiplying the number of MRSA cases by 1,000 and then dividing by the total number of discharges for each year or group. This method of rate calculation is used throughout this study. Patient age at discharge is the value used to compute the age groups shown.

The regional values are based on the location of the hospitals reporting the data, resulting in some cases of non-Illinois residents being included in the study. Teaching hospitals are members of the Council of Teaching Hospitals. Large urban refers to hospitals in a Metropolitan Statistical Area with a population of 1 million or more. Other urban refers to hospitals in a Metropolitan Statistical Area with a population of less than 1 million and rural refers to hospitals not in a Metropolitan Statistical Area.

Staphylococcus aureus (*S. aureus*) in the bloodstream is identified by diagnosis code 038.11 while *S. aureus* pneumonia is reported using diagnosis code 482.41. All other cases are presented as unspecified location or site.

Stays with a surgical procedure are those cases with at least one listed ICD-9 procedure code. Cases involving cardiovascular surgery are those cases with any listed procedure code in the range 35xx-39xx while neurosurgery cases were selected by procedure codes 01xx-05xx. Orthopedic case selection was more complex, using the following Healthcare Cost Utilization Project (HCUP) Clinical Classification Software⁵ (CCS) categories encompassing 443 procedure codes, shown here.

CCS Label	CCS Label Description
3	Laminectomy
145	Treatment of fracture of dislocation of radius and ulna
146	Treatment of fracture of dislocation of hip and femur
147	Treatment of fracture of dislocation of lower extremity (other than hip and femur)
148	Other fracture and dislocation procedure
152	Arthroplasty knee
153	Hip replacement; total and partial
154	Arthroplasty other than hip or knee
158	Spinal fusion
161	Other OR therapeutic procedures on bone
162	Other OR therapeutic procedures on joints
164	Other OR therapeutic procedures on musculoskeletal sys

Hemodialysis includes cases coded with any listed procedure code 39.95, included here as a common treatment for a chronic condition. Also shown are two frequently occurring conditions based on any

⁵ The full listing of the CCS categories may be obtained at: <http://www.hcup-us.ahrq.gov/toolsssoftware/ccs/ccs.jsp>

listed diagnosis code: 1) asthma indicated by diagnosis codes 493.xx and 2) diabetes by 250.xx. To round out the table, the impact of MRSA on patients diagnosed with smoking-related conditions are included, using any listed diagnosis codes 490.xx-492.xx, 494.xx and 496.xx.

Hospital mortality figures shown are based on discharge status of “20.” Average charges and length of stay are shown to indicate the relative burden of MRSA as it relates to charges and time in the hospital. Primary payer was used to aggregate cases by category: 1) Medicare, 2) Medicaid) 3) private insurance and 4) uninsured. Residence or location of the patient prior to admission (source of admission) was aggregated as: 1) emergency department, 2) another hospital 3) skilled nursing facility (long-term care) and 4) other. Average charges are based on hospital charge master amounts, not amounts actually billed or payments received.