



The First Annual  
HealthGrades Emergency Medicine in  
American Hospitals Study

June 2010

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**Major Contributors:** Susan McBratney Ph.D., editing;  
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Harold Taylor, Ph.D. and Alex Brown, statistical analysis.

Health Grades, Inc., 500 Golden Ridge Road, Suite 100, Golden, Colorado 80401.



HEALTHGRADES®

The First Annual

# HealthGrades Emergency Medicine in American Hospitals Study

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*In this report, HealthGrades identifies patient outcomes for emergency medicine. The emergency medicine analysis uses three years of Medicare data (2006-2008) for eleven diagnoses for patients admitted to the hospital through the emergency department. The analysis identifies top-performing hospitals in emergency medicine to establish a best-practice benchmark against which other hospitals can be evaluated. See [www.HealthGrades.com](http://www.HealthGrades.com) for a list of best-performing hospitals and the specific results for individual hospitals.*

### Introduction

Hospital emergency departments play a vital role in saving lives in the U.S. health care system. The emergency department cares for the most critically ill patients, many with conditions requiring time-sensitive treatments to ensure the best possible outcome. A large number of Americans visit an emergency department each year with many of those visits resulting in hospitalization. In fact, a 2006 study found that 44% of 39.5 million hospitalizations began in the emergency department.<sup>1</sup> Yet this vital component of the health care system, according to the Institute of Medicine, is overburdened, underfunded, and highly fragmented.<sup>2</sup>

Recent studies of emergency department use indicate that privately insured patients accounted for most of the growth in total emergency department visits from 1996 to 2004.<sup>3</sup> With the recently passed health care legislation, most individuals will be required to have insurance by 2014. By 2019, The Congressional Budget Office estimates that there will be 32 million additional insured patients in the health care marketplace.<sup>4</sup> This increase in insured patients is likely to increase the number of patients using the emergency department.

For many industry professionals as well as health care consumers, the potential increase in patients is cause for concern. How will already overburdened and fragmented hospital emergency departments cope with the additional increase in patients and how will the quality of care be impacted? The cause for concern is quite valid. Research has shown that critically ill patients who experienced delays in being admitted to the hospital from the emergency department had significantly higher in-hospital mortality than patients without delays.<sup>5</sup>

However, not all hospital emergency departments are alike. While many hospitals are struggling with emergency department overcrowding and quality of care issues, there are many hospitals across the country that have been redesigning patient care processes by streamlining patient triage and admission systems. There are examples of hospitals competing for new emergency department patients by advertising their emergency department wait times through billboards, websites, Twitter® and even text messages.<sup>6</sup>

Because of the current and anticipated increase in emergency department use, HealthGrades recognized the need to analyze emergency medicine outcomes in America's hospitals. There are many ways to measure the quality of a hospital's emergency medicine. Emergency department wait times, "door-to-doctor" times, and patients left without being seen are common measures with clear impact on patient care. In this study, we provide an additional measure of emergency medicine quality by evaluating the end result—inpatient mortality.

This study, *The First Annual HealthGrades Emergency Medicine in American Hospitals Study*, aims to identify the best-performing hospitals in emergency medicine, and quantify the clinical impacts of the variation between these best-performing hospitals and all others. HealthGrades analyzed over 5 million Medicare records of patients admitted through the emergency department at 4,907 hospitals from 2006 through 2008. To identify the best-performing hospitals in emergency medicine, HealthGrades evaluated and compared hospitals on the risk-adjusted mortality outcomes for patients admitted through the emergency department for eleven of the most common life-threatening diagnoses in the Medicare population.

The best-performing hospitals are those hospitals that have combined rates of mortality low enough to place them among the top 5% of hospitals in the nation for emergency medicine. From this analysis, HealthGrades identified 255 hospitals with the lowest risk-adjusted mortality and designated these hospitals as recipients of the Emergency Medicine Excellence Award™. This Emergency Medicine Excellence Award is intended as a proxy for the effectiveness of a hospital's multi-disciplinary teamwork and its ability to diagnose, triage and provide timely care to their patients.

More information on the emergency medicine methodology can be found in the following *Emergency Medicine Methodology Brief* section, or in the *HealthGrades Emergency Medicine Excellence Award Methodology 2010* white paper at [www.HealthGrades.com](http://www.HealthGrades.com).

HealthGrades illustrates that there are clear differences in outcomes between the best-performing hospitals and all other hospitals with regards to emergency medicine. These differences could mean the difference between life and death for patients requiring emergency treatment. Therefore, consumers and health care providers alike should use the available quality information and understand the quality of care in their marketplace. Health care providers should look to and learn best practices from these best-performing hospitals. In addition, consumers should use this information to have a preferred hospital in mind should a medical emergency occur that permits the time to choose.

## Summary of Findings

HealthGrades analyzed Medicare data of over 5 million patient records for emergency department admissions from 2006 through 2008 for eleven diagnoses, and found the following trends.

### Emergency Medicine Excellence™ Hospitals

If all hospitals studied performed at the level of best-performing hospitals, an additional 118,014 people could have potentially survived their emergency hospitalization

- For the group of patients studied, Emergency Medicine Excellence hospitals had, on average, **38.97% lower risk-adjusted mortality** than all other hospitals across the eleven diagnoses studied (*Appendix B*).
- If all hospitals performed at the level of the Emergency Medicine Excellence hospitals from 2006 through 2008, an additional **118,014 people could have potentially survived their emergency hospitalization**.
- From 2006 to 2008, Emergency Medicine Excellence hospitals showed an average overall improvement in risk-adjusted mortality of 15.55%, while all other hospitals improved 10.34% (*Appendix B*).
- The conditions with the largest variation in risk-adjusted mortality between Emergency Medicine Excellence Hospitals and all others were diabetic acidosis and coma, chronic obstructive pulmonary disease, pulmonary embolism, and pneumonia (*Appendix B*).

### Emergency Department Admissions among Medicare Recipients

The most common causes for emergency department admissions by Medicare patients were pneumonia, chronic obstructive pulmonary disease, and sepsis.

- The most common causes for admission through the emergency department by Medicare patients were pneumonia, chronic obstructive pulmonary disease, and sepsis (*Appendix C*).
- For the eleven conditions studied, emergency department admissions increased 1.70% overall from 2006 to 2008 (*Appendix C*).
- The highest in-hospital mortality rates were among patients with a primary diagnosis of sepsis (21.05%), respiratory failure (20.88%) or heart attack (10.84%) (*Table 2*).

### Emergency Department Trends by State

Thirty-one states have one or more Emergency Medicine Excellence Award hospitals.

Ohio, Arizona and Michigan had the lowest risk-adjusted mortality for Medicare patients admitted through the emergency department.

- Thirty-one states have one or more Emergency Medicine Excellence Award hospitals (*Table 3*).
- More than half (51.76% or 132) of the 255 Emergency Medicine Excellence Award hospitals are in five states: Ohio (37), Florida (28), California (27), Michigan (21) and Illinois (19) (*Table 3*).
- Rhode Island, Delaware and Connecticut had the highest percentage of admissions through the emergency department (88.68%, 88.47% and 86.05%, respectively) while South Dakota, Nebraska and Kansas had the lowest percentage of admissions through the emergency department (49.44%, 50.71% and 57.72%, respectively) for the eleven conditions studied (*Appendix D*).
- Mississippi, Alabama and Hawaii had the worst risk-adjusted mortality for patients admitted through the emergency department (observed-to-expected ratios of 1.33, 1.27 and 1.27, respectively) while Ohio, Arizona and Michigan had the lowest (observed-to-expected ratios of 0.80, 0.81 and 0.85, respectively) for the eleven conditions studied (*Table 4* and *Appendix D*).

## Emergency Medicine Methodology Brief

To identify the top-performing hospitals in the area of emergency medicine, HealthGrades analyzed mortality data for virtually every hospital in the country. HealthGrades analyzed patients admitted to the hospital through the emergency department for the following eleven diagnoses (cohorts):

- Bowel Obstruction
- Chronic Obstructive Pulmonary Disease
- Diabetic Acidosis and Coma
- Gastrointestinal Bleed
- Heart Attack
- Pancreatitis
- Pneumonia
- Pulmonary Embolism
- Respiratory Failure
- Sepsis
- Stroke

To receive a rating (z-score) in a cohort, a hospital must have a minimum of 30 patients admitted through the emergency department over the three years of study and at least five cases in the most recent year of analysis (2008). To be eligible for the Emergency Medicine Excellence Award, a hospital must have a rating in a minimum of nine of the eleven cohorts.

Award recipients were determined using the following process:

1. For each hospital and cohort, the observed and predicted numbers of in-hospital deaths were summed for patients admitted through the emergency department, and a z-score was calculated.
2. For each eligible hospital, the straight average of their cohort z-scores was calculated.
3. The eligible hospitals were then rank ordered by their average z-score, and 255 had risk-adjusted mortality rates low enough to qualify them as recipients of the HealthGrades Emergency Medicine Excellence Award.

The final group of 255 hospitals represents the top 5% of the 4,907 short-term acute care hospitals.

For more detail, see *HealthGrades Emergency Medicine Excellence Award Methodology 2010* available at [www.HealthGrades.com](http://www.HealthGrades.com).



## Emergency Medicine Findings

HealthGrades' first annual analysis of hospital emergency medicine programs found that the best-performing hospitals consistently outperformed all other hospitals for all eleven cohorts studied.

Nationwide, 255 hospitals had risk-adjusted mortality rates low enough to be recipients of the HealthGrades 2010 Emergency Medicine Excellence Award. These 255 recipients represent the top 5% of the nation's 4,907 short-term, acute-care hospitals. (See *Appendix A* for a complete list of award recipients; visit [www.HealthGrades.com](http://www.HealthGrades.com) to view recipients by state). These 255 hospitals, as a group, comprise the Emergency Medicine Excellence hospitals whose outcomes were compared to all other hospitals.

### Emergency Medicine Excellence Hospitals have Consistently Lower Risk-Adjusted Mortality

From 2006 to 2008, across eleven common diagnoses in the Medicare population, Emergency Medicine Excellence hospitals had consistently lower risk-adjusted mortality than all other hospitals. On average, Emergency Medicine Excellence hospitals had risk-adjusted mortality that was 38.97% lower than all other hospitals (*Appendix B*). The most variation in risk-adjusted mortality between Emergency Medicine Excellence hospitals and all others was seen in the treatment of diabetic acidosis and coma, chronic obstructive pulmonary disease, pulmonary embolism, and pneumonia where Emergency Medicine Excellence hospitals had on average 52.48%, 47.14%, 43.70%, and 43.22% respectively, lower risk-adjusted mortality than all other hospitals (*Appendix B*).

While these conditions showed the most variation in outcomes between the Emergency Medicine Excellence hospitals and all others, sepsis, pneumonia, and respiratory failure presented the greatest opportunity to save lives by closing the performance gap. If all hospitals performed at the level of the Emergency Medicine Excellence hospitals in these three cohorts, a total of 78,196 lives could have potentially been saved between 2006 and 2008.

In total, if all hospitals performed at the level of the Emergency Medicine Excellence hospitals from 2006 through 2008, in just the eleven diagnoses studied, an additional 118,014 patients could have potentially survived their emergency hospital admission (*Appendix B*).

### Emergency Medicine Excellence Hospitals Showed Greater Improvement

Over the past decade, U.S. hospitals have been under pressure from both payers and the public to improve quality and increase transparency. As a result, hospitals have been diligently working to implement multiple quality initiatives aimed at increasing adherence to known best practices. For many of these initiatives, the emergency department plays an important and critical role (e.g., door-to-balloon times for heart attack, the administration of clot busting drugs for stroke patients, protocols in the Surviving Sepsis Campaign, and antibiotics given to pneumonia patients within six hours of arrival). The good news for both hospitals and patients is that in this study, both Emergency Medicine Excellence hospitals and all other hospitals showed reductions in overall risk-adjusted mortality between 2006 and 2008 for patients admitted through the emergency department (*Appendix B*).

Overall, between 2006 and 2008, Emergency Medicine Excellence hospitals improved at a greater rate than all other hospitals. For Emergency Medicine Excellence hospitals, risk-adjusted mortality improved by 15.55% while all other hospitals improved at a rate of 10.34% (*Appendix B*). Both groups of hospitals improved across all cohorts with two exceptions:

The highest volume diagnoses presented the greatest opportunity to save lives by closing the performance gap. If all hospitals performed at the level of excellence hospitals in sepsis, pneumonia, and respiratory failure, 78,196 lives could have potentially been saved between 2006 and 2008.

Both Emergency Medicine Excellence hospitals and all other hospitals showed reductions in overall risk-adjusted mortality between 2006 and 2008 for patients admitted through the emergency department.

- Emergency Medicine Excellence hospitals showed a decline of 0.12% in the treatment of pancreatitis while all other hospitals improved by 12.92% (*Appendix B*).
- All other hospitals showed a decline of 6.53% in diabetic acidosis and coma while Emergency Medicine Excellence hospitals improved by 18.09% (*Appendix B*).

For both groups of hospitals, pulmonary embolism and gastrointestinal bleed were among the top four diagnoses with the most improvement (*Appendix B and Table 1*).

Table 1. Top Four Diagnoses Showing Most Improvement

Emergency Medicine Excellence Hospitals		All Other Hospitals	
Diagnosis	% Improvement	Diagnosis	% Improvement
Pulmonary Embolism	21.96%	Chronic Obstructive Pulmonary Disease	20.66%
Pneumonia	19.67%	Pulmonary Embolism	15.95%
Gastrointestinal Bleed	19.58%	Gastrointestinal Bleed	15.24%
Chronic Obstructive Pulmonary Disease	18.29%	Pancreatitis	12.92%

### Emergency Department Use is Common and Increasing among Medicare Recipients

Overall, there was a 1.70% increase in the percentage of patients being admitted through the emergency department for the eleven conditions studied (*Appendix C*). An increase in admissions was observed for all conditions examined, except for sepsis, which showed a slight decrease (-0.98%) (*Appendix C*).

The most common causes for admission through the emergency department by Medicare patients were pneumonia, chronic obstructive pulmonary disease, and sepsis. These three conditions alone comprised almost 2.5 million emergency department admissions, almost half of all the emergency admissions studied. Stroke, sepsis, and respiratory failure had the highest percentage of patients admitted through the emergency department as compared to all patients with those respective conditions (79.83%, 79.13%, and 78.54%, respectively) (*Appendix C*).

In this study, the relationship between the percentage of admissions and risk-adjusted mortality was evaluated. No correlation was found between risk-adjusted mortality and the percentage of emergency department admissions. In other words, lower emergency department admission rates did not correlate to lower risk-adjusted mortality nor did high rates of emergency department admissions correlate to lower risk-adjusted mortality (data not shown). As a group, Emergency Medicine Excellence hospitals had about the same percentage of patients admitted through the emergency department as all other hospitals.

Medicare recipients experienced the highest in-hospital mortality rate when they were admitted through the emergency department with a primary diagnosis of sepsis, respiratory failure, or heart attack; whereas, the lowest mortality rates were for patients admitted for gastrointestinal bleed, chronic obstructive pulmonary disease, and diabetic acidosis and coma (*Table 2*).

The most common causes for admissions through the emergency department by Medicare patients were pneumonia, chronic obstructive pulmonary disease, and sepsis.

No correlation was found between risk-adjusted mortality and percentage of emergency department admissions.



Table 2. Emergency Department Admissions and Mortality Rates per Diagnosis

Diagnosis	Emergency Department Admissions	Average Unadjusted Mortality Rate
Sepsis	661,856	21.05%
Respiratory Failure	349,303	20.88%
Heart Attack	461,736	10.84%
Stroke	509,205	7.02%
Pneumonia	1,080,955	5.06%
Pulmonary Embolism	112,933	4.56%
Bowel Obstruction	337,871	3.25%
Pancreatitis	113,806	2.59%
Gastrointestinal Bleed	565,153	2.10%
Chronic Obstructive Pulmonary Disease	746,617	2.00%
Diabetic Acidosis and Coma	119,195	1.63%

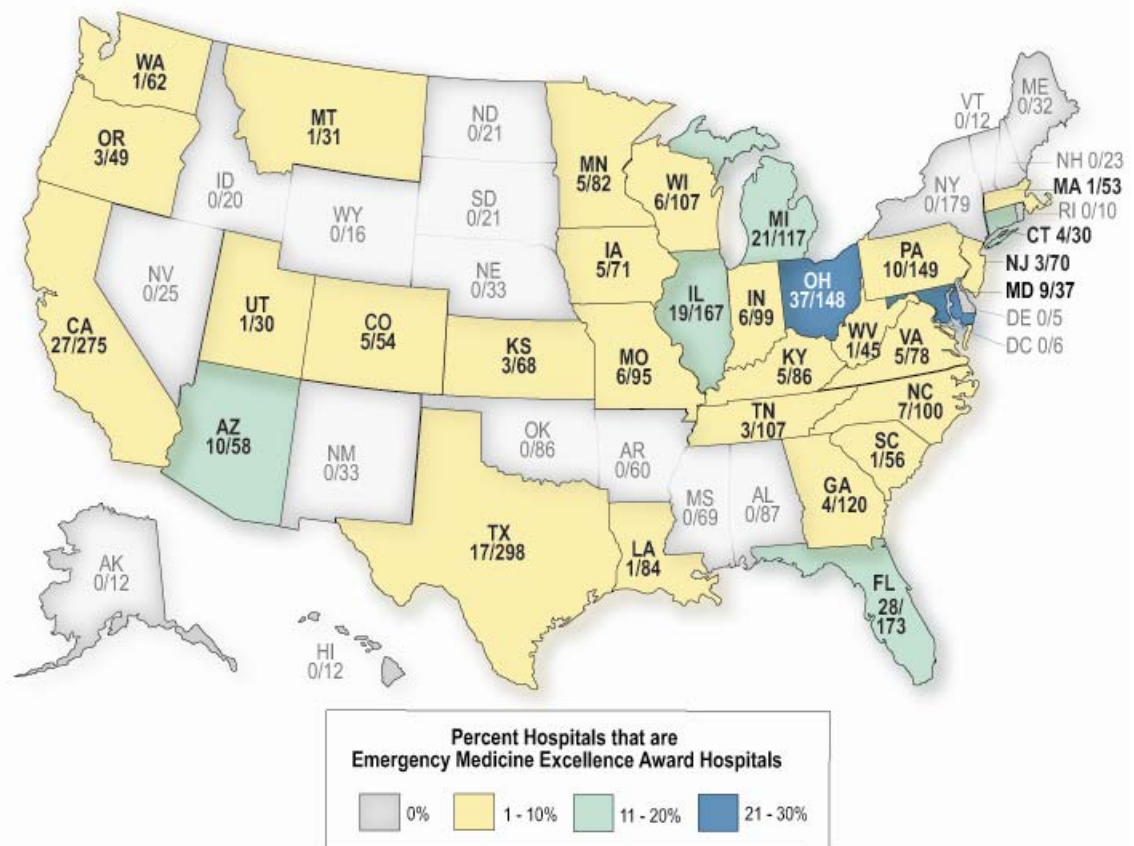
### Nineteen States Do Not have an Emergency Excellence Hospital

Thirty-one states have an Emergency Excellence hospital. Of the 3,761 hospitals nationwide that had emergency department admissions, 1,698 met the criteria to be considered for the Emergency Medicine Excellence Award. Of these hospitals, 255 had risk-adjusted mortality low enough to qualify them as recipients of the HealthGrades 2010 Emergency Medicine Excellence Award™. These 255 recipients represent the top 5% of the nation's 4,907 short-term acute-care hospitals. (See *Appendix A* for a list of award recipients.)

Nationwide, of the 3,761 hospitals that had emergency department admissions, 255 had risk-adjusted mortality low enough to qualify them as an Emergency Medicine Excellence hospital.

- Thirty-one states have one or more hospitals that have been recognized with a HealthGrades Emergency Medicine Excellence Award (*Table 3*).
- More than half (51.76% or 132) of the 255 Emergency Medicine Excellence Award hospitals are in five states: Ohio (37), Florida (28), California (27), Michigan (21), and Illinois (19) (*Table 3*).
- Ohio had a quarter of its hospitals that had emergency department admissions recognized as Emergency Medicine Excellence Award hospitals while Maryland followed with 24.32% (*Table 3*).

Emergency Medicine Excellence Award Hospitals by Hospitals that had Emergency Department Admissions by State



More than half (51.76%) of the 255 Emergency Medicine Excellence hospitals are in five states: Ohio, Florida, California, Michigan and Illinois.

Table 3. Emergency Medicine Excellence Award Hospitals Distribution by State

More than half (51.76% or 132) of the 255 Emergency Medicine Excellence Award hospitals are in five states: Ohio (37), Florida (28), California (27), Michigan (21) and Illinois (19).

State / Abbreviation	Hospitals with Emerg. Dept. Admits	Emerg. Medicine Excell. Award Hospitals	% of Hospitals with Emerg. Dept. Admits that are Emerg. Medicine Excell. Award Hospitals	% of All Emerg. Medicine Excell. Award Hospitals
Alabama	AL	87	0	0.00%
Alaska	AK	12	0	0.00%
Arizona	AZ	58	10	17.24%
Arkansas	AR	60	0	0.00%
California	CA	275	27	9.82%
Colorado	CO	54	5	9.26%
Connecticut	CT	30	4	13.33%
Delaware	DE	5	0	0.00%
Dist. Of Columbia	DC	6	0	0.00%
Florida	FL	173	28	16.18%
Georgia	GA	120	4	3.33%
Hawaii	HI	12	0	0.00%
Idaho	ID	20	0	0.00%
Illinois	IL	167	19	11.38%
Indiana	IN	99	6	6.06%
Iowa	IA	71	5	7.04%
Kansas	KS	68	3	4.41%
Kentucky	KY	86	5	5.81%
Louisiana	LA	84	1	1.19%
Maine	ME	32	0	0.00%
Maryland	MD	37	9	24.32%
Massachusetts	MA	53	1	1.89%
Michigan	MI	117	21	17.95%
Minnesota	MN	82	5	6.10%
Mississippi	MS	69	0	0.00%
Missouri	MO	95	6	6.32%
Montana	MT	31	1	3.23%
Nebraska	NE	33	0	0.00%
Nevada	NV	25	0	0.00%
New Hampshire	NH	23	0	0.00%
New Jersey	NJ	70	3	4.29%
New Mexico	NM	33	0	0.00%
New York	NY	179	0	0.00%
North Carolina	NC	100	7	7.00%
North Dakota	ND	21	0	0.00%
Ohio	OH	148	37	25.00%
Oklahoma	OK	86	0	0.00%
Oregon	OR	49	3	6.12%
Pennsylvania	PA	149	10	6.71%
Rhode Island	RI	10	0	0.00%
South Carolina	SC	56	1	1.79%
South Dakota	SD	21	0	0.00%
Tennessee	TN	107	3	2.80%
Texas	TX	298	17	5.70%
Utah	UT	30	1	3.33%
Vermont	VT	12	0	0.00%
Virginia	VA	78	5	6.41%
Washington	WA	62	1	1.61%
West Virginia	WV	45	1	2.22%
Wisconsin	WI	107	6	5.61%
Wyoming	WY	16	0	0.00%
<b>Total</b>		<b>3,761</b>	<b>255</b>	<b>6.78%</b>

## Emergency Medicine Use and Outcomes Vary by State

Consistent with the findings between Emergency Medicine Excellence hospitals and all other hospitals, there was also no correlation found in the state analysis between the percentage of emergency department admissions and risk-adjusted mortality. Higher emergency department admission was not statistically related to lower or higher risk-adjusted mortality rates (data not shown). However, overall emergency department admission rates did vary by state (*Appendix D*):

- Rhode Island, Delaware and Connecticut (88.68%, 88.47% and 86.05%, respectively) had the highest percentage of admissions through the emergency department for the eleven conditions studied (*Appendix D*).
- South Dakota, Nebraska and Kansas (49.44%, 50.71% and 57.72%, respectively) had the lowest percentage of admission through the emergency department for the eleven conditions studied (*Appendix D*).

In addition to major differences in the percentages of patients admitted through the emergency department by state, there were also differences in risk-adjusted mortality among states.

- Ohio, Arizona, Michigan, Maryland and Utah had the lowest risk-adjusted mortality of all states for their patients admitted through the emergency department (*Table 4 and Appendix D*).
- Mississippi, Alabama, Hawaii, Wyoming and Idaho had the worst risk-adjusted mortality for the eleven conditions studied (*Table 4 and Appendix D*).

Ohio, Arizona, Michigan, Maryland and Utah had the lowest risk-adjusted mortality of all states for Medicare patients admitted through the emergency department.

Table 4. Best-Performing and Worst-Performing States for Emergency Medicine

State	Observed-to-Expected Ratio
<b>Best-Performing States</b>	
An Observed to Expected <1.0 indicates better than expected performance	
Ohio	0.80
Arizona	0.81
Michigan	0.85
Maryland	0.86
Utah	0.87
<b>Worst-Performing States</b>	
An Observed to Expected >1.0 indicates worse than expected performance	
Mississippi	1.33
Alabama	1.27
Hawaii	1.27
Wyoming	1.25
Idaho	1.24

## Interpretation of Results

Research has shown that the quality and timeliness of care received in the emergency department has a direct impact on the likelihood of surviving the hospitalization.

The emergency department plays a vital role in the health and safety of Americans in the U.S. health care system. The American public trusts that high quality emergency care is available to them when they need it; however, not all emergency care is equal in its service and quality.

This study, the first of its kind, evaluates U.S. hospitals based on mortality in the treatment of their most critically-ill patients. For the 5 million hospitalizations evaluated, the emergency department was the point of entry. While the patients that were evaluated were admitted as inpatients, and the emergency department was just one aspect of the overall care, research has shown that the quality and timeliness of care received in the emergency department has a direct impact on the likelihood of surviving the hospitalization.<sup>8</sup>

As U.S. hospitals anticipate an increase in insured patients and as they prepare for value-based purchasing and increased care coordination requirements, they first must benchmark their performance against top-performing hospitals. This study provides an objective evaluation of outcomes across all short-term acute care hospitals for their most critically ill patients. From this evaluation, 255 hospitals can boast the lowest risk-adjusted mortality for eleven conditions in the Medicare population (*Appendix A*).

While there are a number of quality measures available to both hospitals and consumers to assess a hospital's interventions and treatments, this study uses outcomes to evaluate hospital performance. Some consumers may question the usefulness of this type of information in an emergent situation. However, because there are large quality variations between hospitals, it is important for consumers to understand the hospital quality landscape in their immediate area and to be prepared when an emergent situation arises.

A typical patient is nearly 40% less likely to die during an emergency hospitalization at a top-performing hospital than at all other hospitals.

In summary, this study found that a typical patient is nearly 40% less likely to die during an emergency hospitalization at a top-performing hospital than all other hospitals. Surprisingly, the conditions with the least amount of variation between the top-performing hospitals and all other hospitals did not consistently align with the conditions that have been the focus of much national attention. For example, out of the eleven diagnoses, heart attack and sepsis (two areas where hospitals have focused much attention on quality improvement and guideline adherence) had the least variation in outcomes (*Appendix B*). Conversely, stroke and pneumonia, also areas of increased guideline adherence initiatives, showed large gaps between the top-performing and all other hospitals (*Appendix B*). This suggests that there is still much work to be done in closing the performance gaps and elevating the performance of all hospitals to the level of the best hospitals.

One aim of the health care reform legislation of 2010 is to create Accountable Care Organizations (ACO) and move away from episodic care for individuals with chronic conditions and/or complex medical needs. As early as 2012, payment reforms tied to hospital rates of readmissions for Medicare recipients are scheduled to begin. Overall, from 2006 to 2008 there was a 1.70% increase in the percentage of emergency room admissions (*Appendix C*). While this study could not evaluate what percentage of those patients were readmissions, recent research in California found that 36% of Medicare and Medicaid patients were readmitted within 365 days of an initial hospitalization. Researchers also found that readmitted patients were more likely to have been admitted through the emergency department at their initial visit.<sup>9</sup> This means that hospitals will need to find creative interventions and work collaboratively with other health care providers to avoid inpatient readmissions and reduce emergency room visits.

There is also much variation among the quality of care provided from state to state. A typical patient has the best chance of surviving an emergency hospitalization in Ohio, Arizona, Michigan, Maryland and Utah, and the worst chance in Mississippi, Alabama, Hawaii, Wyoming and Idaho (*Table 4* and *Appendix D*). This has huge implications for policy makers as they adopt policies around pay for

performance as well as for individual hospitals as insurance reform creates the possibility of increased patient choice.

In just eleven diagnoses among Medicare patients only, if all hospitals performed at the level of the best 255 hospitals, 118,014 inpatient deaths could have potentially been avoided from 2006 through 2008 (*Appendix B*). In the U.S., kidney disease and sepsis rank as the 9<sup>th</sup> and 10<sup>th</sup> leading causes of death. These conditions result in 45,344 and 34,234 deaths each year, respectively.<sup>10</sup> This means that annually the potentially preventable deaths due to the variation in emergency medicine in U.S. hospitals is somewhere between the number of deaths caused by the 9<sup>th</sup> and 10<sup>th</sup> leading causes of death in the U.S.

In conclusion, both Emergency Medicine Excellence Hospitals and all other hospitals showed reductions in overall risk-adjusted mortality between 2006 and 2008 for the eleven diagnoses studied in this report (*Appendix B*). However, a typical patient is nearly 40% less likely to die during an emergency hospitalization at a top-performing hospital than at all other hospitals (*Appendix B*). This fact suggests that there is much work to do to address an emergency medicine system that is plagued by numerous present and future challenges. We show here that there are 255 examples in 31 states of hospitals that, in spite of these challenges, have managed to achieve the lowest risk-adjusted mortality among their peers.



## Limitations of the Emergency Medicine Performance Assessment and the Risk-Adjustment Models for Emergency Medicine Performance

It must be understood that while these models may be valuable in identifying hospital groups that perform better than others, one should recognize that these models are limited by the following factors:

- Cases may have been coded incorrectly or incompletely by the hospital.
- The models can only account for risk factors that are coded into the billing data. If a particular risk factor was not coded into the billing data, such as a patient's socioeconomic status and health behavior, then it was not accounted for with these models.
- Although HealthGrades has taken steps to carefully compile these data, some information may be missing, outdated, or incorrect.

## Acknowledgements

Health Grades, Inc., 500 Golden Ridge Road, Suite 100, Golden, Colorado 80401. Health Grades Inc. is the leading independent health care ratings organization, providing quality ratings, profiles and cost information on the nation's hospitals, physicians, nursing homes and prescription drugs.

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## Appendix A. HealthGrades 2010 Emergency Medicine Excellence Award™ Recipients

The following hospitals are recipients of HealthGrades 2010 Emergency Medicine Excellence Award™.

\* Some of the Emergency Medicine Excellence Award recipients have multiple locations. In these cases, results for all locations were used in the analysis and each of the facilities is designated as a recipient of the award.

HealthGrades 2010 Emergency Medicine Excellence Award™ Recipients*	City
<b>Alabama</b>	
<i>There are no recipients of this award in this state.</i>	
<b>Alaska</b>	
<i>There are no recipients of this award in this state.</i>	
<b>Arizona</b>	
Banner Baywood Medical Center	Mesa
Banner Boswell Medical Center	Sun City
Banner Del E. Webb Medical Center	Sun City West
Banner Estrella Medical Center	Phoenix
Banner Thunderbird Medical Center	Glendale
Mayo Clinic Hospital	Phoenix
Scottsdale Healthcare - Osborn	Scottsdale
Scottsdale Healthcare - Shea	Scottsdale
Tucson Medical Center	Tucson
University Medical Center	Tucson
<b>Arkansas</b>	
<i>There are no recipients of this award in this state.</i>	
<b>California</b>	
Alhambra Hospital and Medical Center	Alhambra
Beverly Hospital	Montebello
Centinela Freeman Regional Medical Center - Centinela	Inglewood
<i>including:</i> Centinela Freeman Regional Medical Center - Memorial	Inglewood
Chino Valley Medical Center	Chino
Desert Valley Hospital	Victorville
Feather River Hospital	Paradise
Fountain Valley Regional Hospital and Medical Center	Fountain Valley
Garden Grove Hospital and Medical Center	Garden Grove
Garfield Medical Center	Monterey Park
Good Samaritan Hospital	Los Angeles
Henry Mayo Newhall Memorial Hospital	Valencia
John Muir Medical Center - Walnut Creek	Walnut Creek
Long Beach Memorial Medical Center	Long Beach

\* Distinction cannot be used without a Licensing Agreement from Health Grades, Inc. Continued....

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HealthGrades 2010 Emergency Medicine Excellence Award™ Recipients*	City
Mills-Peninsula Health Services	Burlingame
<i>including:</i> Mills Health Center	San Mateo
Olympia Medical Center	Los Angeles
Presbyterian Intercommunity Hospital	Whittier
Providence Holy Cross Medical Center	Mission Hills
Saddleback Memorial Medical Center - Laguna Hills	Laguna Hills
<i>including:</i> Saddleback Memorial Medical Center San Clemente	San Clemente
Saint Vincent Medical Center	Los Angeles
San Antonio Community Hospital	Upland
San Gabriel Valley Medical Center	San Gabriel
Scripps Memorial Hospital Encinitas	Encinitas
Scripps Mercy Hospital	San Diego
<i>including:</i> Scripps Mercy Hospital - Chula Vista	Chula Vista
Sierra Nevada Memorial Hospital	Grass Valley
Sutter Auburn Faith Hospital	Auburn
Sutter Delta Medical Center	Antioch
Whittier Hospital	Whittier
<b>Colorado</b>	
Centura Health - Penrose St. Francis Health Services	Colorado Springs
McKee Medical Center	Loveland
North Colorado Medical Center	Greeley
Rose Medical Center	Denver
The Medical Center of Aurora	Aurora
<b>Connecticut</b>	
Hartford Hospital	Hartford
Manchester Memorial Hospital	Manchester
Middlesex Hospital	Middletown
Yale - New Haven Hospital	New Haven
<b>Delaware</b>	
<i>There are no recipients of this award in this state.</i>	
<b>District of Columbia</b>	
<i>There are no recipients of this award in this state.</i>	
<b>Florida</b>	
Baptist Medical Center	Jacksonville
Bay Medical Center	Panama City
Bethesda Memorial Hospital	Boynton Beach
Boca Raton Community Hospital	Boca Raton
Brandon Regional Hospital	Brandon

\* Distinction cannot be used without a Licensing Agreement from Health Grades, Inc. Continued...

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HealthGrades 2010 Emergency Medicine Excellence Award™ Recipients*	City
Cleveland Clinic Hospital	Weston
Delray Medical Center	Delray Beach
Doctors' Hospital	Coral Gables
Flagler Hospital	Saint Augustine
Florida Hospital Deland	Deland
Florida Hospital Fish Memorial	Orange City
Florida Hospital Memorial Medical Center <i>including: Florida Hospital Oceanside</i>	Daytona Beach Ormond Beach
Florida Hospital Orlando	Orlando
JFK Medical Center	Atlantis
Jupiter Medical Center	Jupiter
Kendall Regional Medical Center	Miami
Lee Memorial Hospital	Fort Myers
Martin Memorial Medical Center	Stuart
Memorial Hospital Pembroke	Pembroke Pines
Memorial Hospital West	Pembroke Pines
Munroe Regional Medical Center	Ocala
Ocala Regional Medical Center/West Marion Hospital	Ocala
Palm Beach Gardens Medical Center	Palm Beach Gardens
Raulerson Hospital	Okeechobee
Sacred Heart Hospital	Pensacola
Sarasota Memorial Hospital	Sarasota
Wellington Regional Medical Center	Wellington
Wuesthoff Medical Center Rockledge	Rockledge
<b>Georgia</b>	
Gwinnett Medical Center	Lawrenceville
Houston Medical Center	Warner Robins
Northeast Georgia Medical Center <i>including: Northeast Georgia Medical Center – Lanier Park</i>	Gainesville Gainesville
Oconee Regional Medical Center	Milledgeville
<b>Hawaii</b>	
<i>There are no recipients of this award in this state.</i>	
<b>Idaho</b>	
<i>There are no recipients of this award in this state.</i>	
<b>Illinois</b>	
Advocate Christ Hospital and Medical Center	Oak Lawn
Advocate Good Samaritan Hospital	Downers Grove
Advocate Trinity Hospital	Chicago
Alexian Brothers Medical Center	Elk Grove Village

\* Distinction cannot be used without a Licensing Agreement from Health Grades, Inc. Continued....

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HealthGrades 2010 Emergency Medicine Excellence Award™ Recipients*	City
Central Dupage Hospital	Winfield
Evanston Hospital	Evanston
<i>including:</i> Highland Park Hospital	Highland Park
Holy Cross Hospital	Chicago
Ingalls Memorial Hospital	Harvey
Little Company of Mary Hospital	Evergreen Park
Mercy Hospital & Medical Center	Chicago
Metrosouth Medical Center	Blue Island
Northwest Community Hospital	Arlington Heights
Our Lady of the Resurrection Medical Center	Chicago
Provena Saint Joseph Hospital	Elgin
Provena Saint Joseph Medical Center	Joliet
Resurrection Medical Center	Chicago
Rush Oak Park Hospital	Oak Park
Saint Alexius Medical Center	Hoffman Estates
Westlake Community Hospital	Melrose Park
<b>Indiana</b>	
Clarian Health Partners Incorporated	Indianapolis
<i>including:</i> Indiana University Medical Center	Indianapolis
Clark Memorial Hospital	Jeffersonville
Floyd Memorial Hospital and Health Services	New Albany
Howard Regional Health System	Kokomo
Saint Vincent Indianapolis Hospital	Indianapolis
The Community Hospital	Munster
<b>Iowa</b>	
Great River Medical Center	West Burlington
Mercy Medical Center - Cedar Rapids	Cedar Rapids
Mercy Medical Center - Des Moines	Des Moines
Mercy Medical Center - North Iowa	Mason City
Saint Lukes Hospital	Cedar Rapids
<b>Kansas</b>	
St. Francis Health Center	Topeka
University of Kansas Hospital	Kansas City
Via Christi Regional Medical Center	Wichita
<b>Kentucky</b>	
Jewish Hospital	Louisville
<i>including:</i> Sts Mary & Elizabeth Hospital	Louisville
King's Daughters Medical Center	Ashland
Our Lady of Bellefonte Hospital	Ashland
Saint Elizabeth Edgewood	Edgewood
Saint Joseph - London	London

\* Distinction cannot be used without a Licensing Agreement from Health Grades, Inc. Continued....

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HealthGrades 2010 Emergency Medicine Excellence Award™ Recipients*	City
<b>Louisiana</b>	
Ochsner Clinic Foundation	New Orleans
<b>Maine</b>	
<i>There are no recipients of this award in this state.</i>	
<b>Maryland</b>	
Doctor's Community Hospital	Lanham
Howard County General Hospital	Columbia
Northwest Hospital Center	Randallstown
Peninsula Regional Medical Center	Salisbury
Prince Georges Hospital Center	Cheverly
Saint Joseph Medical Center	Towson
Sinai Hospital of Baltimore	Baltimore
Suburban Hospital	Bethesda
Washington Adventist Hospital	Takoma Park
<b>Massachusetts</b>	
HealthAlliance Hospital Burbank Campus	Fitchburg
<i>including:</i> HealthAlliance Hospital Leominster Campus	Leominster
<b>Michigan</b>	
Beaumont Hospital - Royal Oak	Royal Oak
Beaumont Hospital - Troy	Troy
Bronson Methodist Hospital	Kalamazoo
Genesys Regional Medical Center	Grand Blanc
Hackley Hospital	Muskegon
Henry Ford Hospital	Detroit
Henry Ford Macomb Hospital	Clinton Township
Henry Ford Wyandotte Hospital	Wyandotte
Huron Valley Sinai Hospital	Commerce Township
Lapeer Regional Medical Center	Lapeer
McLaren Regional Medical Center	Flint
Mercy Hospital - Cadillac	Cadillac
Mercy Hospital - Grayling	Grayling
Mount Clemens Regional Medical Center	Mount Clemens
Munson Medical Center	Traverse City
Oakwood Heritage Hospital	Taylor
Providence Hospital	Southfield
Saint John Macomb Hospital	Warren
<i>including:</i> Saint John Oakland Hospital	Madison Heights
Saint Mary Mercy Hospital	Livonia
Saint Mary's Health Care	Grand Rapids
Sinai - Grace Hospital	Detroit

\* Distinction cannot be used without a Licensing Agreement from Health Grades, Inc. Continued....



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HealthGrades 2010 Emergency Medicine Excellence Award™ Recipients*	City
<b>Minnesota</b>	
Fairview Southdale Hospital	Edina
North Memorial	Robbinsdale
Park Nicollet Methodist Hospital	Minneapolis
Regions Hospital	Saint Paul
Saint Lukes Hospital	Duluth
<b>Mississippi</b>	
<i>There are no recipients of this award in this state.</i>	
<b>Missouri</b>	
Barnes - Jewish Saint Peters Hospital	Cottleville
Missouri Baptist Medical Center	Saint Louis
Skaggs Regional Medical Center	Branson
SSM Saint Clare Health Center	Kirkwood
SSM Saint Joseph Health Center <i>including: SSM Saint Joseph Health Center - Wentzville</i>	Saint Charles Wentzville
SSM Saint Joseph Hospital West	Lake Saint Louis
<b>Montana</b>	
Benefis Health System	Great Falls
<b>Nebraska</b>	
<i>There are no recipients of this award in this state.</i>	
<b>Nevada</b>	
<i>There are no recipients of this award in this state.</i>	
<b>New Hampshire</b>	
<i>There are no recipients of this award in this state.</i>	
<b>New Jersey</b>	
Community Medical Center	Toms River
Monmouth Medical Center	Long Branch
Robert Wood Johnson University Hospital at Hamilton	Hamilton
<b>New Mexico</b>	
<i>There are no recipients of this award in this state.</i>	
<b>New York</b>	
<i>There are no recipients of this award in this state.</i>	
<b>North Carolina</b>	
Carolinas Medical Center - Union	Monroe
Gaston Memorial Hospital	Gastonia
Haywood Regional Medical Center	Clyde
Northern Hospital of Surry County	Mount Airy
Randolph Hospital	Asheboro
Rex Hospital	Raleigh
Stanly Regional Medical Center	Albemarle

\* Distinction cannot be used without a Licensing Agreement from Health Grades, Inc. Continued....

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HealthGrades 2010 Emergency Medicine Excellence Award™ Recipients*	City
<b>North Dakota</b>	
<i>There are no recipients of this award in this state.</i>	
<b>Ohio</b>	
Akron General Medical Center	Akron
Ashtabula County Medical Center	Ashtabula
Aultman Hospital	Canton
Bethesda North Hospital	Cincinnati
Christ Hospital	Cincinnati
EMH Regional Medical Center	Elyria
Euclid Hospital	Euclid
Fort Hamilton Hughes Memorial Hospital	Hamilton
Good Samaritan Hospital	Dayton
<i>including:</i> Dayton Heart and Vascular Hospital	Dayton
Good Samaritan Hospital	Cincinnati
Grandview Medical Center	Dayton
Hillcrest Hospital	Mayfield Heights
Huron Hospital	East Cleveland
Jewish Hospital	Cincinnati
Kettering Medical Center	Kettering
Marymount Hospital	Garfield Heights
Medical College of Ohio at Toledo	Toledo
Mercy Franciscan Hospital - Mount Airy	Cincinnati
Mercy Medical Center	Canton
Miami Valley Hospital	Dayton
Mount Carmel Health	Columbus
Northside Medical Center	Youngstown
Ohio State University Hospitals	Columbus
<i>including:</i> The Ohio State University Hospital East	Columbus
Parma Community General Hospital	Parma
Robinson Memorial Hospital	Ravenna
Saint Anne Mercy Hospital	Toledo
Saint Charles Mercy Hospital	Oregon
Saint Elizabeth Health Center	Youngstown
Saint Vincent Charity Hospital	Cleveland
South Pointe Hospital	Warrensville Heights
Southern Ohio Medical Center	Portsmouth
Southwest General Health Center	Middleburg Heights
Summa Akron City and St. Thomas Hospitals	Akron
Summa Barberton Hospital	Barberton

\* Distinction cannot be used without a Licensing Agreement from Health Grades, Inc. Continued....

HealthGrades 2010 Emergency Medicine Excellence Award™ Recipients*	City
<b>Ohio (continued)</b>	
Union Hospital	Dover
University Hospitals Bedford Medical Center	Bedford
Wooster Community Hospital	Wooster
<b>Oklahoma</b>	
<i>There are no recipients of this award in this state.</i>	
<b>Oregon</b>	
McKenzie - Willamette Medical Center	Springfield
Mercy Medical Center	Roseburg
Saint Charles Medical Center - Bend	Bend
<b>Pennsylvania</b>	
Easton Hospital	Easton
Evangelical Community Hospital	Lewisburg
Hamot Medical Center	Erie
Lehigh Valley Hospital	Allentown
Lehigh Valley Hospital - Muhlenberg	Bethlehem
Mercy Hospital Scranton	Scranton
Pocono Medical Center	East Stroudsburg
Saint Luke's Hospital	Bethlehem
<i>including:</i> Saint Luke's Hospital - Allentown	Allentown
The Western Pennsylvania Hospital - Forbes Regional	Monroeville
University of Pittsburgh Medical Center - McKeesport	McKeesport
<b>Rhode Island</b>	
<i>There are no recipients of this award in this state.</i>	
<b>South Carolina</b>	
Anmed Health	Anderson
<b>South Dakota</b>	
<i>There are no recipients of this award in this state.</i>	
<b>Tennessee</b>	
Baptist Memorial Hospital	Memphis
Methodist Medical Center of Oak Ridge	Oak Ridge
Vanderbilt University Hospital	Nashville
<b>Texas</b>	
Baptist Health System	San Antonio
<i>including:</i> Saint Lukes Lutheran Hospital	San Antonio
Cypress Fairbanks Medical Center	Houston
Doctors Hospital at Renaissance	Edinburg
East Texas Medical Center	Tyler
Houston Northwest Medical Center	Houston

\* Distinction cannot be used without a Licensing Agreement from Health Grades, Inc. Continued....

HealthGrades 2010 Emergency Medicine Excellence Award™ Recipients*	City
<b>Texas (continued)</b>	
Memorial Hermann Healthcare System - Southwest	Houston
<i>including:</i> Memorial Hermann Northwest	Houston
Memorial Hermann Southeast	Houston
Memorial Hermann the Woodlands Hospital	The Woodlands
Memorial Hermann Katy Hospital	Katy
Memorial Hermann Memorial City Hospital	Houston
Methodist Hospital	San Antonio
<i>including:</i> Methodist Specialty and Transplant Hospital	San Antonio
Metropolitan Methodist Hospital	San Antonio
Northeast Methodist Hospital	San Antonio
Methodist Sugar Land Hospital	Sugar Land
Mission Regional Medical Center	Mission
Mother Frances Hospital - Tyler	Tyler
Northwest Texas Healthcare System	Amarillo
Saint Lukes Episcopal Hospital	Houston
San Jacinto Methodist Hospital	Baytown
South Texas Health - Edinburg Regional Medical Center	Edinburg
<i>including:</i> South Texas Health - McAllen Medical Center/ Heart Hospital	McAllen
Texas Health Harris Methodist Hospital Fort Worth	Fort Worth
<b>Utah</b>	
Dixie Regional Medical Center - River Road	Saint George
<b>Vermont</b>	
<i>There are no recipients of this award in this state.</i>	
<b>Virginia</b>	
Augusta Health	Fishersville
Bon Secours Memorial Regional Medical Center	Mechanicsville
Bon Secours Saint Marys Hospital	Richmond
Inova Fairfax Hospital	Falls Church
Rockingham Memorial Hospital	Harrisonburg
<b>Washington</b>	
Providence Regional Medical Center Everett	Everett
<b>West Virginia</b>	
Greenbrier Valley Medical Center	Ronceverte
<b>Wisconsin</b>	
Aurora Saint Lukes Medical Center	Milwaukee
<i>including:</i> Saint Lukes Medical Center	Cudahy
Bellin Memorial Hospital	Green Bay
Gundersen Lutheran Medical Center	La Crosse

\* Distinction cannot be used without a Licensing Agreement from Health Grades, Inc. Continued....

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HealthGrades 2010 Emergency Medicine Excellence Award™ Recipients*	City
<b>Wisconsin (continued)</b>	
West Allis Memorial Hospital	West Allis
Wheaton Franciscan Healthcare - Saint Francis	Milwaukee
Wheaton Franciscan Healthcare All Saints - Spring Street	Racine
<i>including:</i> Wheaton Franciscan Healthcare All Saints - Wisconsin Avenue	Racine
<b>Wyoming</b>	
<i>There are no recipients of this award in this state.</i>	

\* Distinction cannot be used without a Licensing Agreement from Health Grades, Inc.

## Appendix B. Inhospital Mortality Performance Emergency Medicine Excellence Hospitals and All Other U.S. Hospitals

(EM Award Hospital = Emergency Medicine Excellence Hospitals)

Diagnosis	Year	Total Number of Medicare Hospitalizations Admitted Through Emergency Department	Emergency Medicine Excellence Award Hospitals Observed-to-Expected Inhospital Mortality Ratio	% Improvement by Emergency Medicine Excellence Award Hospitals <sup>1</sup>	All Other U.S. Hospitals Observed-to-Expected Inhospital Mortality Ratio	% Improvement by All Other Hospitals <sup>2</sup>	Relative Risk Reduction Associated with Emergency Medicine Excellence Award Hospitals Compared to All Other U.S. Hospitals <sup>3</sup>	Number of Lives that could have been Saved if All Patients were Treated at Emergency Medicine Excellence Award Hospitals (2006-2008) <sup>4</sup>	P-Value (EM Award Hospital Mortality Compared to National Mortality Average)
Bowel Obstruction	2006	111,493	.70		1.09				<.001
	2007	110,869	.61		1.04				<.001
	2008	115,509	.65		1.05				<.001
	2006-2008	337,871	.65	7.97%	1.06	3.19%	38.66%	3,768	<.001
Chronic Obstructive Pulmonary Disease (COPD)	2006	236,686	.65		1.21				<.001
	2007	231,206	.54		1.11				<.001
	2008	278,725	.53		.96				<.001
	2006-2008	746,617	.57	18.29%	1.08	20.66%	47.14%	6,384	<.001
Diabetic Acidosis and Coma	2006	39,161	.62		1.05				<.001
	2007	39,655	.43		1.13				<.001
	2008	40,379	.51		1.11				<.001
	2006-2008	119,195	.52	18.09%	1.10	-6.53%	52.48%	933	<.001
Gastrointestinal Bleed	2006	192,118	.75		1.18				<.001
	2007	188,477	.65		1.03				<.001
	2008	184,558	.61		1.00				<.001
	2006-2008	565,153	.67	19.58%	1.07	15.24%	37.61%	3,932	<.001
Heart Attack	2006	155,906	.89		1.09				<.001
	2007	152,363	.81		1.03				<.001
	2008	153,467	.74		1.00				<.001
	2006-2008	461,736	.81	17.56%	1.04	8.30%	21.65%	9,350	<.001
Pancreatitis	2006	39,234	.62		1.13				<.001
	2007	37,921	.62		1.13				<.001
	2008	36,651	.63		.99				<.001
	2006-2008	113,806	.62	-12%	1.08	12.92%	42.60%	1,123	<.001

Continued....



Diagnosis	Year	Total Number of Medicare Hospitalizations Admitted Through Emergency Department	Emergency Medicine Excellence Award Hospitals Observed-to-Expected Inhospital Mortality Ratio	% Improvement by Emergency Medicine Excellence Award Hospitals <sup>1</sup>	All Other U.S. Hospitals Observed-to-Expected Inhospital Mortality Ratio	% Improvement by All Other Hospitals <sup>2</sup>	Relative Risk Reduction Associated with Emergency Medicine Excellence Award Hospitals Compared to All Other U.S. Hospitals <sup>3</sup>	Number of Lives that could have been Saved if All Patients were Treated at Emergency Medicine Excellence Award Hospitals (2006-2008) <sup>4</sup>	P-Value (EM Award Hospital Mortality Compared to National Mortality Average)
Pneumonia	2006	379,513	.68		1.15				<.001
	2007	363,576	.59		1.04				<.001
	2008	337,866	.55		1.01				<.001
	2006-2008	1,080,955	.61	19.67%	1.07	11.60%	43.22%	21,540	<.001
Pulmonary Embolism	2006	36,522	.73		1.21				<.001
	2007	38,419	.58		1.10				<.001
	2008	37,992	.57		1.01				<.001
	2006-2008	112,933	.62	21.96%	1.10	15.95%	43.70%	1,984	<.001
Respiratory Failure	2006	112,883	.80		1.12				<.001
	2007	113,173	.73		1.07				<.001
	2008	123,247	.65		1.01				<.001
	2006-2008	349,303	.73	18.19%	1.07	9.79%	31.76%	19,807	<.001
Sepsis	2006	203,382	.80		1.13				<.001
	2007	215,730	.73		1.07				<.001
	2008	242,744	.69		1.01				<.001
	2006-2008	661,856	.73	14.12%	1.06	11.25%	31.17%	36,849	<.001
Stroke	2006	175,136	.72		1.14				<.001
	2007	168,615	.65		1.08				<.001
	2008	165,454	.61		1.01				<.001
	2006-2008	509,205	.66	15.78%	1.08	11.40%	38.68%	12,344	<.001
<b>Totals</b>		<b>5,058,630</b>						<b>118,014</b>	
<b>3-Year Performance Averages</b>			<b>0.65</b>	<b>15.55%</b>	<b>1.07</b>	<b>10.34%</b>	<b>38.97%</b>		

<sup>1</sup> Percent improvement is the improvement over time (2006 through 2008) for aggregate EM Award hospitals. Calculated as follows: (O/E for 2006 – O/E for 2008) / (O/E for 2006) where the O/E is for the EM Award hospitals.

<sup>2</sup> Percent improvement is the improvement over time (2006 through 2008) for aggregate Non-EM Award hospitals. Calculated as follows: (O/E for 2006 – O/E for 2008) / (O/E for 2006) where the O/E is for the Non-EM Award hospitals.

<sup>3</sup> Relative Risk Reduction determines the difference in performance between EM Award and All Other hospitals. Calculated as follows using the 2006-2008 values: (Non-EM Award O/E – EM Award O/E) / Non-EM Award O/E.

<sup>4</sup> Lives saved were calculated: All Other hospitals' 3-year actual number of mortalities – (All Other hospitals' 3-year expected number of mortalities x EM Award 3-year O/E ratio).

### Appendix C. Emergency Room Admissions by Cohort by Year

Diagnosis	Year	Cases Admitted through Emergency Department	All Hospital Admissions	Percent of Admissions through Emergency Department	Percent Increase 2006 to 2008
Bowel Obstruction	2006	111,493	150,810	73.93%	
	2007	110,869	147,947	74.94%	
	2008	115,509	153,394	75.30%	1.86%
	2006-2008	337,871	452,151	74.73%	
Chronic Obstructive Pulmonary Disease	2006	236,686	329,033	71.93%	
	2007	231,206	316,165	73.13%	
	2008	278,725	373,110	74.70%	3.85%
	2006-2008	746,617	1,018,308	73.32%	
Diabetic Acidosis and Coma	2006	39,161	54,085	72.41%	
	2007	39,655	53,600	73.98%	
	2008	40,379	54,759	73.74%	1.84%
	2006-2008	119,195	162,444	73.38%	
Gastrointestinal Bleed	2006	192,118	261,394	73.50%	
	2007	188,477	251,910	74.82%	
	2008	184,558	245,583	75.15%	2.25%
	2006-2008	565,153	758,887	74.47%	
Heart Attack	2006	155,906	244,954	63.65%	
	2007	152,363	233,731	65.19%	
	2008	153,467	232,202	66.09%	3.84%
	2006-2008	461,736	710,887	64.95%	
Pancreatitis	2006	39,234	50,316	77.98%	
	2007	37,921	48,368	78.40%	
	2008	36,651	46,423	78.95%	1.25%
	2006-2008	113,806	145,107	78.43%	
Pneumonia	2006	379,513	513,531	73.90%	
	2007	363,576	484,840	74.99%	
	2008	337,866	454,662	74.31%	0.55%
	2006-2008	1,080,955	1,453,033	74.39%	
Pulmonary Embolism	2006	36,522	50,618	72.15%	
	2007	38,419	52,464	73.23%	
	2008	37,992	51,252	74.13%	2.74%
	2006-2008	112,933	154,334	73.17%	
Respiratory Failure	2006	112,883	144,514	78.11%	
	2007	113,173	143,122	79.07%	
	2008	123,247	157,129	78.44%	0.42%
	2006-2008	349,303	444,765	78.54%	
Sepsis	2006	203,382	257,026	79.13%	
	2007	215,730	269,596	80.02%	
	2008	242,744	309,808	78.35%	-0.98%
	2006-2008	661,856	836,430	79.13%	
Stroke	2006	175,136	220,937	79.27%	
	2007	168,615	210,085	80.26%	
	2008	165,454	206,846	79.99%	0.91%
	2006-2008	509,205	637,868	79.83%	
Overall	2006	1,682,034	2,277,218	73.86%	
	2008	1,716,592	2,285,168	75.12%	1.70%

## Appendix D. Emergency Medicine Admissions and Mortality Observed-to-Expected by State

State / Abbreviation		All Hospital Admissions in Cohorts Studied	Emergency Admissions Actual Mortality	Emergency Admissions Predicted Mortality	Cases Admitted through Emergency Department	Percent of Admissions through Emergency Department	Observed/Expected Ratio Emergency Admissions	State Rank by Percentage of Emergency Department Admissions
Alabama	AL	136,952	7,547	5,952	81,603	59.59%	1.27	4
Alaska	AK	7,307	432	356	5,736	78.50%	1.21	40
Arizona	AZ	90,165	4,468	5,534	75,077	83.27%	0.81	45
Arkansas	AR	91,169	4,682	3,912	56,907	62.42%	1.20	6
California	CA	465,671	32,184	33,261	345,750	74.25%	0.97	31
Colorado	CO	59,276	2,688	3,006	44,277	74.70%	0.89	32
Connecticut	CT	91,939	6,468	6,605	79,112	86.05%	0.98	49
Delaware	DE	23,405	1,541	1,694	20,706	88.47%	0.91	50
Dist. Of Columbia	DC	16,710	1,066	973	11,683	69.92%	1.10	19
Florida	FL	460,135	29,344	32,207	388,902	84.52%	0.91	47
Georgia	GA	190,615	11,952	11,042	135,071	70.86%	1.08	22
Hawaii	HI	16,372	1,313	1,036	11,929	72.86%	1.27	29
Idaho	ID	22,689	1,154	929	15,666	69.05%	1.24	17
Illinois	IL	331,835	18,172	19,756	256,403	77.27%	0.92	37
Indiana	IN	184,106	8,789	9,342	127,745	69.39%	0.94	18
Iowa	IA	88,599	3,297	3,634	55,589	62.74%	0.91	7
Kansas	KS	74,759	2,921	2,798	43,152	57.72%	1.04	3
Kentucky	KY	156,019	7,514	7,621	101,961	65.35%	0.99	9
Louisiana	LA	114,425	6,612	5,888	76,564	66.91%	1.12	12
Maine	ME	40,484	2,158	2,042	29,213	72.16%	1.06	24
Maryland	MD	139,273	7,741	8,960	89,013	63.91%	0.86	8
Massachusetts	MA	153,100	7,675	7,330	108,768	71.04%	1.05	23
Michigan	MI	274,323	14,650	17,226	221,693	80.81%	0.85	42
Minnesota	MN	93,304	3,758	4,285	64,088	68.69%	0.88	15
Mississippi	MS	88,080	5,219	3,913	57,904	65.74%	1.33	11
Missouri	MO	171,387	9,216	9,216	120,368	70.23%	1.00	20
Montana	MT	24,361	948	870	15,960	65.51%	1.09	10
Nebraska	NE	45,510	1,630	1,351	23,076	50.71%	1.21	2
Nevada	NV	38,618	3,372	3,191	33,020	85.50%	1.06	48
New Hampshire	NH	30,177	1,391	1,259	21,263	70.46%	1.10	21
New Jersey	NJ	223,852	16,257	15,496	184,568	82.45%	1.05	44
New Mexico	NM	30,688	1,598	1,441	21,160	68.95%	1.11	16
New York	NY	407,972	36,118	30,267	341,981	83.82%	1.19	46
North Carolina	NC	224,907	13,973	12,627	162,317	72.17%	1.11	25
North Dakota	ND	21,360	754	829	12,750	59.69%	0.91	5

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 Appendix D: Emergency Medicine Mortality Observed-to-Expected by State

State / Abbreviation		All Hospital Admissions in Cohorts Studied	Emergency Admissions Actual Mortality	Emergency Admissions Predicted Mortality	Cases Admitted through Emergency Department	Percent of Admissions through Emergency Department	Observed/Expected Ratio Emergency Admissions	State Rank by Percentage of Emergency Department Admissions
Ohio	OH	318,593	14,992	18,689	245,266	76.98%	0.80	36
Oklahoma	OK	103,852	5,675	4,702	71,220	68.58%	1.21	14
Oregon	OR	55,005	3,191	3,137	43,002	78.18%	1.02	39
Pennsylvania	PA	319,248	18,275	18,645	249,195	78.06%	0.98	38
Rhode Island	RI	21,377	1,550	1,337	18,957	88.68%	1.16	51
South Carolina	SC	110,240	6,926	5,854	74,559	67.63%	1.18	13
South Dakota	SD	23,225	713	666	11,483	49.44%	1.07	1
Tennessee	TN	192,410	11,594	10,790	139,049	72.27%	1.07	26
Texas	TX	470,526	27,996	29,569	353,496	75.13%	0.95	34
Utah	UT	29,487	1,372	1,584	22,060	74.81%	0.87	33
Vermont	VT	13,723	642	521	10,017	72.99%	1.23	30
Virginia	VA	178,239	12,172	12,256	144,844	81.26%	0.99	43
Washington	WA	103,791	6,546	6,964	83,121	80.08%	0.94	41
West Virginia	WV	75,467	4,566	4,044	57,249	75.86%	1.13	35
Wisconsin	WI	118,595	5,221	5,691	86,249	72.73%	0.92	28
Wyoming	WY	10,892	499	400	7,888	72.42%	1.25	27