Methicillin-resistant *Staphylococcus aureus* (MRSA) in Illinois Hospitals

This section presents information about **Methicillin-resistant *Staphylococcus aureus*** from the Illinois Hospital Discharge Dataset for 2002-2008, with emphasis on 2008. 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 data presented in this section should be interpreted with caution. Hospital discharge data are collected for billing, rather than disease surveillance. A 2007 study in an Illinois hospital found that only 31 percent of confirmed MRSA cases were identified using the first nine diagnosis codes from the Hospital Discharge Dataset (Schaefer, SHEA Annual Scientific Meeting, 2008). Through 2007, only nine diagnosis codes, out of up to 25 collected codes, were available to the Illinois Department of Public Health (the Department). Therefore, it is to be expected that some cases will be missed by this data source, and the analysis will not reflect those cases.

The ICD-9 diagnosis code V09.0 was used to select cases for this study. As this code for MRSA can be used only as a secondary diagnosis, all cases for the time period having V09.0 as a secondary diagnosis were included.

MRSA Trends, 2002-2008

The data presented in this section include the first nine diagnosis codes listed for each discharge. Rates are calculated by dividing the number of MRSA cases in a given year by the total number of discharges for that year.

Table 1 shows MRSA infections per 1,000 discharges in Illinois for the years 2002-2008. Overall, MRSA rates among patients at Illinois hospitals during this time period increased from 4.1 per 1,000 discharges to 5.9 per 1,000 discharges, a trend paralleling numerous national reports (Elixhauser, HCUP Statistical Brief #35, 2007). During 2008, the last year for which data are available for Illinois, there were 10,103 MRSA infections among 1,699,853 discharges; 0.6 percent of all hospital discharges had diagnosis codes indicating MRSA infection.

Table 1. Number of MRSA infections per 1,000 hospital discharges, 2002-2008

Year	Total number of MRSA discharges	Total number of discharges	Number of MRSA discharges per 1,000 discharges
2002	6,841	1,685,051	4.1
2003	7,384	1,677,125	4.4
2004	8,785	1,710,389	5.1
2005	10,078	1,725,033	5.8
2006	10,714	1,724,612	6.2
2007	11,372	1,713,279	6.6
2008	10,103	1,699,853	5.9

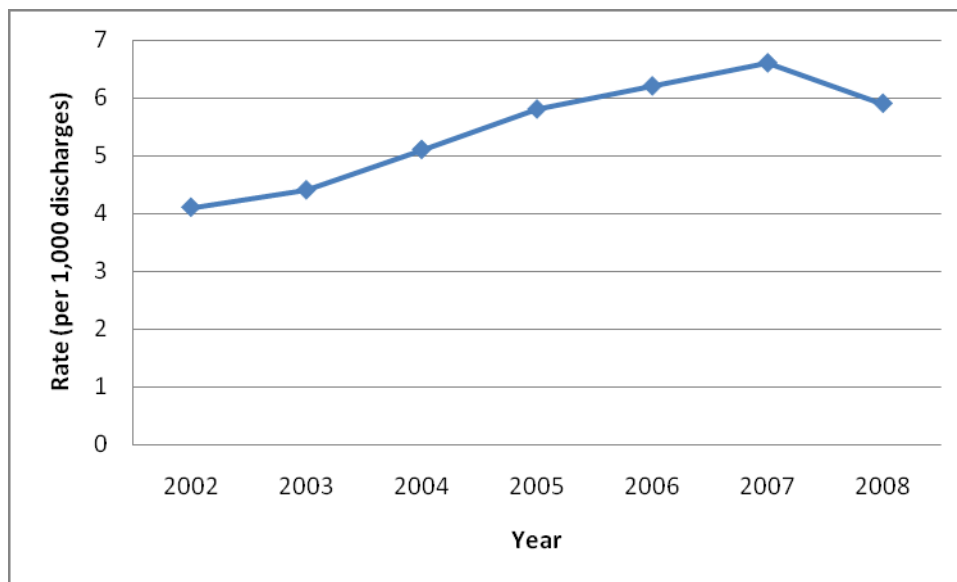Figure 1. Number of MRSA infections per 1,000 hospital discharges, 2002-2008

Table 2 shows the number (N) of MRSA infections stratified by age group and by sex for the years 2002-2008. The number of MRSA infections increased in each age group 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 2008, the latest year for which discharge data are available, more than half of all MRSA infections occurred among individuals ages 50 and older, with the majority of these infections (65.5 percent) occurring in patients 65 years or older.

The sex distribution of MRSA cases remained equally distributed during this period (2002-2008), with females accounting for 47 percent to 50 percent of MRSA discharges.

Table 2. Age and sex distribution of MRSA infections among hospitalized patients, 2002-2008

Age range (years)	2002 N (%)	2003 N (%)	2004 N (%)	2005 N (%)	2006 N (%)	2007 N (%)	2008 N (%)
0-4	120 (1.8)	196 (2.7)	331 (3.8)	412 (4.1)	555 (5.2)	729 (6.4)	596 (5.9)
5-17	90 (1.3)	146 (2.0)	206 (2.3)	346 (3.4)	400 (3.7)	475 (4.2)	384 (3.8)
18-34	459 (6.7)	602 (8.2)	866 (9.9)	1,238 (12.3)	1,408 (13.1)	1,671 (14.7)	1,336 (13.2)
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)	1,936 (19.2)
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)	2,016 (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)	3,835 (38.0)
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)	4,966 (49.2)
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)	5,137 (50.8)

Figure 2. Age distribution of MRSA infections among hospitalized patients, 2008
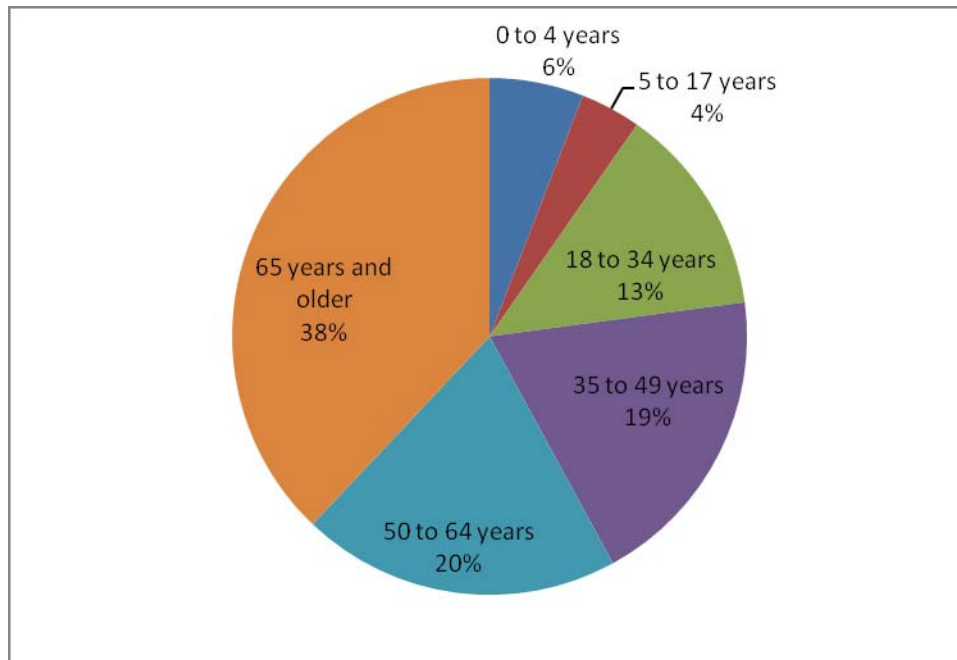
For a detailed report of MRSA rates in specific populations for 2002-2007, click here
http://www.idph.state.il.us/health/infect/MRSA_Data_02-07.pdf.

MRSA in Illinois Hospitals, 2008

Beginning in 2008, 25 diagnosis codes were available to the Department for each discharge. Using all 25 codes, 20,714 discharges with a MRSA diagnosis code occurred in 2008, or 12.2 MRSA cases per 1,000 discharges.

Also beginning in 2008, a code was included with each diagnosis to indicate whether the condition was present on admission to the hospital. This code, along with the source of the admission (e.g., emergency department, non-health care facility, skilled nursing facility), the dates of previous hospital admissions, and codes indicating exposure to certain medical procedures prior to the current admission, can inform estimates of the proportions of MRSA infections in hospitalized patients that are acquired in health care settings.

Table 3 uses the information described above to estimate the proportions of MRSA infections acquired in different settings.

Table 3. Present on admission status and recent health care exposures for MRSA cases, 2008

Present on admission and health care exposures	Frequency	Percent
Infection not present on admission	1,098	5.3
Infection present on admission, with recent health care exposure documented in discharge data*	5,209	25.1
Infection present on admission, with no recent health care exposure documented in discharge data	14,147	68.3
Unavailable	260	1.3
Total	20,714	100.0

* A patient is considered to have had recent health care exposure if a previous admission is documented in the year before the current admission, if evidence of recent surgery or dialysis exists in billing codes, or if the patient was admitted from a different hospital, a skilled nursing or intermediate care facility, a health care facility, an ambulatory surgery center, or hospice, or if the source of admission is same facility, separate claim.

Conclusions

This report summarizes trends in MRSA in Illinois hospitals from 1999-2008. The burden of MRSA in Illinois hospitals is substantial.   While data generated from the Illinois Hospital Discharge Dataset should be interpreted with caution, these findings highlight the importance of devoting resources to infection control and prevention activities aimed at decreasing transmission of MRSA in hospitals.

Due to hospital discharge dataset coding modifications implemented in 2008, the 2008 MRSA discharge data were analyzed using two approaches. In order to compare 2008 MRSA discharge rates with those from 1999-2007, the rates were calculated based on the first nine discharge diagnosis codes. However, when the MRSA rate for 2008 was calculated using 25 discharge diagnoses codes, the rate was, as might be expected, greater in large part due to the increased pool of discharge diagnoses codes. Future trend analyses will have to account for this shift in coding practices to make valid temporal comparisons.

To have a better understanding of the burden of MRSA in Illinois hospitals, it is necessary to distinguish between health care-facility onset and community-onset cases. Historically, discharge data have not been able to discern where a disease or condition was acquired. Beginning in 2008, hospitals were required to include a present on admission (POA) code with each diagnostic code. The mandated use of this code,

which indicates whether each diagnosis occurred before or after hospital admission, was part of the Centers for Medicare and Medicaid Services' (CMS) Hospital-Acquired Conditions Initiative, in which CMS would no longer pay hospitals extra when patients developed specified complications after admission.

Because the implementation of the POA code was part of a quality improvement strategy explicitly linking payment with health care outcomes, its use in epidemiological studies has not been explored. No published studies have evaluated the validity of the POA variable in hospital discharge data with respect to health care-associated infections such as C. *difficile* and MRSA.

Initial analysis of the MRSA infection data for 2008, using the Illinois Hospital Discharge Dataset, revealed trends in POA coding that bring into question the accuracy and usefulness of this variable in differentiating between community-acquired infections and hospital-acquired infections. Attempts were made to refine the POA status using a coding algorithm that incorporated elements from the discharge dataset that identified the source of admission (e.g., emergency department, non-health care facility, skilled nursing facility), the dates of previous hospital admissions, and history of surgery and dialysis, which can serve as a proxy for recent health care exposure. This index is not without its limitations. Possible sources of error could be the inaccurate coding of the POA variable and/or the inaccurate or incomplete coding of the date of previous admission, which would underestimate the percentage of discharges having had an admission within the past year. Also, the source of the majority of admissions was the emergency department; it is not known whether these patients were residents of long-term care facilities prior to their emergency department room visits.

Reliance on administrative databases, such as the Illinois Hospital Discharge Dataset, to assess trends in health care-associated infections, to detect outbreaks, and to provide inter-facility comparisons is not ideal. Further study will be required to validate the POA coding. A personal health care identification number would facilitate linkage of medical records over time and across facilities – both acute and long-term care. This would help to identify previous health care exposures and to track infections.

A hospital-based infection surveillance program, such as the U.S. Centers for Disease Control and Prevention's National Healthcare Safety Network (NHSN), which is currently being used to track central line-associated bloodstream infections in intensive care units in all hospitals in Illinois, would provide more useful data on health care-associated infections. NHSN has the capacity to monitor MRSA rates using laboratory data.