# After Hospitalization:

## A Dartmouth Atlas Report on Post-Acute Care for Medicare Beneficiaries

*A Report of the Dartmouth Atlas Project*

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## Executive summary

This is the first national report to look at how effectively communities and hospitals coordinate care for some of their sickest patients—those leaving the hospital after a stay to treat an acute or chronic illness. Without high-quality care coordination, patients can bounce from home to the emergency room and back into the hospital, sometimes repeatedly. Hospital readmission rates are increasingly seen as markers of local health care systems' ability to coordinate care for patients across the full continuum of care settings: hospitals, rehabilitation and skilled nursing facilities, nursing homes, clinician offices, hospice and home. Better care coordination promises to reduce readmission rates and improve patients' lives while reducing costs.

Improving care coordination for patients is also important to Medicare and to hospitals. Medicare patients returning to the hospital shortly after they are discharged impose an enormous cost to Medicare that could be avoided with better post-discharge care. In its patient safety and quality initiative, the Centers for Medicare and Medicaid Services has estimated the cost of avoidable readmissions at more than $17 billion a year.[1] Medicare plans to reduce payments for readmissions, exposing hospitals to considerable financial risks. In fiscal year 2013, hospitals face a penalty equal to 1% of their total Medicare billings if an excessive number of patients are readmitted. The penalty rises to 2% in 2014 and 3% in 2015.

This Dartmouth Atlas report reveals striking variation in 30-day readmission rates across hospital referral regions and academic medical centers. Little progress was seen in reducing readmission rates over the five-year period 2004 to 2009. In fact, for some conditions, readmission rates have increased for the nation and for many regions and hospitals.

Early follow-up with clinicians (e.g., physicians, nurse practitioners and physician assistants) fell short in most regions of the country and at most hospitals. A significant proportion of Medicare patients discharged to home did not see a clinician within 14 days of discharge. Rates of emergency room visits after discharge varied up to twofold across regions and academic medical centers, suggesting that many health care systems have important opportunities to develop alternatives to emergent care.

While most efforts to reduce readmissions have focused on specific processes of care, we found that an important factor associated with higher readmission rates was the overall intensity of inpatient care provided to patients within a region or hospital. That is, places with a pattern of relatively high use of hospitals for medical conditions in general were frequently the same places with high readmission rates. This suggests that improving care for these elderly patients will also require attention to the overall systems of care in a community, including the supply of inpatient and outpatient resources.

Care coordination needs to be a continuous process that begins before illness warrants hospitalization, continues when hospitalization is necessary, and seamlessly moves back into the community. For many patients, particularly for those with chronic illness, the episode of care has no definite end. Innovations in care coordination need to further develop lifelong models of longitudinal care.

## Introduction

Medicare patients over age 65 are admitted to the hospital over nine million times annually.[2] Almost one in five of these patients are readmitted within a month of discharge.[1] These readmissions are often a sign of inadequate discharge planning, poor care coordination between hospital and community clinicians, and the lack of effective longitudinal community-based care. The additional hospital stays imply that many patients are getting sicker, not better, after their initial discharge. Other patients are readmitted simply because they live in a locale where the hospital is used more frequently as a site of care. Irrespective of the cause, these readmissions lead to more tests and treatments, more time away from home and family, and higher health care costs.

A hospitalization marks an important point in the course of a patient's health care experience. While the primary objective during a hospitalization is to treat a patient's immediate health problem, it is also an opportunity for reassessing and resetting care plans to keep patients well after discharge. Medical hospital admissions (e.g., hospitalizations for pneumonia, heart attacks, etc.) among the elderly are usually caused by the acute worsening of longstanding, sometimes hidden, chronic illness. Chronic disease is also the cause of most surgical admissions, such as joint replacement for osteoarthritis or heart surgery for coronary artery disease.

These illnesses do not begin or end at the hospital door. As the largest and most comprehensive providers of health care services, hospitals are increasingly seen as one of the most important potential foci of accountability for care of patient populations that should extend beyond the hospital walls to include community providers and caregivers.

The recognition of hospitals' central role in patients' care has grown during the past two decades along with the evidence that many patients do not do well after hospital discharge. Many patients are readmitted within 30 days and even more are readmitted within one year.[1] Readmission rates for some common causes of hospitalization, such as congestive heart failure, have increased even as lengths of stay and mortality rates have fallen.[3] Some of these readmissions are difficult to prevent. New and unexpected problems can occur that require immediate hospital care. Other readmissions are scheduled for planned procedures to complete a patient's treatment. But many readmissions can be prevented.

What are the problems with care that lead to more hospital stays? The list is long. Some patients leave the hospital with a treatment plan for one illness when other problems should also be addressed. Many patients are discharged without understanding their illnesses or treatment plans, or inadvertently discontinue important medicines needed to stay well.[4] Family caregivers are frequently not included in discharge planning, even though they may be central caregivers to the patient. At other times, the many physicians involved in a patient's hospital care fail

to develop a coordinated plan for post-discharge care. Patients may not have the right prescriptions or be able to fill them. Appointments with primary care clinicians or with specialists may not occur soon enough after discharge. Information about a patient's hospital course does not always go to the appropriate community clinicians. Most important is the lack of clarity about who is responsible following discharge; accountability is scattered among hospital staff, community physicians and nurses, rehabilitation facility staff and families. With these gaps in care, problems that could be prevented are missed, leading to avoidable emergency room visits and repeat hospitalizations.

Recent efforts to address problems in discharge planning and care transitions are proceeding along three fronts. The first is better measurement of the problem. Numerous research studies have already identified the extent of readmissions and some of the contributing factors. The Centers for Medicare and Medicaid Services (CMS) has also started publishing 30-day readmission rates following common medical hospitalizations.[5] The second is to improve care through better discharge planning and care coordination. There are several specific interventions that have been shown to improve patient outcomes—including readmission rates—at least in the short term, although their effectiveness when widely implemented is less certain.[6,7,8,9] And the third is to change financial incentives to reward hospitals with lower readmission rates. The Patient Protection and Affordable Care Act requires the development of programs to reduce readmissions, and CMS will begin to penalize hospitals in fiscal year 2012 that fail to meet set readmission standards.[10]

This Dartmouth Atlas report presents variation and recent changes in the care of Medicare patients after they are discharged from the hospital for medical and surgical conditions. The findings highlight the relative progress in improving the care of patients with serious illness and the challenges that still remain. Several important aspects of post-discharge care are featured. We report on variation and changes in 30-day readmission rates from 2004 to 2009, the percent of patients visiting a primary care clinician or any clinician within two weeks after discharge, and the percent having an emergency room visit within one month. These findings are reported for the nation's 306 hospital referral regions and for 94 academic medical centers that represent some of the very best hospitals in the United States. To help understand the extent of problems with discharge planning and care coordination, we examine six Medicare patient populations: those discharged for medical conditions, for surgical conditions, for hip fracture (a serious injury that is more likely in the frail elderly), and for three common causes of medical hospitalization—congestive heart failure, heart attacks (i.e., acute myocardial infarctions) and pneumonia.

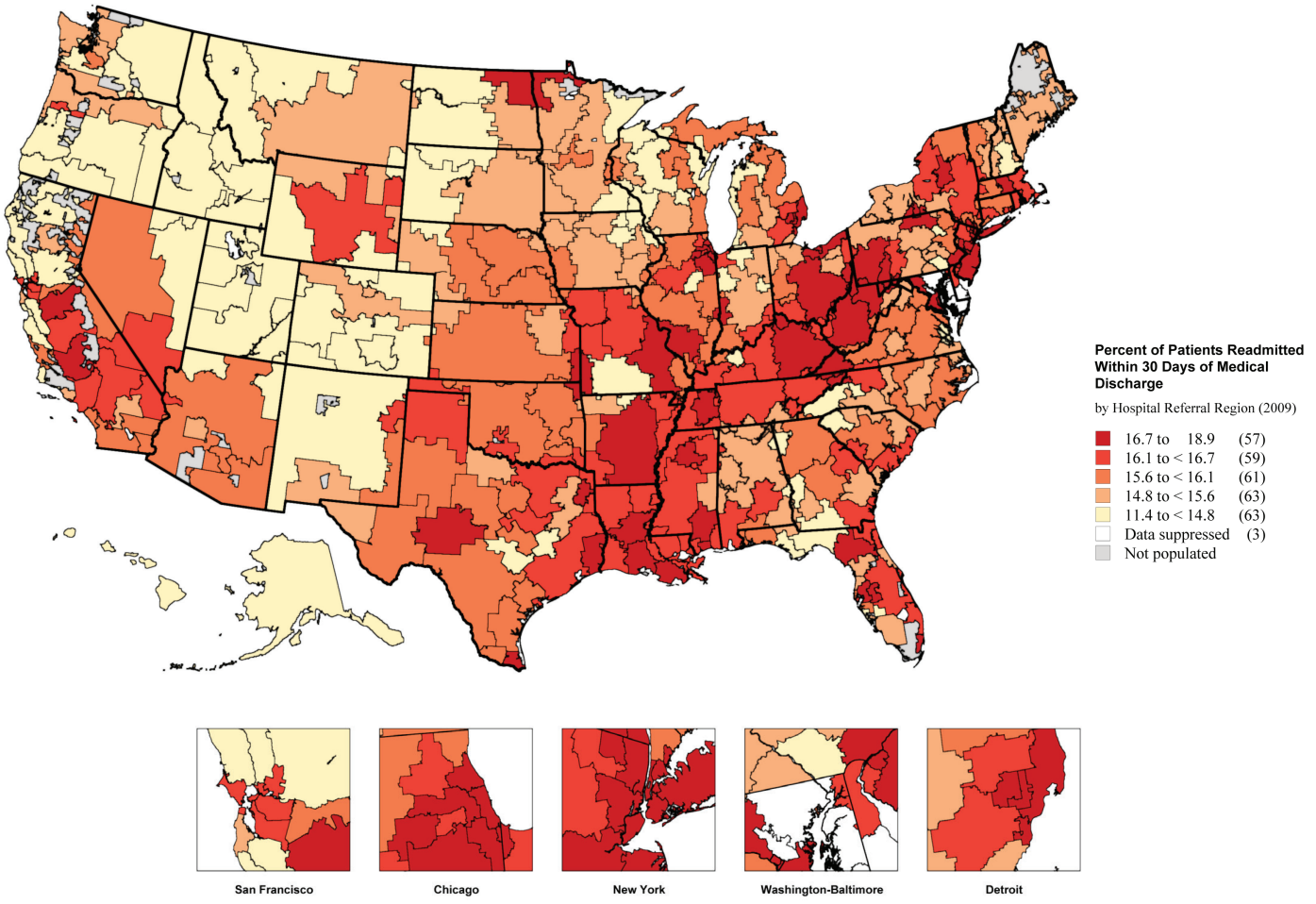
Our findings show that there are pervasive problems with patient care after hospital discharge. Specific regions and hospital can use this report, and the extensive database provided on the Dartmouth Atlas web site (www.dartmouthatlas.org), to better understand the opportunities to improve the care of Medicare beneficiaries after they leave the hospital. Data are available for hospital referral regions and for more than 1,900 hospitals, as well as counties and states.

# Findings

## Regional variation in 30-day readmission rates

Hospital readmissions are sentinel events that often signal gaps in the quality of care provided to Medicare patients. There are many different reasons for higher readmission rates across certain regions and hospitals, including differences in patient health status, the quality of inpatient care, discharge planning and care coordination prior to discharge, and the availability and effectiveness of ambulatory services in the community. This report also demonstrates the importance of the general tendency of health care systems to use the hospital as a site of care. The combination of these factors will differ across communities and systems as each faces its own challenges in keeping patients well and out of the hospital.

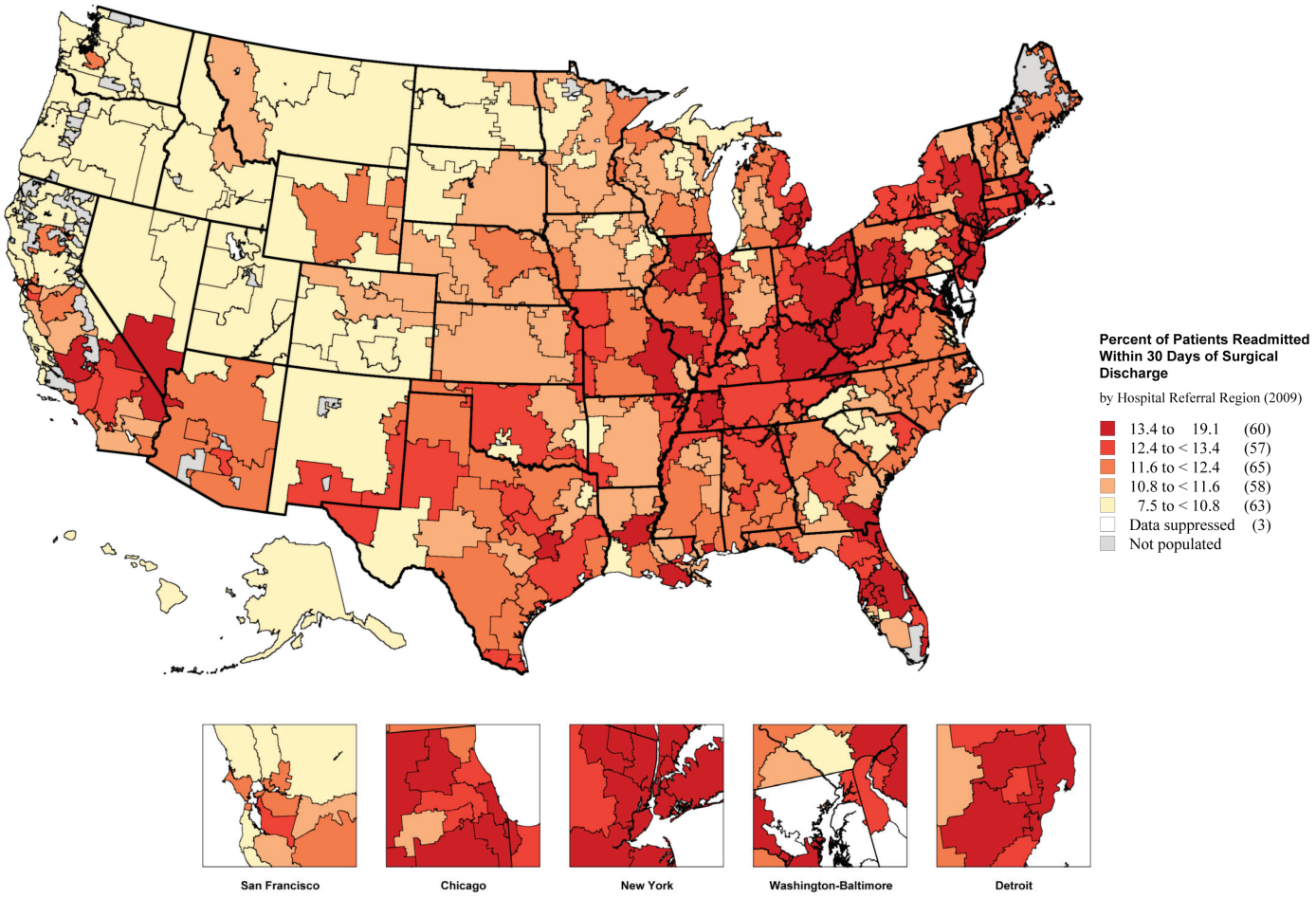
In 2009, there was marked variation in the percent of patients readmitted to the hospital within 30 days of an initial discharge (Table 1). Map 1 and Map 2 show the




**Map 1. Percent of patients readmitted within 30 days following medical discharge among hospital referral regions (2009)**

extent of the variation for medical and surgical discharges. Among the 306 hospital referral regions (HRRs) in the U.S., 30-day readmission rates following medical discharge ranged from 11.5% in Ogden, Utah to 18.9% in Pontiac, Michigan. The other two Utah regions—Provo (13.0%) and Salt Lake City (13.6%)—also had relatively low rates. Readmission rates were also high in other eastern Michigan regions, including the Royal Oak (18.8%), Dearborn (18.0%) and Detroit (17.9%) HRRs (Map 1). The U.S. average was 16.1%.

Thirty-day readmission rates following surgical discharge varied more than twofold, from 7.5% in Rapid City, South Dakota to 19.0% in the Bronx. Other HRRs with rates below 10% included Boise, Idaho (9.1%), Medford, Oregon (9.3%), Spokane, Washington (9.7%) and Salt Lake City (9.8%). Readmission rates following surgery were more than twice as high in other regions in the New York City area, including White Plains (17.4%), Manhattan (17.0%) and East Long Island (16.7%) (Map 2). The U.S. average was 12.7%.




**Map 2. Percent of patients readmitted within 30 days following surgical discharge among hospital referral regions (2009)**

Because of the way hospitals are paid under Medicare in Maryland, readmissions to hospital-owned rehabilitation and psychiatric facilities were counted as readmissions to acute care hospitals in claims data before 2010. This adversely impacted the 30-day readmission rates for Maryland HRRs. Readmission rates for Maryland HRRs have been suppressed. For more information, see http://www.hospitalcompare.hhs.gov/staticpages/for-professionals/ooc/calculation-of-30-day-risk.aspx.

Hip fracture is one of the few causes of hospitalization with very low regional and hospital variation in admission rates, because the diagnosis is certain and the hospital is almost always the site of treatment. Illness levels are much more homogeneous in hip fracture patients than in other hospitalized patient cohorts across regions.[11] Table 1 shows that even with this relatively similar illness level, patients discharged for hip fracture had as high variation in readmission rates as those discharged for medical and surgical hospitalizations.

**Table 1. Patterns of variation in 30-day readmission rates following discharge for six causes of hospitalization among hospital referral regions (2009)**

| Condition | N HRRs | Median among HRRs | Interquartile ratio | Extremal ratio | Coefficient of variation |
|---|---|---|---|---|---|
| **Medical** | 306 | 15.8 | 1.10 | 1.66 | 0.07 |
| **CHF** | 299 | 20.7 | 1.15 | 2.31 | 0.12 |
| **AMI** | 257 | 18.2 | 1.24 | 3.04 | 0.16 |
| **Pneumonia** | 299 | 15.3 | 1.20 | 2.83 | 0.13 |
| **Hip fracture** | 245 | 14.1 | 1.29 | 4.55 | 0.20 |
| **Surgical** | 306 | 12.0 | 1.17 | 2.84 | 0.14 |

CHF = congestive heart failure. AMI = acute myocardial infarction (heart attack). Column two gives the number of hospital referral regions with a sufficient number of patients and events to report statistically stable rates. Column three gives the median: the HRR with the middle value (50th percentile) when ordering HRRs from lowest to highest. Column four gives the interquartile ratio: the value for the HRR at the 75th percentile divided by the value for the HRR at the 25th percentile, showing the extent of variation between the highest and lowest quartile. Column five gives the extremal ratio: the highest value divided by the lowest value, showing the variation between the extremes. Column six gives the coefficient of variation, which shows the extent of variation by dividing the standard deviation by the mean HRR value. For the three ratios, a higher value means more variation.

## MAKING FAIR COMPARISONS ACROSS REGIONS AND HOSPITALS

Readers of this report are cautioned that efforts to draw firm conclusions about the causes of specific differences in readmission rates among hospitals or regions—or of changes over time—are challenged by the multiple factors that can influence inpatient severity of illness, the settings to which patients are discharged, and the effectiveness of post-discharge care coordination. It is also important to recognize that readmission rates and early follow-up visits are only indirect measures of the effectiveness of care coordination. Better measures, such as patient reports of their care experiences or health outcomes, are not yet widely available.

We adjusted our analyses for differences in age, sex and race, but did not further control for differences in case mix because of evidence that currently available measures of illness levels are highly influenced by local diagnostic and clinical practices. Patients who receive more care, regardless of underlying health status, have more opportunities for diagnosis and will therefore appear sicker in claims data.[12,13] Even so, studies that have examined regional variation in readmission rates, including published CMS data,[5] have consistently found that much of the variation cannot be explained by differences in patient populations. Comparisons over time reduce the likelihood that change in population health status explains a change in readmission rates, because each place is compared against itself, and rapid changes in local health status or admission thresholds are relatively unlikely.

The assumption that high readmission rates are always bad and that high rates of early follow-up are always good does not acknowledge the complex nature of patient care. For example, if the physicians in a region or health care system perform a higher proportion of surgical procedures in outpatient facilities, the remaining inpatient surgical patients will be likely to have higher severity of illness and, thus, higher risk of readmission. Whether patients are discharged to an inpatient rehabilitation or skilled nursing facility may influence how likely they are to be readmitted to the hospital; and health care systems that have implemented care transition models using telephone follow-up may have lower rates of early ambulatory clinician visits while still providing excellent care.

Nevertheless, prior research has documented the failings of current care coordination and the high proportion of readmissions (and admissions) that can be avoided by improving care, even in communities with the lowest hospitalization rates in the country.[14] This report underscores how little progress has been made in the U.S. overall and in most regions of the country—and suggests that there is a lot of room to improve in almost every community.

## Correlation in 30-day readmission rates across patient cohorts

Thirty-day readmission rates were correlated among all six cohorts, demonstrating that, in general, regions with high readmission rates for one type of hospitalization also had high readmission rates for the others (Table 2). Figure 1 shows the relationship between 30-day readmission rates following discharge for medical and surgical hospitalizations. These correlations indicate that there may be common system-level factors within a region influencing readmission rates, independent of particular illnesses or chronic conditions.

**Table 2. The relationships between 30-day readmission rates following discharge for six causes of hospitalization among hospital referral regions (2009)**

| Condition | Surgical | | | |
|---|---|---|---|---|
| Medical | 0.70 | | | |
| CHF | 0.50 | CHF | | |
| AMI | 0.59 | 0.43 | AMI | |
| Pneumonia | 0.49 | 0.40 | 0.38 | Pneumonia |
| Hip fracture | 0.73 | 0.43 | 0.48 | 0.49 |

The value represents the correlation (Pearson r) between 30-day readmission rates for each pair. All P values < 0.0001.

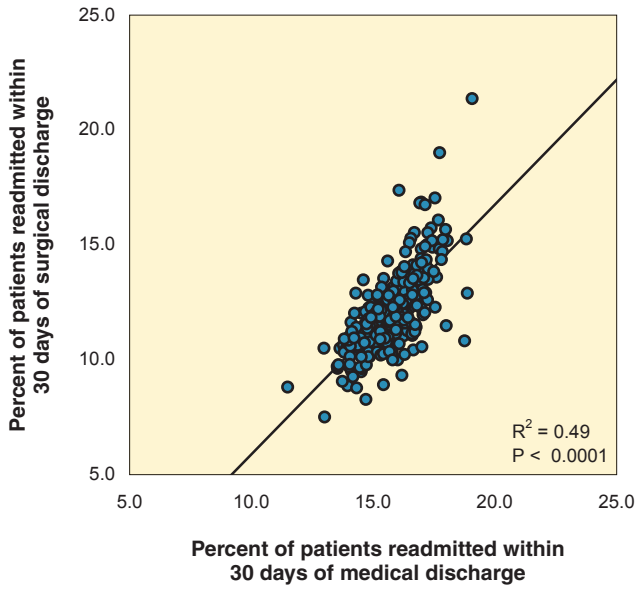



**Figure 1. The relationship between 30-day readmission rates following medical and surgical discharges among hospital referral regions (2009)**

There was a strong relationship between 30-day readmission rates following discharge for medical and surgical conditions ($R^2$ = 0.49). In general, regions with high readmission rates following medical discharge also had high rates for surgical discharges.

## What factors beyond discharge planning and care coordination cause hospital readmissions?

The causes of hospital readmissions are complex and not completely understood. Variables include patient illness level; communication with patients and families; reconciliation of medications; coordination with community clinicians and non-acute care facilities; and the availability of longitudinal post-hospital care that can recognize problems early and work towards their resolution. While all of these factors can affect patient outcomes and readmissions, the relative importance of each is poorly understood.

One powerful—and poorly recognized—influence on readmission rates is the local pattern of hospital utilization, irrespective of discharge planning and care coordination. Communities and health care systems that have higher underlying admission rates tend to have higher readmission rates, suggesting that they are more likely to rely on the hospital as a site of care.[15]

The relationship between underlying admission rates and readmission rates is evident in Figures 2 and 3. Thirty-seven percent of the variation in 30-day readmission rates following discharge for medical hospitalizations in 2009 was explained by overall medical discharge rates (even when the medical discharge rate was calculated for a different time period — 2004). Similarly 31% of the variation in readmission rates after surgical hospitalization in 2009 was explained by *medical* discharge rates in 2004 (Figure 2).[i]

[i] The $R^2$ value is an indication of the strength of the correlation between two variables. For example, if the $R^2$ association between overall medical discharge rates and 30-day readmission rates is 0.37, that means that 37% of the variation in readmission rates can be explained by the underlying admission rate.

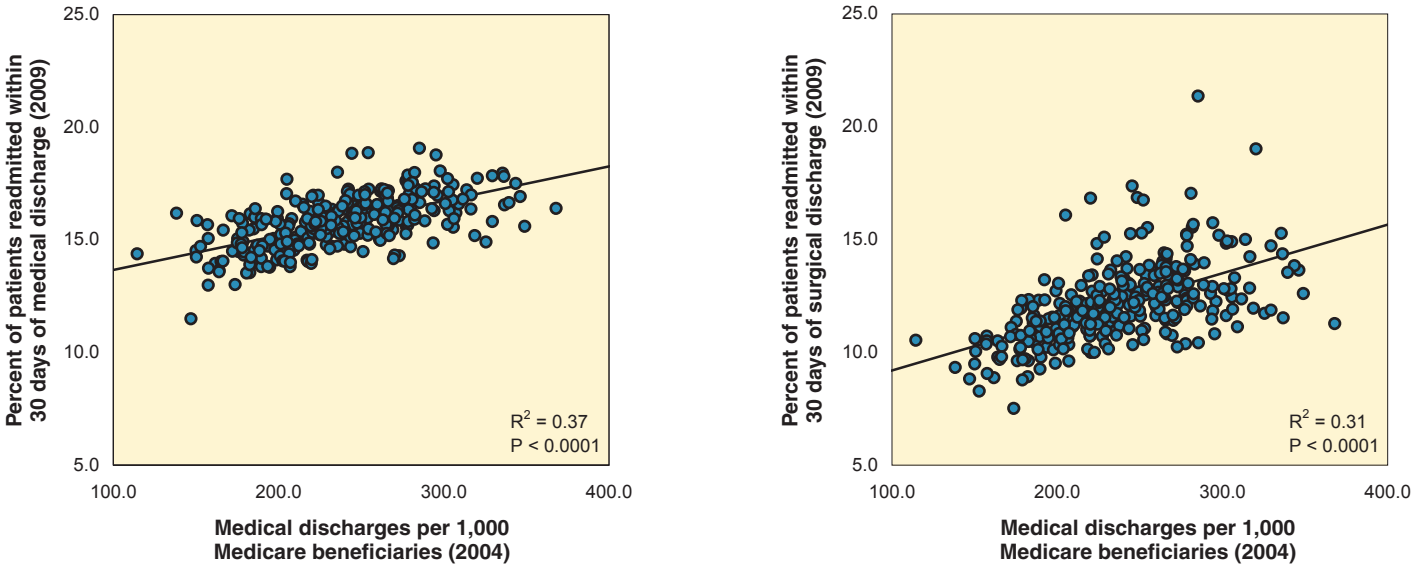



**Figure 2. The relationship between medical discharges per 1,000 Medicare beneficiaries (2004) and 30-day readmission rates for medical and surgical discharges among hospital referral regions (2009)**

Could the relationship between admission rates and readmission rates simply reflect that some places care for sicker patients? Patient populations do differ across regions and hospitals, but the general intensity of inpatient care provided, irrespective of illness, is still strongly associated with readmission rates. Figure 3 shows that there was a strong association between 30-day readmission rates following medical and surgical discharge in 2009 and the number of days patients with chronic illness dying between 2003 and 2007 spent in the hospital during their last six months of life. The health status of end-of-life patients differed little by region, given that all of the patients had the same outcome, and that the cohorts were adjusted for age, sex, race and chronic illness mix. These correlations suggest the strong, and often hidden, effects that regional patterns of hospital care can have on readmissions. Other studies have shown that the effects of regional and hospital inpatient care intensity on post-discharge care extend to outpatient as well as inpatient services, without evidence of better care quality or a mortality benefit.[11]

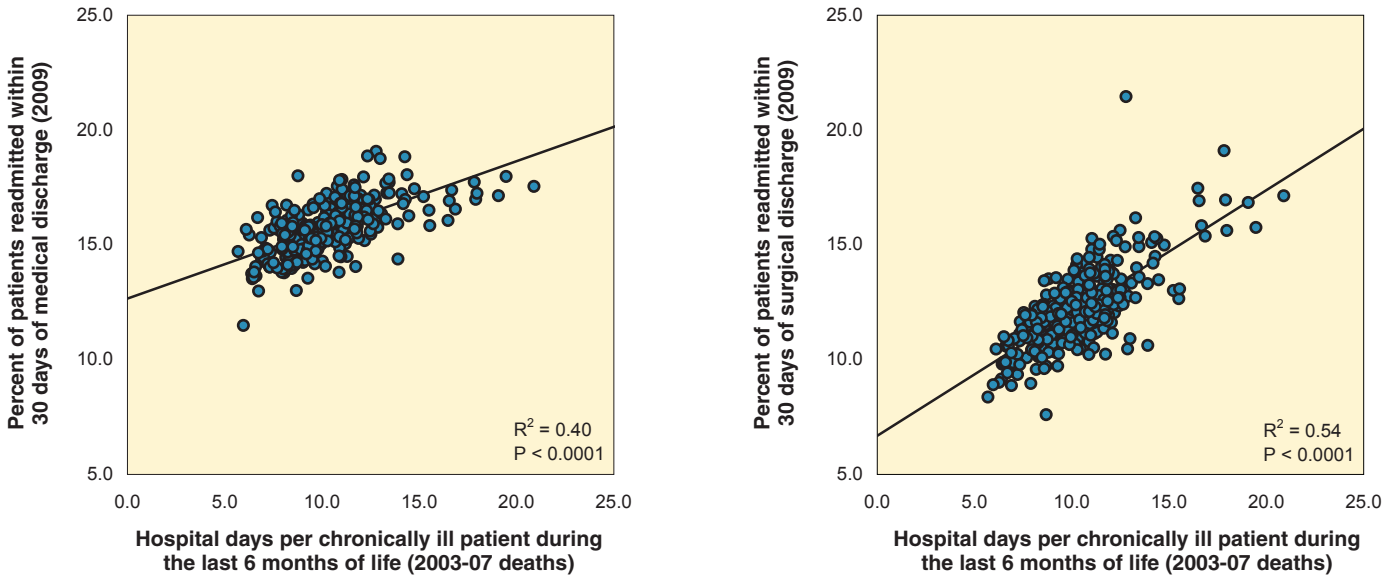


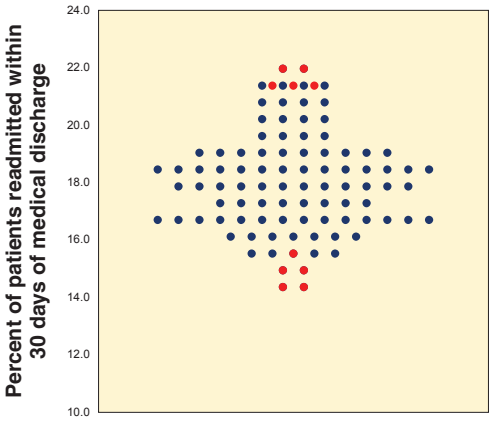

**Figure 3. The relationship between the average number of days spent in hospital per chronically ill patient during the last six months of life (deaths occurring 2003-07) and 30-day readmission rates following medical and surgical discharges among hospital referral regions (2009)**

## Variation in 30-day readmission rates across academic medical centers

Academic medical centers (i.e., teaching hospitals) are the nation's foremost health care systems, leading the nation in research, adoption of novel medical and surgical technologies, and teaching new generations of clinicians. While academic medical centers provide some of the best care in the country, previous Dartmouth Atlas reports have shown that they vary as much as community hospitals in the quality, efficiency and outcomes of patient care.

We found a high degree of variation in 30-day readmission rates at 94 academic medical centers, selected because they are major teaching hospitals affiliated with medical schools.[ii] Less than 15% of patients were readmitted within 30 days following medical discharge at two academic medical centers in western New York: Strong Memorial Hospital (14.1%), affiliated with the University of Rochester, and Kaleida Health (14.1%), affiliated with the State University of New York at Buffalo. At least 20% of patients were readmitted within 30 days of medical discharge at 13 academic medical centers, including the University of Medicine and Dentistry of New Jersey Hospital in Newark (22.3%) and the University of Minnesota Medical Center in Minneapolis (22.2%) (Figure 4). Following surgical discharge, at least 20% of patients were readmitted within 30 days at two academic medical centers: Hahnemann University Hospital in Philadelphia (20.6%) and Ohio State University Medical Center in Columbus (20.1%). Rates were much lower at Stanford Hospital and Clinics in California (10.6%) and Fletcher Allen Health Care in Burlington, Vermont (10.9%) (Figure 5).

[ii] Because of the way hospitals are paid under Medicare in Maryland, readmissions to hospital-owned rehabilitation and psychiatric facilities were counted as readmissions to acute care hospitals in claims data before 2010. This adversely impacted the 30-day readmission rates for Maryland hospitals. Readmission rates for Maryland hospitals have been suppressed. For more information, see http://www.hospitalcompare.hhs.gov/staticpages/for-professionals/ooc/calculation-of-30-day-risk.aspx

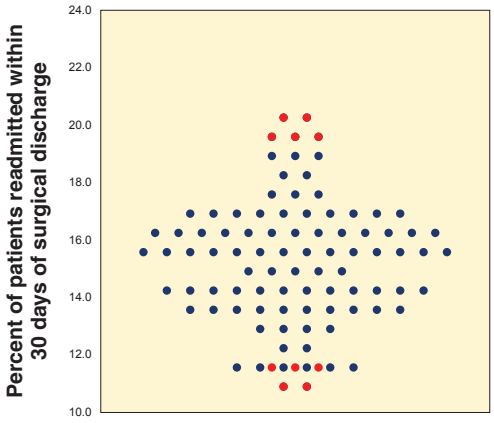



| | |
|---|---|
| UMDNJ University Hospital | 22.3 |
| University of Minnesota Med Ctr | 22.2 |
| MUSC Medical Center | 21.5 |
| Cleveland Clinic Foundation | 21.3 |
| St. Louis University Hospital | 21.1 |
| Fletcher Allen Health Care | 15.3 |
| University of Utah Health Care | 15.2 |
| UC Davis Medical Center | 15.1 |
| Kaleida Health | 14.1 |
| Strong Memorial Hospital | 14.1 |

**Figure 4. Percent of patients readmitted within 30 days following medical discharge among academic medical centers (2009)**

Each blue dot represents one of 94 academic medical centers. Red dots indicate the five academic medical centers with the highest rates and the five with the lowest rates.

The causes of the variation in 30-day readmission rates across academic medical centers are as diverse as those driving regional variation. Some of this variation is expected, due to differences in patient populations and to care patterns that may keep less ill patients out of the hospital initially. Nevertheless, some of this variation represents opportunities for improving care that may lead to fewer hospital days and better outcomes.




| | |
|---|---|
| Hahnemann University Hospital | 20.6 |
| Ohio State University Med Ctr | 20.1 |
| University Hospital-Cincinnati | 19.8 |
| St. Louis University Hospital | 19.7 |
| Montefiore Medical Center | 19.4 |
| Penn State Hershey Med Ctr | 11.6 |
| Loma Linda University Med Ctr | 11.4 |
| Oklahoma University Med Ctr | 11.3 |
| Fletcher Allen Health Care | 10.9 |
| Stanford Hospital and Clinics | 10.6 |

**Figure 5. Percent of patients readmitted within 30 days following surgical discharge among academic medical centers (2009)**

Each blue dot represents one of 94 academic medical centers. Red dots indicate the five academic medical centers with the highest rates and the five with the lowest rates.

## Trends in 30-day readmission rates

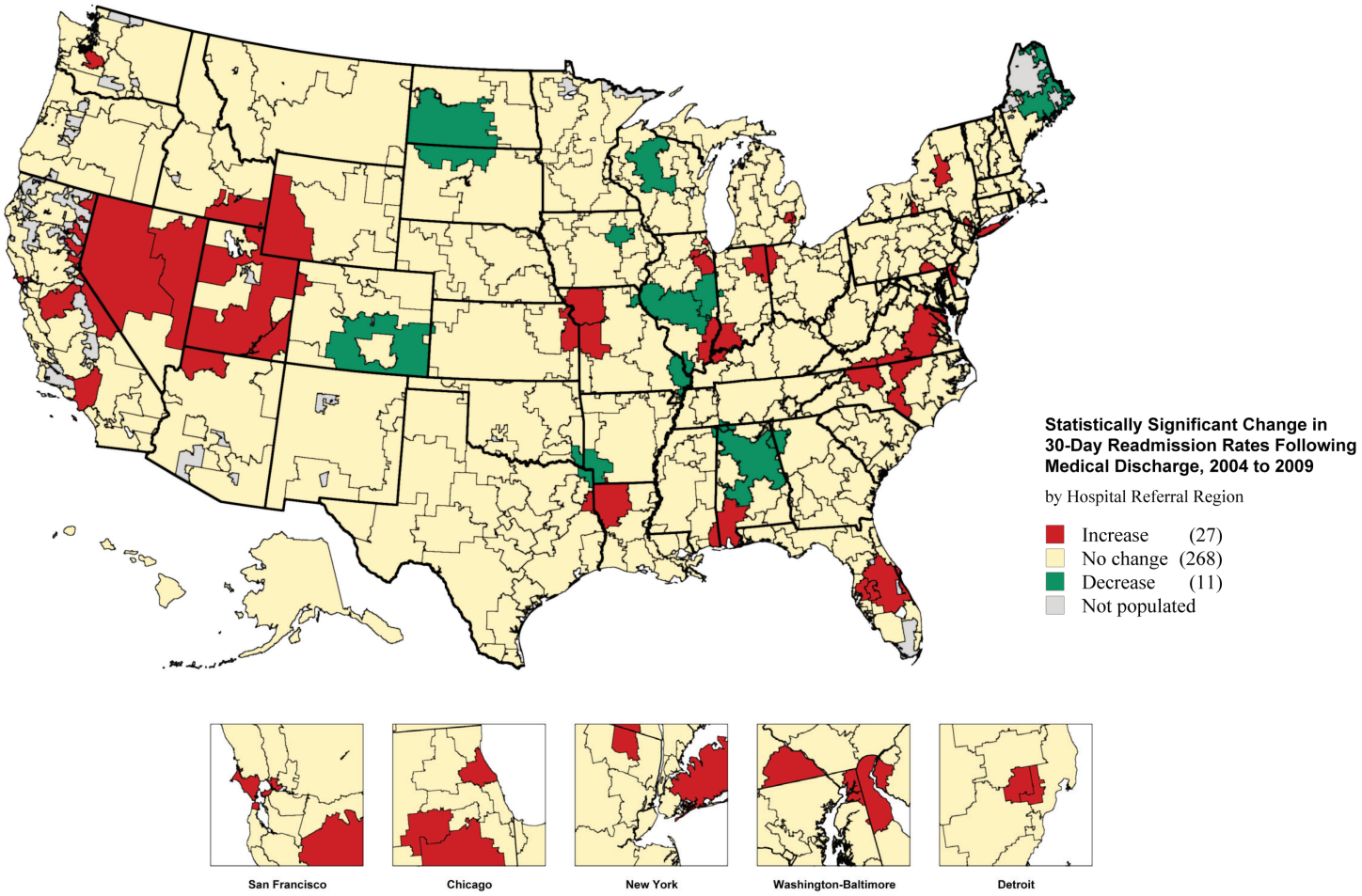
The general problems of high readmission rates and poor care coordination, as well as the variations across regions and hospitals, have been known for many years. In this section we examine whether hospitals and clinicians were successful in addressing this long-standing problem over a five-year period, 2004 to 2009. Overall, improvement has been slow and inconsistent. No change was observed for most regions and hospitals.

### *National trends*

There was little change in U.S. 30-day readmission rates, regardless of the cause of the initial hospitalization (Table 3). Surgical 30-day readmission rates were 12.7% in both 2004 and 2009, while medical 30-day readmission rates were 15.9% in 2004 and rose slightly to 16.1% in 2009. Readmission rates for hip fractures (14.3% versus 14.5%), congestive heart failure (20.9% versus 21.2%) and pneumonia (15.1% versus 15.3%) barely changed. Only readmission rates for acute myocardial infarctions improved somewhat, decreasing from 19.4% to 18.5%.

**Table 3. Change in 30-day readmission rates following discharge for six causes of hospitalization, 2004 to 2009**

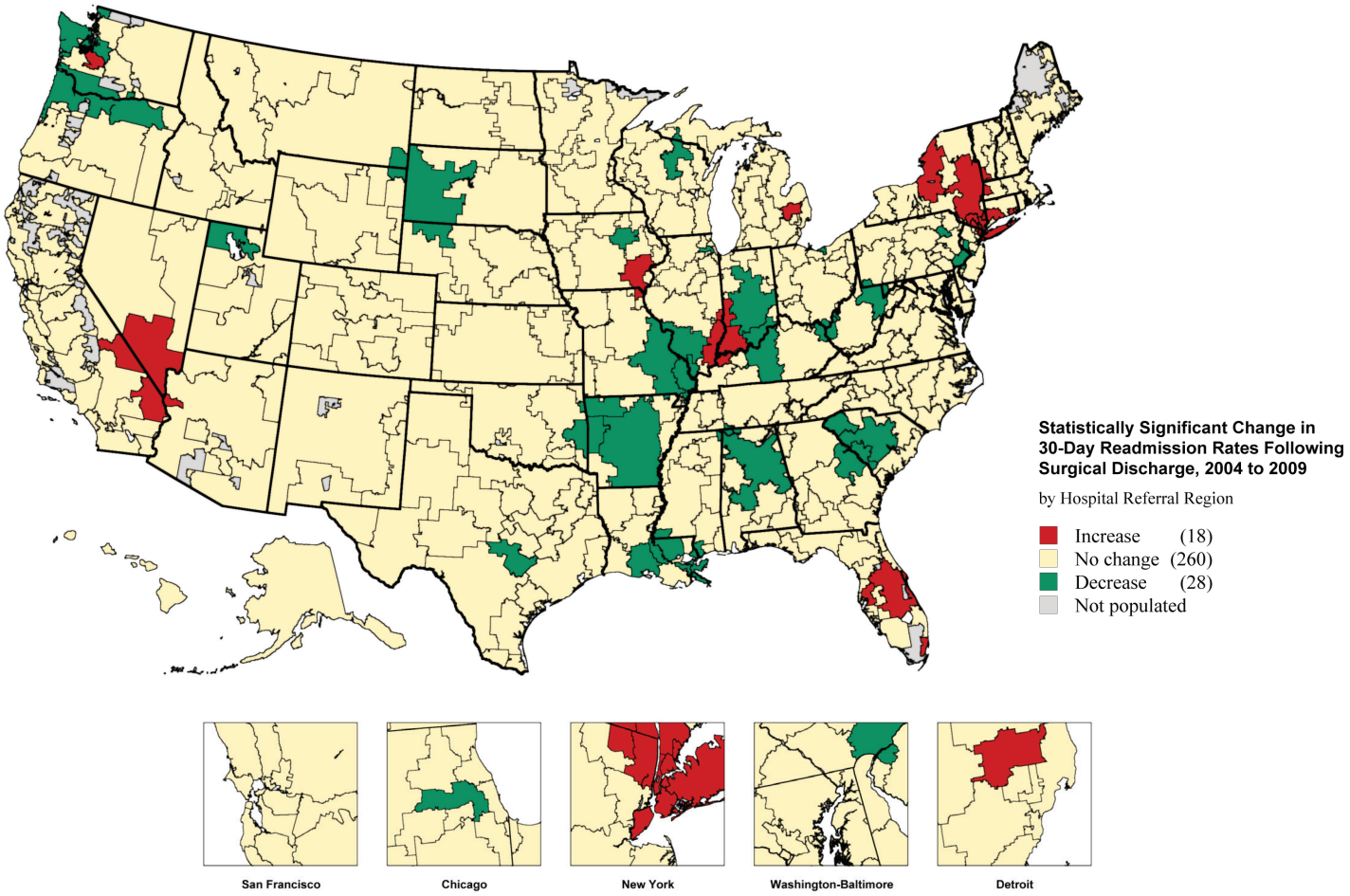
| Condition | % Readmission | | Relative change (%) | Absolute change (%) |
|---|---|---|---|---|
| | 2004 | 2009 | | |
| Medical | 15.9 | 16.1 | 1.2 | < 0.5 |
| CHF | 20.9 | 21.2 | 1.4 | < 0.5 |
| AMI | 19.4 | 18.5 | -4.6 | -0.9 |
| Pneumonia | 15.1 | 15.3 | 1.7 | < 0.5 |
| Hip fracture | 14.3 | 14.5 | 1.4 | < 0.5 |
| Surgical | 12.7 | 12.7 | < 0.5 | < 0.5 |




**Map 3. Absolute change in 30-day readmission rates following medical discharge among hospital referral regions, 2004 to 2009**

### *Trends in 30-day readmission rates by hospital referral region*

In most HRRs there was little change from 2004 to 2009 in 30-day readmission rates after discharge from the hospital for a medical admission. In 11 of the 306 regions, the readmission rate decreased, with a range of absolute decrease from 2.3 percentage points—from 16.3% (in 2004) to 14.0% (in 2009) in Bismarck, North Dakota—to less than one percentage point in Birmingham, Alabama (16.4% to 15.6%). Readmission rates increased in 27 regions, with a range of absolute increase from less than 0.5 in Los Angeles (16.1% to 16.5%) to 3.7 percentage points in Aurora, Illinois (14.3% to 18.0%) (Map 3).




**Map 4. Absolute change in 30-day readmission rates following surgical discharge among hospital referral regions, 2004 to 2009**

Similarly, there was little change from 2004 to 2009 in 30-day readmission rates following discharge from the hospital after surgery. In 28 of the 306 regions, the readmission rate decreased, with a range of absolute decrease from 3.8 percentage points in Elyria, Ohio (19.0% to 15.2%) to 0.6 in Philadelphia (14.7% to 14.1%). Readmission rates increased in 18 regions, with a range of absolute increase from 0.7 in Orlando, Florida (13.1% to 13.8%) to 4.4 percentage points in White Plains, New York (13.0% to 17.4%) (Map 4).

The relative rank of HRRs from 2004 to 2009 changed little. Regions with high readmission rates in 2004 were generally the same regions with high readmission rates in 2009 (Figure 6).

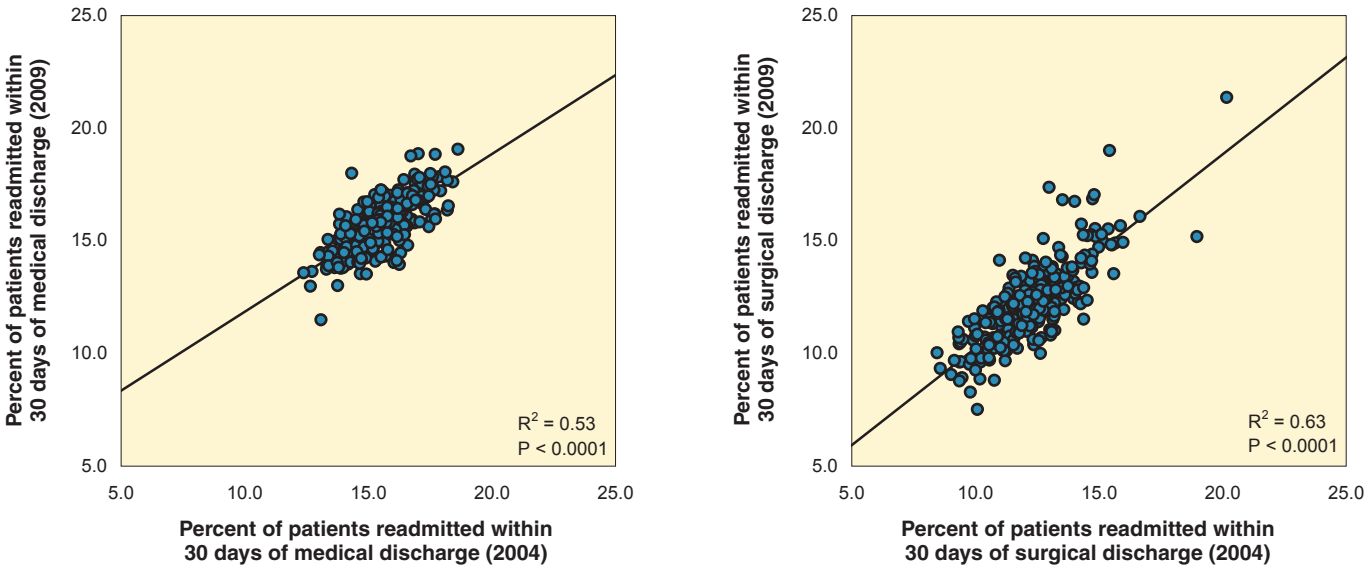



**Figure 6. The relationship between 30-day readmission rates in 2004 and 2009 among hospital referral regions**

***Trends in 30-day readmission rates at academic medical centers***

We found that academic medical centers made limited and uneven progress in improving care over the five-year study period. These findings suggest that even some of the largest and most technologically sophisticated hospitals in the country face considerable challenges in improving care for the elderly.

Only seven of the 94 academic medical centers we studied had statistically significant changes in 30-day readmission rates following medical discharge from 2004 to 2009. The readmission rate decreased more than three percentage points at Northwestern Memorial Hospital in Chicago, from 19.9% in 2004 to 16.7% in 2009. The rate also decreased at the University of Michigan Hospitals in Ann Arbor, from 20.0% to 17.4% (2.6 percentage points). Readmission rates increased by more than four percentage points at the University of Connecticut Health Center in Farmington (13.1% to 17.9%) and Nebraska Medical Center in Omaha (14.8% to 19.4%) (Figure 7).

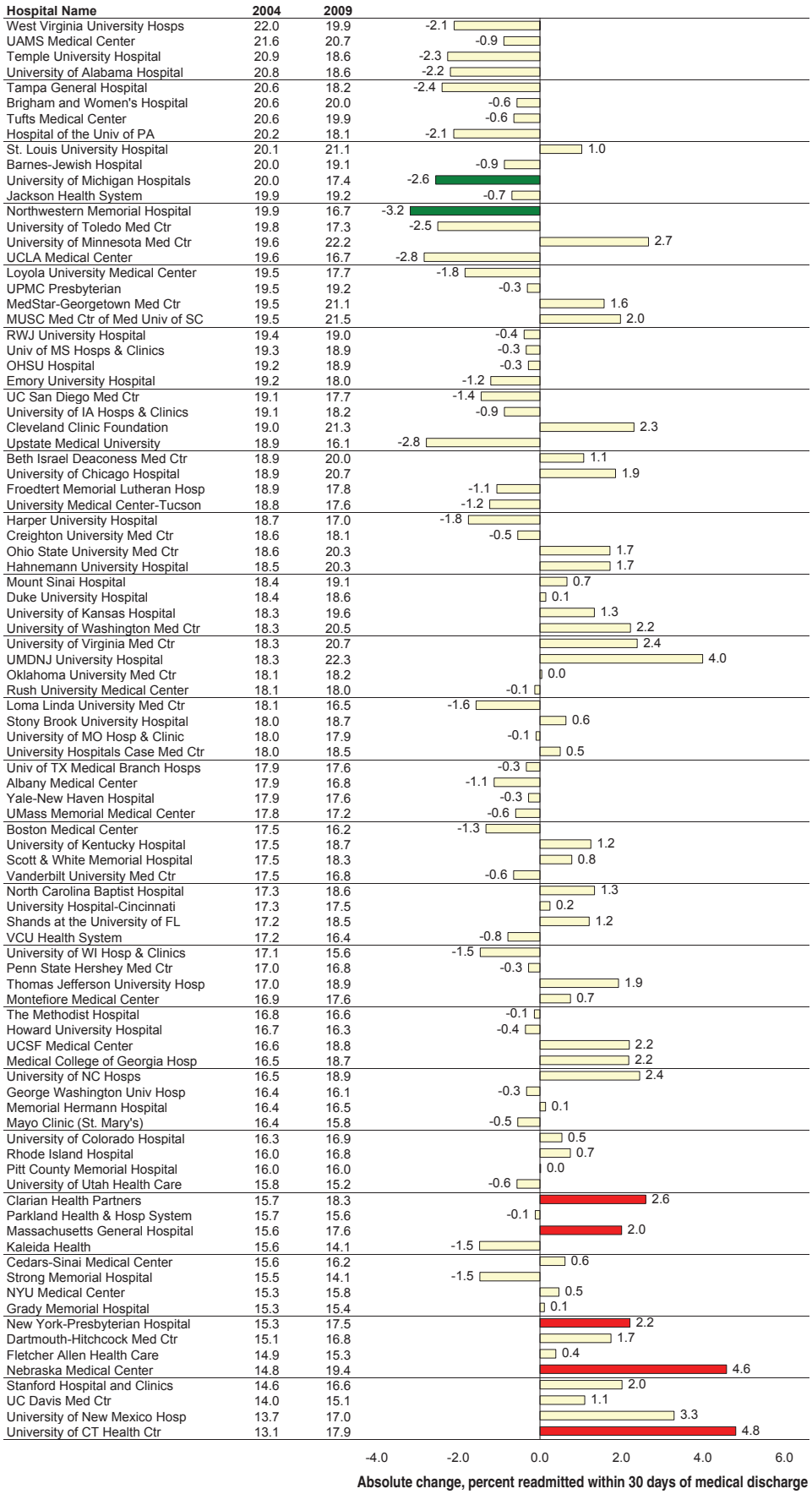
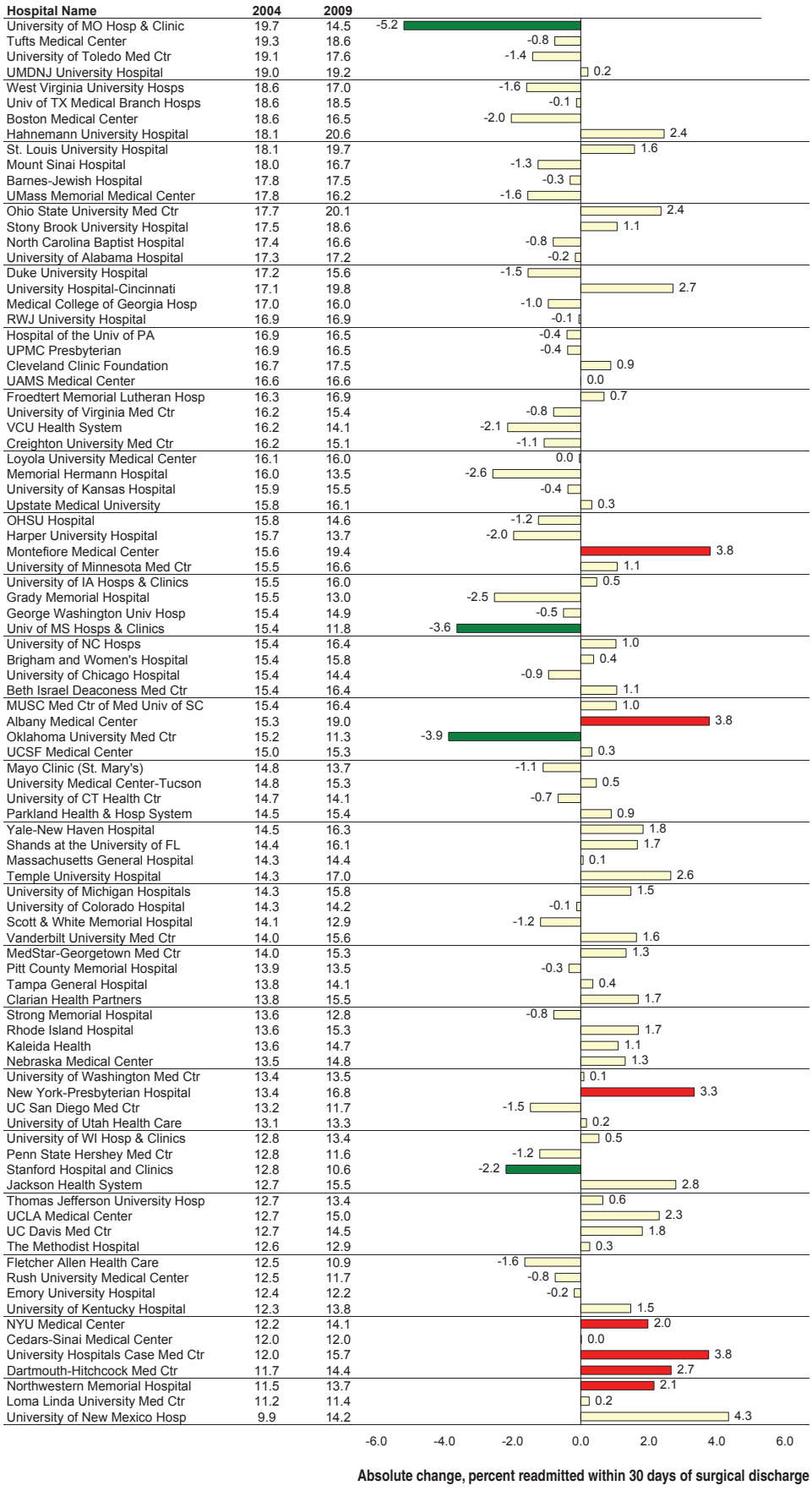



**Figure 7. Change in 30-day readmission rates following medical discharge among academic medical centers, 2004 to 2009**

Each bar represents one of 94 academic medical centers. Red bars indicate a statistically significant increase in readmission rates; green bars indicate a statistically significant decrease.



| Hospital Name | 2004 | 2009 | Change |
|---|---|---|---|
| University of MO Hosp & Clinic | 19.7 | 14.5 | -5.2 |
| Tufts Medical Center | 19.3 | 18.6 | -0.8 |
| University of Toledo Med Ctr | 19.1 | 17.6 | -1.4 |
| UMDNJ University Hospital | 19.0 | 19.2 | 0.2 |
| West Virginia University Hosps | 18.6 | 17.0 | -1.6 |
| Univ of TX Medical Branch Hosps | 18.6 | 18.5 | -0.1 |
| Boston Medical Center | 18.6 | 16.5 | -2.0 |
| Hahnemann University Hospital | 18.1 | 20.6 | 2.4 |
| St. Louis University Hospital | 18.1 | 19.7 | 1.6 |
| Mount Sinai Hospital | 18.0 | 16.7 | -1.3 |
| Barnes-Jewish Hospital | 17.8 | 17.5 | -0.3 |
| UMass Memorial Medical Center | 17.8 | 16.2 | -1.6 |
| Ohio State University Med Ctr | 17.7 | 20.1 | 2.4 |
| Stony Brook University Hospital | 17.5 | 18.6 | 1.1 |
| North Carolina Baptist Hospital | 17.4 | 16.6 | -0.8 |
| University of Alabama Hospital | 17.3 | 17.2 | -0.2 |
| Duke University Hospital | 17.2 | 15.6 | -1.5 |
| University Hospital-Cincinnati | 17.1 | 19.8 | 2.7 |
| Medical College of Georgia Hosp | 17.0 | 16.0 | -1.0 |
| RWJ University Hospital | 16.9 | 16.9 | -0.1 |
| Hospital of the Univ of PA | 16.9 | 16.5 | -0.4 |
| UPMC Presbyterian | 16.9 | 16.5 | -0.4 |
| Cleveland Clinic Foundation | 16.7 | 17.5 | 0.9 |
| UAMS Medical Center | 16.6 | 16.6 | 0.0 |
| Froedtert Memorial Lutheran Hosp | 16.3 | 16.9 | 0.7 |
| University of Virginia Med Ctr | 16.2 | 15.4 | -0.8 |
| VCU Health System | 16.2 | 14.1 | -2.1 |
| Creighton University Med Ctr | 16.2 | 15.1 | -1.1 |
| Loyola University Medical Center | 16.1 | 16.0 | 0.0 |
| Memorial Hermann Hospital | 16.0 | 13.5 | -2.6 |
| University of Kansas Hospital | 15.9 | 15.5 | -0.4 |
| Upstate Medical University | 15.8 | 16.1 | 0.3 |
| OHSU Hospital | 15.8 | 14.6 | -1.2 |
| Harper University Hospital | 15.7 | 13.7 | -2.0 |
| Montefiore Medical Center | 15.6 | 19.4 | 3.8 |
| University of Minnesota Med Ctr | 15.5 | 16.6 | 1.1 |
| University of IA Hosps & Clinics | 15.5 | 16.0 | 0.5 |
| Grady Memorial Hospital | 15.5 | 13.0 | -2.5 |
| George Washington Univ Hosp | 15.4 | 14.9 | -0.5 |
| Univ of MS Hosps & Clinics | 15.4 | 11.8 | -3.6 |
| University of NC Hosps | 15.4 | 16.4 | 1.0 |
| Brigham and Women's Hospital | 15.4 | 15.8 | 0.4 |
| University of Chicago Hospital | 15.4 | 14.4 | -0.9 |
| Beth Israel Deaconess Med Ctr | 15.4 | 16.4 | 1.1 |
| MUSC Med Ctr of Med Univ of SC | 15.4 | 16.4 | 1.0 |
| Albany Medical Center | 15.3 | 19.0 | 3.8 |
| Oklahoma University Med Ctr | 15.2 | 11.3 | -3.9 |
| UCSF Medical Center | 15.0 | 15.3 | 0.3 |
| Mayo Clinic (St. Mary's) | 14.8 | 13.7 | -1.1 |
| University Medical Center-Tucson | 14.8 | 15.3 | 0.5 |
| University of CT Health Ctr | 14.7 | 14.1 | -0.7 |
| Parkland Health & Hosp System | 14.5 | 15.4 | 0.9 |
| Yale-New Haven Hospital | 14.5 | 16.3 | 1.8 |
| Shands at the University of FL | 14.4 | 16.1 | 1.7 |
| Massachusetts General Hospital | 14.3 | 14.4 | 0.1 |
| Temple University Hospital | 14.3 | 17.0 | 2.6 |
| University of Michigan Hospitals | 14.3 | 15.8 | 1.5 |
| University of Colorado Hospital | 14.3 | 14.2 | -0.1 |
| Scott & White Memorial Hospital | 14.1 | 12.9 | -1.2 |
| Vanderbilt University Med Ctr | 14.0 | 15.6 | 1.6 |
| MedStar-Georgetown Med Ctr | 14.0 | 15.3 | 1.3 |
| Pitt County Memorial Hospital | 13.9 | 13.5 | -0.3 |
| Tampa General Hospital | 13.8 | 14.1 | 0.4 |
| Clarian Health Partners | 13.8 | 15.5 | 1.7 |
| Strong Memorial Hospital | 13.6 | 12.8 | -0.8 |
| Rhode Island Hospital | 13.6 | 15.3 | 1.7 |
| Kaleida Health | 13.6 | 14.7 | 1.1 |
| Nebraska Medical Center | 13.5 | 14.8 | 1.3 |
| University of Washington Med Ctr | 13.4 | 13.5 | 0.1 |
| New York-Presbyterian Hospital | 13.4 | 16.8 | 3.3 |
| UC San Diego Med Ctr | 13.2 | 11.7 | -1.5 |
| University of Utah Health Care | 13.1 | 13.3 | 0.2 |
| University of WI Hosp & Clinics | 12.8 | 13.4 | 0.5 |
| Penn State Hershey Med Ctr | 12.8 | 11.6 | -1.2 |
| Stanford Hospital and Clinics | 12.8 | 10.6 | -2.2 |
| Jackson Health System | 12.7 | 15.5 | 2.8 |
| Thomas Jefferson University Hosp | 12.7 | 13.4 | 0.6 |
| UCLA Medical Center | 12.7 | 15.0 | 2.3 |
| UC Davis Med Ctr | 12.7 | 14.5 | 1.8 |
| The Methodist Hospital | 12.6 | 12.9 | 0.3 |
| Fletcher Allen Health Care | 12.5 | 10.9 | -1.6 |
| Rush University Medical Center | 12.5 | 11.7 | -0.8 |
| Emory University Hospital | 12.4 | 12.2 | -0.2 |
| University of Kentucky Hospital | 12.3 | 13.8 | 1.5 |
| NYU Medical Center | 12.2 | 14.1 | 2.0 |
| Cedars-Sinai Medical Center | 12.0 | 12.0 | 0.0 |
| University Hospitals Case Med Ctr | 12.0 | 15.7 | 3.8 |
| Dartmouth-Hitchcock Med Ctr | 11.7 | 14.4 | 2.7 |
| Northwestern Memorial Hospital | 11.5 | 13.7 | 2.1 |
| Loma Linda University Med Ctr | 11.2 | 11.4 | 0.2 |
| University of New Mexico Hosp | 9.9 | 14.2 | 4.3 |



**Figure 8. Change in 30-day readmission rates following surgical discharge among academic medical centers, 2004 to 2009**

Each bar represents one of 94 academic medical centers. Red bars indicate a statistically significant increase in readmission rates; green bars indicate a statistically significant decrease.

Eleven academic medical centers had statistically significant changes in 30-day readmission rates following discharge from the hospital after surgery between 2004 and 2009. The readmission rate decreased by more than five percentage points at the University of Missouri Hospital and Clinic in Columbia, from 19.7% of patients in 2004 to 14.5% in 2009. Oklahoma University Medical Center in Oklahoma City, the University of Mississippi Hospitals and Clinics in Jackson, and Stanford Hospital and Clinics in California saw decreases of more than two percentage points. The readmission rate increased by nearly four percentage points at Montefiore Medical Center in the Bronx (15.6% to 19.4%), Albany Medical Center in Albany, New York (15.3% to 19.0%) and University Hospitals Case Medical Center in Cleveland (12.0% to 15.7%) (Figure 8).

## Early physician follow-up after discharge for medical and surgical hospitalizations

Several research studies have shown that patients who are hospitalized for medical conditions, such as congestive heart failure and chronic obstructive pulmonary disease, are less likely to have subsequent readmissions or emergency room visits if they are seen by a primary clinician (e.g., physician, advanced practice nurse or physician assistant) or subspecialist shortly after discharge.[16,17]

In this section, we report the frequency of clinician follow-up visits within 14 days after patients were discharged from the hospital for medical conditions, surgery, congestive heart failure, acute myocardial infarction and pneumonia. We do not report primary care or ambulatory visit rates for patients discharged after hip fracture; more than 85% of these patients are discharged to skilled nursing or rehabilitation facilities and receive much of their follow-up medical care in these institutions (Table 4). For other patient cohorts, visit rates are reported only for patients who are discharged home. Payments for post-operative surgical follow-up visits are bundled in to the surgical charge. This means that early follow-up visits are not always reported reliably, and are not included in this report. The lack of an accurate early physician follow-up measure leaves a gap in our understanding of this important aspect of post-discharge surgical care that may impede efforts to improve patient outcomes.

**Table 4. The percent of patients discharged to home, facility-based rehabilitation and other locations following six causes of hospitalization[iii]**

| Condition | % Discharged to home | | % Discharged to facility-based rehabilitation | | % Discharged to other location | |
|---|---|---|---|---|---|---|
| | 2004 | 2009 | 2004 | 2009 | 2004 | 2009 |
| Medical | 73.6 | 72.6 | 22.6 | 24.8 | 3.8 | 2.7 |
| CHF | 78.0 | 76.9 | 19.0 | 21.0 | 3.0 | 2.1 |
| AMI | 74.7 | 76.0 | 22.5 | 22.4 | 2.8 | 1.6 |
| Pneumonia | 69.1 | 70.1 | 26.6 | 26.6 | 4.4 | 3.2 |
| Hip fracture | 8.6 | 8.6 | 86.5 | 89.8 | 5.0 | 1.6 |
| Surgical | 69.5 | 68.7 | 28.4 | 30.5 | 2.1 | 0.8 |

[iii] Home discharges include those with or without home health services. Facility-based rehabilitation includes care received in skilled nursing facilities, inpatient rehabilitation facilities, long-term acute care hospitals and swing beds within hospitals.

The outpatient care patterns presented in this section show serious and persistent gaps in care coordination after hospital discharge. In only a few regions of the country did more than half of patients see a primary care clinician within 14 days of leaving the hospital, and in many regions less than half saw any clinician. Depending on the cause of the initial hospitalization, the likelihood of an emergency room visit within 30 days varied markedly, but was as high as one in four in some regions for some conditions.

### *Primary care*

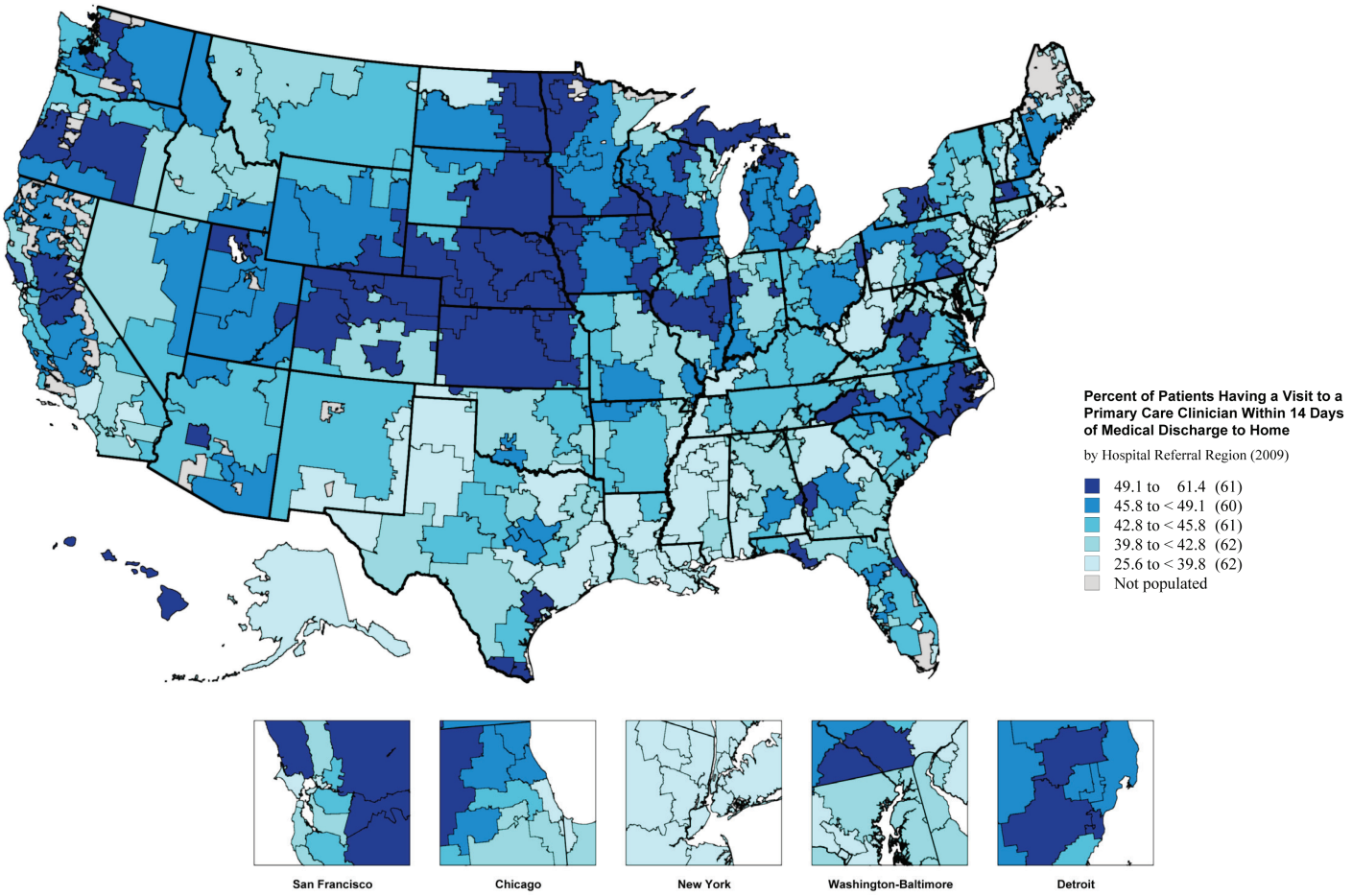
Primary care clinicians have proven strengths in providing patient care coordination and longitudinal follow-up, both important factors in improving outcomes for patients after they leave the hospital. In this section, we report on the variation in the proportion of patients visiting a primary care clinician within 14 days of discharge. Table 5 shows the variation in primary care visit rates within each patient cohort among HRRs.

**Table 5. Patterns of variation in the percent of patients seeing a primary care clinician within 14 days following discharge to home for five causes of hospitalization among hospital referral regions (2009)**

| Condition | N HRRs | Median among HRRs | Interquartile ratio | Extremal ratio | Coefficient of variation |
|---|---|---|---|---|---|
| Medical | 306 | 44.2 | 1.17 | 2.40 | 0.13 |
| CHF | 304 | 43.8 | 1.25 | 3.15 | 0.17 |
| AMI | 296 | 35.6 | 1.30 | 4.83 | 0.23 |
| Pneumonia | 306 | 50.6 | 1.17 | 2.30 | 0.13 |
| Surgical | 306 | 21.3 | 1.27 | 3.83 | 0.21 |

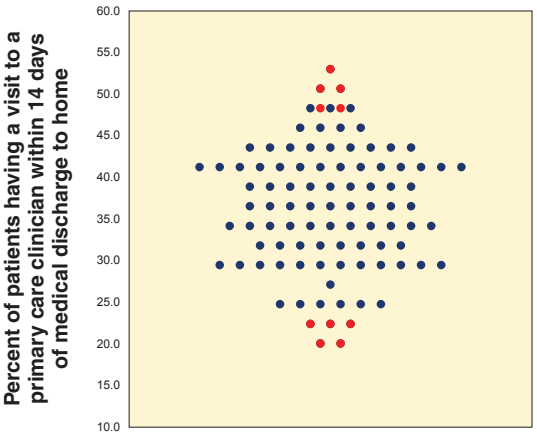
CHF = congestive heart failure. AMI = acute myocardial infarction (heart attack). Column two gives the number of hospital referral regions with a sufficient number of patients and events to report statistically stable rates. Column three gives the median: the HRR with the middle value (50th percentile) when ordering HRRs from lowest to highest. Column four gives the interquartile ratio: the value for the HRR at the 75th percentile divided by the value for the HRR at the 25th percentile, showing the extent of variation between the highest and lowest quartile. Column five gives the extremal ratio: the highest value divided by the lowest value, showing the variation between the extremes. Column six gives the coefficient of variation, which shows the extent of variation by dividing the standard deviation by the mean HRR value. For the three ratios, a higher value means more variation.

The percent of patients visiting a primary care clinician within 14 days of hospital discharge to home following a medical admission varied more than twofold among HRRs in 2009. Less than one third of patients saw a primary care clinician within two weeks of medical discharge in nine regions, including New Orleans (25.6%), Miami (29.4%), Ridgewood, New Jersey (30.3%), the Bronx (31.7%) and Manhattan (31.8%). More than 60% visited a primary care clinician within two weeks of medical discharge in Lincoln, Nebraska (61.4%) and Pueblo, Colorado (60.4%) (Map 5).




**Map 5. The percent of patients seeing a primary care clinician within 14 days of medical discharge to home among hospital referral regions (2009)**

The range of variation was somewhat higher among academic medical centers. Less than 20% of patients discharged from New York University Medical Center in Manhattan saw a primary care clinician within 14 days of a medical discharge. The rate was nearly three times higher at the Mayo Clinic's St. Mary's Hospital in Rochester, Minnesota (Figure 9).

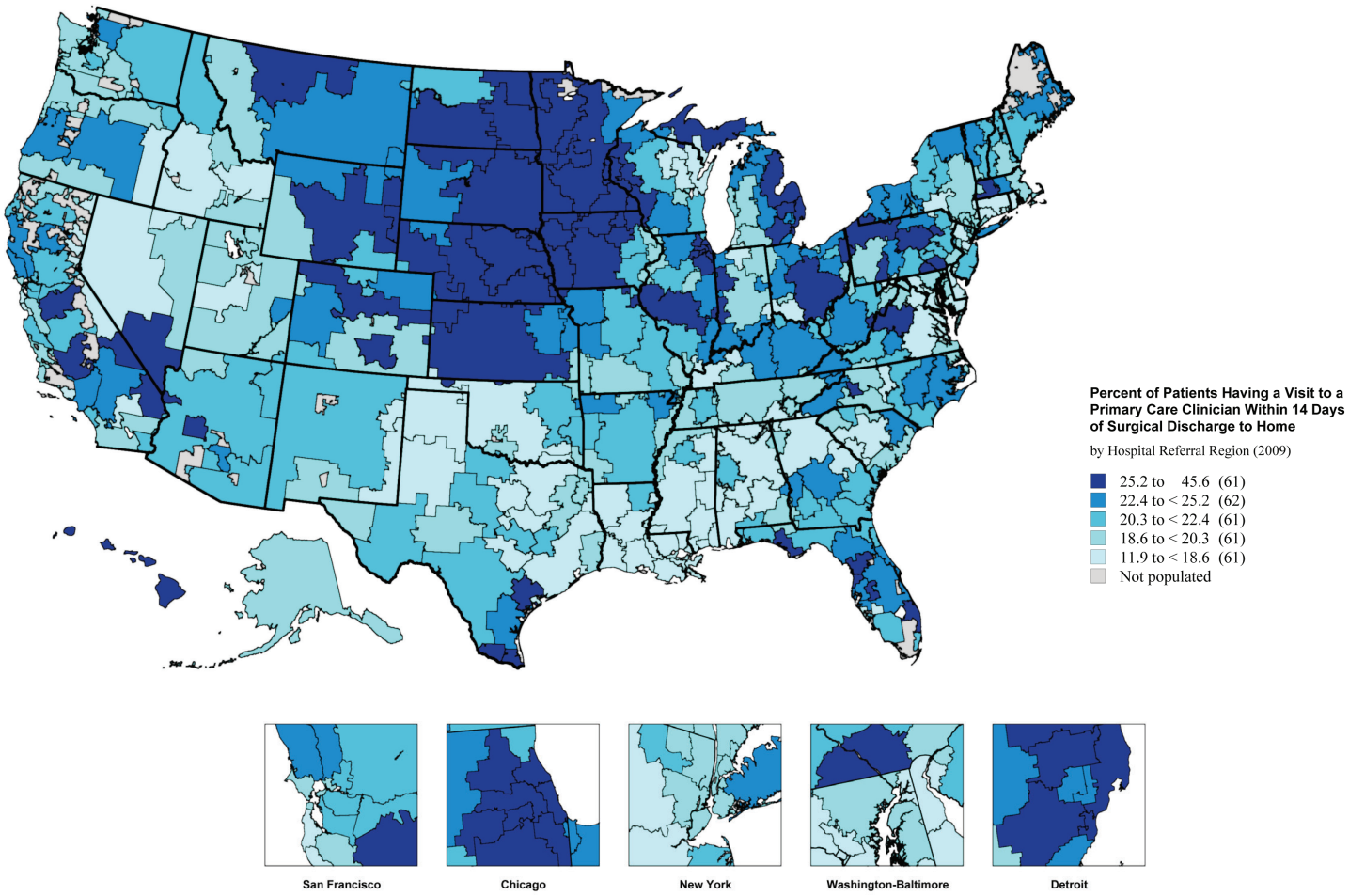



| | |
|---|---|
| Mayo Clinic (St. Mary's) | 54.2 |
| Strong Memorial Hospital | 51.6 |
| Pitt County Memorial Hospital | 51.5 |
| Fletcher Allen Health Care | 48.9 |
| University of Virginia Med Ctr | 48.2 |
| Parkland Health & Hosp System | 23.1 |
| Howard University Hospital | 22.2 |
| UAMS Medical Center | 21.8 |
| Hahnemann University Hospital | 20.8 |
| NYU Medical Center | 18.9 |

**Figure 9. The percent of patients seeing a primary care clinician within 14 days of medical discharge to home among academic medical centers (2009)**

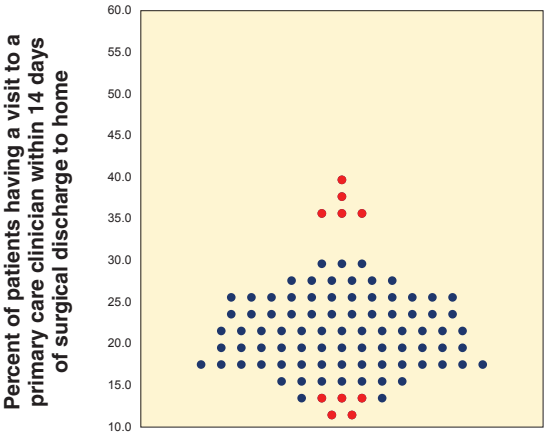
Each blue dot represents one of 94 academic medical centers. Red dots indicate the five academic medical centers with the highest rates and the five with the lowest rates.

The likelihood of seeing a primary care clinician within two weeks of surgical discharge to home varied more than threefold among HRRs in 2009. Less than 15% of patients had a primary care visit within 14 days of discharge from the hospital after surgery in 11 HRRs, including several in Louisiana: New Orleans (11.9%), Metairie (12.6%), Slidell (12.8%), Baton Rouge (13.2%), Alexandria (13.5%) and Lafayette (14.7%). Rates were about three times higher in Lincoln, Nebraska (45.6%) and McAllen, Texas (44.7%) (Map 6).




**Map 6. The percent of patients seeing a primary care clinician within 14 days of surgical discharge to home among hospital referral regions (2009)**

The percent of patients visiting a primary care clinician within 14 days of discharge from the hospital following a surgical admission varied nearly fourfold among academic medical centers, from 10.4% at Grady Memorial Hospital in Atlanta to 40.7% at Creighton University Medical Center in Omaha (Figure 10).




| | |
|---|---|
| Creighton University Med Ctr | 40.7 |
| University of Virginia Med Ctr | 36.8 |
| Mayo Clinic (St. Mary's) | 36.2 |
| Ohio State University Med Ctr | 36.2 |
| Stony Brook University Hospital | 35.0 |
| Oklahoma University Med Ctr | 14.0 |
| The Methodist Hospital | 14.0 |
| Rush University Medical Center | 12.7 |
| Loyola University Medical Center | 11.3 |
| Grady Memorial Hospital | 10.4 |

**Figure 10. The percent of patients seeing a primary care clinician within 14 days of surgical discharge to home among academic medical centers (2009)**

Each blue dot represents one of 94 academic medical centers. Red dots indicate the five academic medical centers with the highest rates and the five with the lowest rates.

### *Ambulatory care*

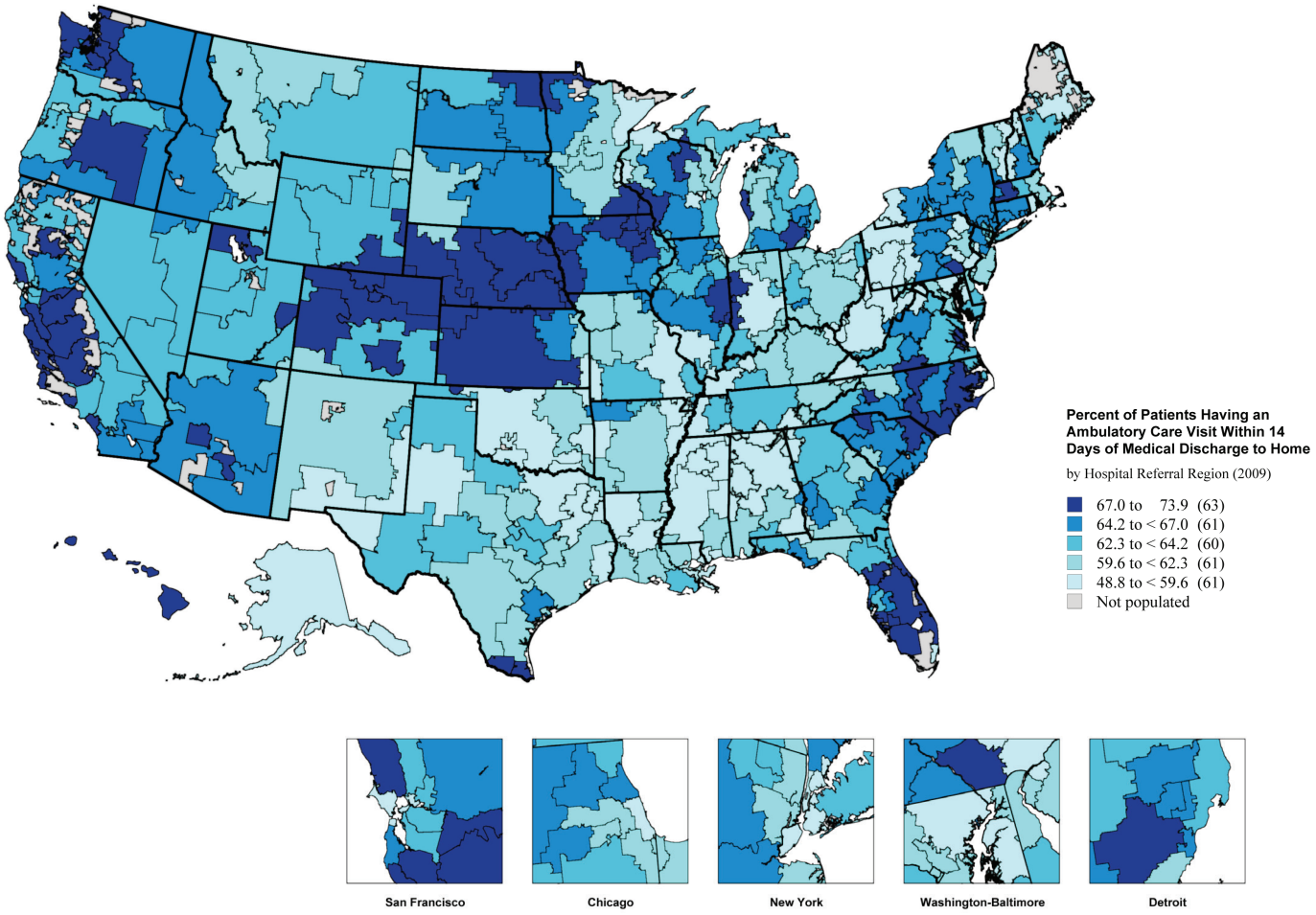
While primary care holds promise as the gold standard for care coordination and longitudinal follow-up, in many instances it is reasonable, or even imperative, that patients visit specialists after hospitalization. In general, surgeons should provide early post-hospital care after major procedures. Patients who are hospitalized for cancer will appropriately receive longitudinal health care services from oncologists. And, in some regions of the country, availability of primary care clinicians is constrained and specialists fill the gap. In this section, we report on the variation in the proportion of patients visiting an ambulatory clinician within 14 days of discharge. Table 6 shows the variation in the percent of patients receiving ambulatory care within two weeks of discharge among HRRs for each patient cohort in 2009.

**Table 6. Patterns of variation in the percent of patients having an ambulatory care visit within 14 days following discharge to home for four causes of hospitalization among hospital referral regions (2009)**

| Condition | N HRRs | Median among HRRs | Interquartile ratio | Extremal ratio | Coefficient of variation |
|---|---|---|---|---|---|
| Medical | 306 | 63.4 | 1.10 | 1.51 | 0.07 |
| CHF | 306 | 64.2 | 1.13 | 1.66 | 0.09 |
| AMI | 305 | 59.7 | 1.22 | 2.35 | 0.14 |
| Pneumonia | 306 | 65.6 | 1.11 | 1.74 | 0.09 |

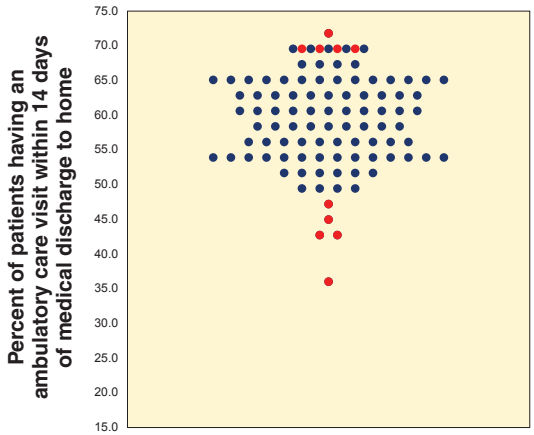
CHF = congestive heart failure. AMI = acute myocardial infarction (heart attack). Column two gives the number of hospital referral regions with a sufficient number of patients and events to report statistically stable rates. Column three gives the median: the HRR with the middle value (50th percentile) when ordering HRRs from lowest to highest. Column four gives the interquartile ratio: the value for the HRR at the 75th percentile divided by the value for the HRR at the 25th percentile, showing the extent of variation between the highest and lowest quartile. Column five gives the extremal ratio: the highest value divided by the lowest value, showing the variation between the extremes. Column six gives the coefficient of variation, which shows the extent of variation by dividing the standard deviation by the mean HRR value. For the three ratios, a higher value means more variation.

The likelihood of having an ambulatory care visit to any provider within 14 days of discharge to home following a medical admission varied about one and a half times among HRRs in 2009. Less than half of patients had an ambulatory care visit to a clinician within 14 days of discharge in Pittsburgh (48.8%) and New Orleans (49.1%). More than 70% of patients had an ambulatory visit within 14 days in 15 regions, including Lincoln, Nebraska (73.8%), McAllen, Texas (72.4%), Greenville, North Carolina (72.3%), Fort Lauderdale, Florida (72.0%) and Omaha, Nebraska (71.1%) (Map 7).




**Map 7. The percent of patients having an ambulatory care visit within 14 days of medical discharge to home among hospital referral regions (2009)**

The range of variation was even greater among academic medical centers. The percent of patients having an ambulatory visit within 14 days of medical discharge was more than twice as high at Pitt County Memorial Hospital in Greenville, North Carolina (72.9%) as the rate at Grady Memorial Hospital in Atlanta (34.9%) (Figure 11).




| | |
|---|---|
| Pitt County Memorial Hospital | 72.9 |
| UCLA Medical Center | 70.3 |
| Mayo Clinic (St. Mary's) | 69.6 |
| Stanford Hospital and Clinics | 69.1 |
| RWJ University Hospital | 68.7 |
| Jackson Health System | 47.2 |
| Univ of MS Hosps & Clinics | 45.6 |
| Howard University Hospital | 43.4 |
| Parkland Health & Hosp System | 43.2 |
| Grady Memorial Hospital | 34.9 |

**Figure 11. The percent of patients having an ambulatory care visit within 14 days of medical discharge to home among academic medical centers (2009)**

Each blue dot represents one of 94 academic medical centers. Red dots indicate the five academic medical centers with the highest rates and the five with the lowest rates.

## Which rate is right for early clinician follow-up?

Early follow-up by health care professionals for patients discharged from the hospital makes good sense and has been shown to be associated with lower rates of readmission in clinical trials and epidemiological studies.[16,17] However, early follow-up cannot be justified for every patient and does not necessarily mean an office visit. A visit to a primary care clinician after discharge for a medical condition can be an important opportunity to check on a patient's progress and their adherence to medication regimens, and to review concurrent illnesses and health risks. It is less clear that a patient should see his or her primary care physician after a surgical hospitalization for a procedure such as a hip replacement or a hernia repair. In these instances, follow-up with a surgical clinician makes much more sense; rates of primary care follow-up after surgical discharges can be low even if patients are receiving excellent care from surgeons.

More importantly, some of the most effective care coordination programs use home visits and telephone calls as the primary follow-up for many patients, with much of the care provided by advanced practice nurses.[18,19] This means that there may be some regions and hospitals with relatively low rates of early clinician visits that still provide coordinated and longitudinal care. It is important to keep in mind that these new methods of discharge planning and care coordination are still in their infancy in most health care systems. In general, it is reasonable to be concerned about places with relatively low rates of early follow-up visits, particularly after medical discharges. As new care models are developed, follow-up visit rates will need to be augmented by other measures to provide a full view of the quality of post-discharge care processes and their association with meaningful patient outcomes.

## Emergency room visits after discharge for medical and surgical hospitalizations

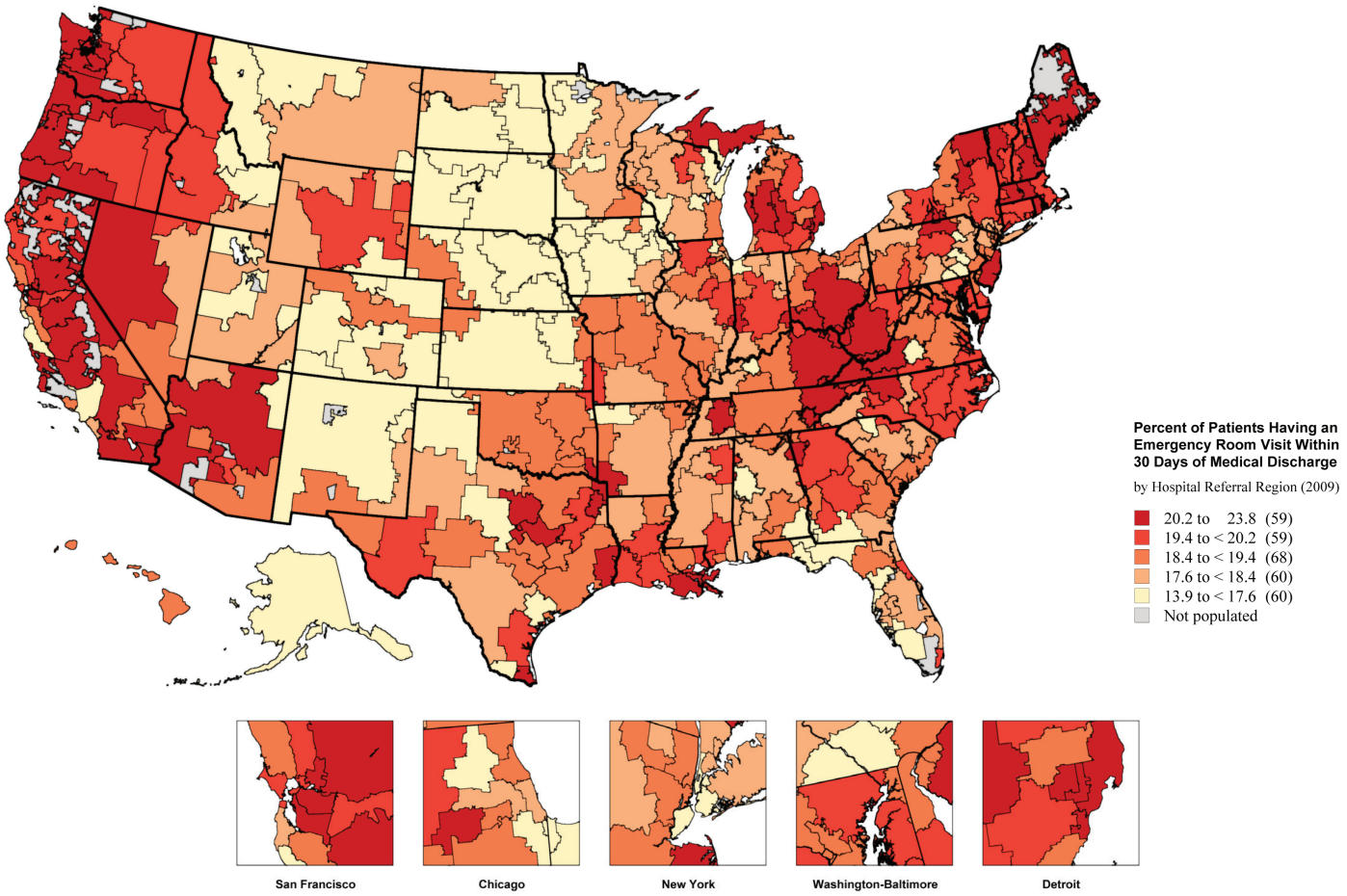
For patients with sudden and acute illness, emergency room care can provide lifesaving treatment at any time of the day or night. For other patients, visits to the emergency room are poor alternatives to office or clinic visits with their usual clinicians. Emergency rooms tend to be busy and noisy sites of care, often with only partial medical records or sometimes with no recent medical information. Follow-up from an emergency room visit requires another care transition, with the very real chance that important information will not be transmitted to the patient's community clinicians. Patients often leave without understanding their illnesses or the care necessary to get better. The right rate for emergency room visits after discharge is not zero, but regions and hospitals with high emergency room visit rates may have opportunities to re-engineer care to more effective and cost-effective alternatives. Table 7 shows the variation in the percent of patients visiting the emergency room within 30 days of discharge for each patient cohort.

**Table 7. Patterns of variation in the percent of patients having an emergency room visit within 30 days following discharge for six causes of hospitalization among hospital referral regions (2009)**

| Condition | N HRRs | Median among HRRs | Interquartile ratio | Extremal ratio | Coefficient of variation |
|---|---|---|---|---|---|
| Medical | 306 | 18.9 | 1.12 | 1.71 | 0.08 |
| CHF | 300 | 23.8 | 1.16 | 2.23 | 0.12 |
| AMI | 273 | 22.9 | 1.17 | 2.16 | 0.13 |
| Pneumonia | 302 | 18.7 | 1.16 | 2.23 | 0.12 |
| Hip fracture | 259 | 17.0 | 1.26 | 2.81 | 0.18 |
| Surgical | 306 | 14.9 | 1.13 | 1.76 | 0.10 |

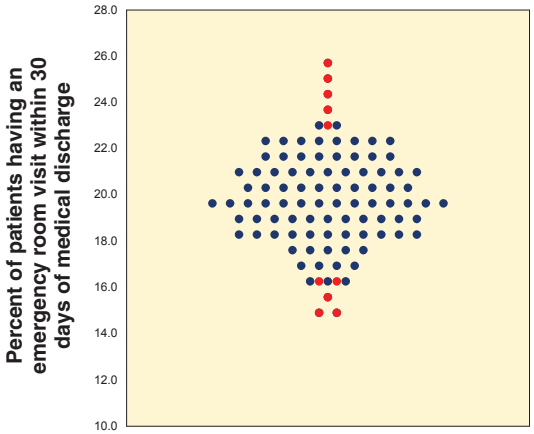
CHF = congestive heart failure. AMI = acute myocardial infarction (heart attack). Column two gives the number of hospital referral regions with a sufficient number of patients and events to report statistically stable rates. Column three gives the median: the HRR with the middle value (50th percentile) when ordering HRRs from lowest to highest. Column four gives the interquartile ratio: the value for the HRR at the 75th percentile divided by the value for the HRR at the 25th percentile, showing the extent of variation between the highest and lowest quartile. Column five gives the extremal ratio: the highest value divided by the lowest value, showing the variation between the extremes. Column six gives the coefficient of variation, which shows the extent of variation by dividing the standard deviation by the mean HRR value. For the three ratios, a higher value means more variation.

The percent of patients visiting the emergency room within 30 days of discharge after a medical hospitalization in 2009 ranged from 13.9% in Great Falls, Montana to 23.8% in Salem, Oregon. Emergency room visit rates were also relatively low in Lincoln, Nebraska (15.3%), Wichita, Kansas (15.6%), Lancaster, Pennsylvania (15.9%) and Hudson, Florida (16.3%). Rates were higher in Kingsport, Tennessee (23.7%), Charleston, West Virginia (21.8%), Lexington, Kentucky (21.6%) and Fresno, California (21.4%) (Map 8).




**Map 8. The percent of patients having an emergency room visit within 30 days of medical discharge among hospital referral regions (2009)**

Among academic medical centers, emergency room visit rates within 30 days of medical discharge varied nearly twofold. Less than 15% of patients visited an emergency room within 30 days after medical discharge from New York University Medical Center in Manhattan (14.6%) and the University of Texas Medical Branch Hospitals in Galveston (14.6%). More than 25% of patients had an emergency room visit within 30 days of discharge from the University of Medicine and Dentistry of New Jersey Hospital in Newark (26.0%) (Figure 12).

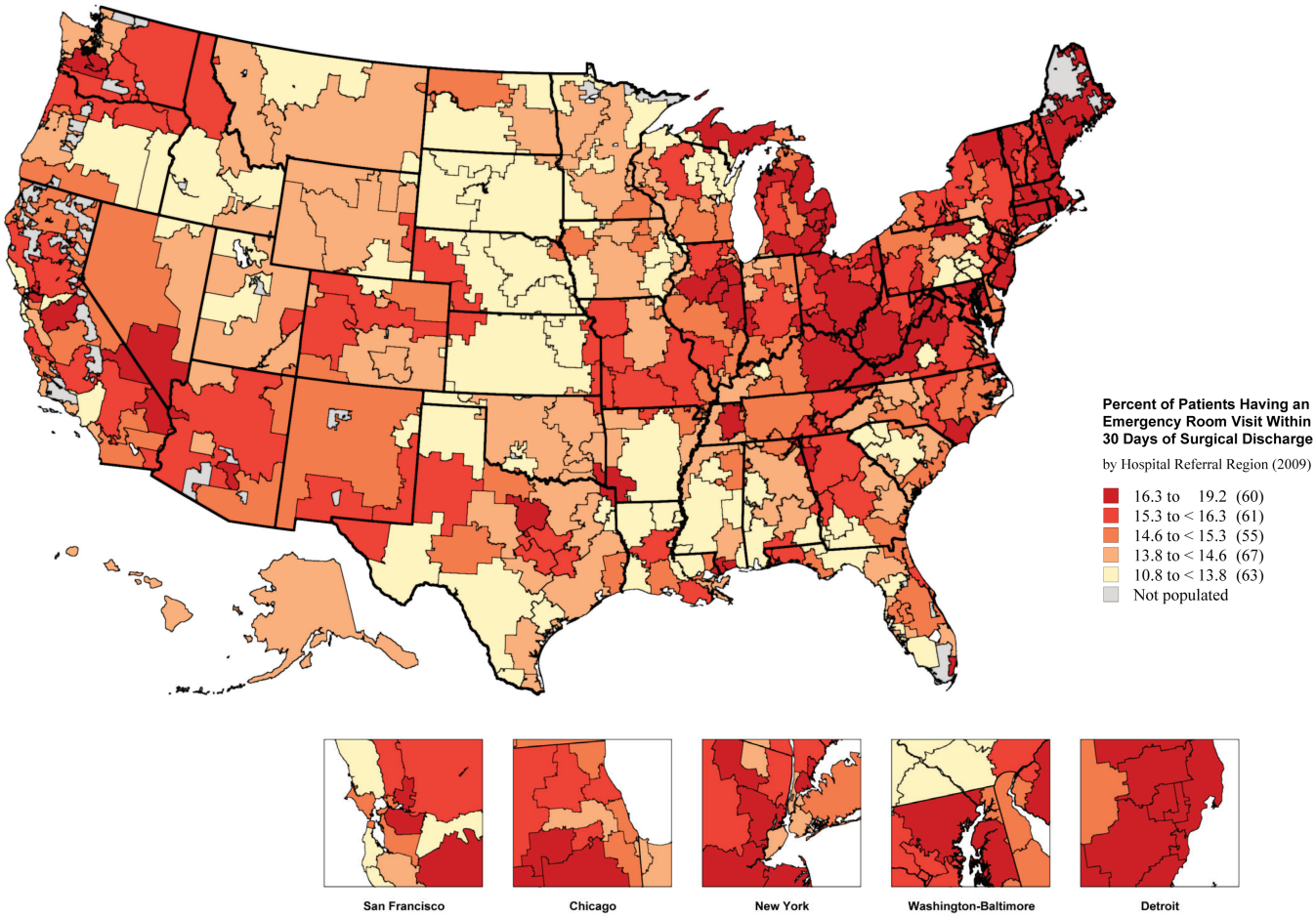



| | |
|---|---|
| UMDNJ University Hospital | 26.0 |
| University of Virginia Med Ctr | 24.9 |
| Oklahoma University Med Ctr | 24.0 |
| UAMS Medical Center | 23.5 |
| Medical College of Georgia Hosp | 23.3 |
| Memorial Hermann Hospital | 16.4 |
| New York-Presbyterian Hospital | 16.0 |
| Penn State Hershey Med Ctr | 15.9 |
| Univ of TX Medical Branch Hosps | 14.6 |
| NYU Medical Center | 14.6 |

**Figure 12. The percent of patients having an emergency room visit within 30 days of medical discharge among academic medical centers (2009)**

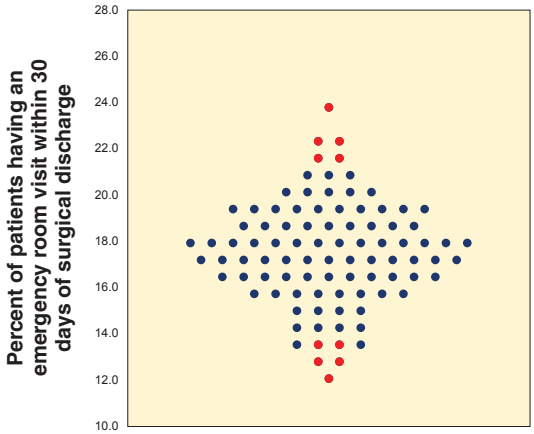
Each blue dot represents one of 94 academic medical centers. Red dots indicate the five academic medical centers with the highest rates and the five with the lowest rates.

The percent of patients having an emergency room visit within 30 days of discharge after surgery varied from less than 12% to almost 20% in 2009. Regions with relatively low rates included Rapid City, South Dakota (10.9%), Columbia, South Carolina (12.2%), Shreveport, Louisiana (12.3%), Amarillo, Texas (12.6%) and Los Angeles (13.2%). Emergency room visit rates within 30 days of surgical discharge were higher in Kingsport, Tennessee (19.2%), Lexington, Kentucky (18.6%), Providence, Rhode Island (18.1%), Detroit (18.1%) and Miami (17.6%) (Map 9).




**Map 9. The percent of patients having an emergency room visit within 30 days of surgical discharge among hospital referral regions (2009)**

Emergency room visit rates within 30 days of surgical discharge varied twofold among academic medical centers. As was the case following medical discharges, rates were relatively low at New York University Medical Center (11.7%) and the University of Texas Medical Branch Hospitals (13.1%). Rates were also low at Cedars-Sinai Medical Center in Los Angeles (13.1%) and Mount Sinai Hospital in Manhattan (13.3%). The percent visiting the emergency room within 30 days of surgical discharge was much higher at Ohio State University Medical Center in Columbus (24.2%) and at two Boston hospitals: Tufts Medical Center (22.6%) and Boston Medical Center (22.1%) (Figure 13).




| | |
|---|---|
| Ohio State University Med Ctr | 24.2 |
| Tufts Medical Center | 22.6 |
| Boston Medical Center | 22.1 |
| St. Louis University Hospital | 22.0 |
| University of Maryland Med Ctr | 21.3 |
| Memorial Hermann Hospital | 13.5 |
| Mount Sinai Hospital | 13.3 |
| Cedars-Sinai Medical Center | 13.1 |
| Univ of TX Medical Branch Hosps | 13.1 |
| NYU Medical Center | 11.7 |

**Figure 13. The percent of patients having an emergency room visit within 30 days of surgical discharge among academic medical centers (2009)**

Each blue dot represents one of 94 academic medical centers. Red dots indicate the five academic medical centers with the highest rates and the five with the lowest rates.

## Summing up: Overall findings and paths towards improving care

The current interest in improving patient care and outcomes after hospitalization for Medicare beneficiaries reflects a professional consensus that gaps in care are prevalent and amenable to care innovations. Hospitalized elderly are some of the nation's sickest patients, and they enter the hospital with the hope for not only short-term improvement, but also long-term benefit.

Good outcomes in health care are not always predictable, even in the best health care system, but this report highlights widespread and systematic failures in patient care after discharge from hospitals. Hospital readmission rates were relatively high in many locations, and, most importantly, there was little improvement in most regions of the country. The proportion of patients seeing a primary care or any ambulatory clinician within 14 days of discharge varied widely and was strikingly low in some regions and hospitals. Emergency rooms were the site of post-discharge care far too often.

Numerous strategies have been suggested to improve the care of hospitalized patients and to reduce subsequent illness and the need for acute care. A recent review of "transition care" identified nine interventions with positive benefits on readmission rates.[20] These interventions included discharge management with follow-up—generally by an advanced practice nurse—patient coaching, disease/health management and provision of telehealth services. Several other strategies were identified that led to better patient outcomes without reducing readmission rates.

The Affordable Care Act directs CMS to develop the Community-based Care Transitions Program (CCTP) and provides funds to test models for improving care transitions for high-risk Medicare patients. This effort is part of the Partnership for Patients, a public-private partnership to reduce harm and improve care transitions.[21] Programs like the CCTP hold promise for improving short-term outcomes for selected populations. The greater question is how they can contribute to, and be effectively aligned with, broader efforts to improve care integration, coordination and accountability across the full continuum of patient care.

The need for further development of *systems* of care, of which discharge planning and care coordination are only two components, is evident in the strong association found between general health care system factors and readmission rates. We reported a robust relationship between regional inpatient intensity of care provided to Medicare beneficiaries and the risk of readmission; that is, in places where there was a greater tendency to use hospitals as the site of care, patients were more likely to be readmitted, irrespective of illness levels. This is quite consistent with other research underscoring the importance of primary care systems in reducing avoidable hospitalizations and the influence of local bed supply on overall admission rates. Under current payment models and care systems, there is a serious risk that a hospital bed freed up through reduced readmission rates will be filled with an additional initial (potentially higher paying) patient who might otherwise have been cared for as an outpatient. In the absence of other interventions, reducing

readmission rates may have no impact on total per capita costs within a community. This underscores the importance of aligning efforts to reduce readmissions with other policy and payment initiatives, such as global payments and accountable care organizations. Efforts to monitor improvements in care coordination and transitions need to be coupled with broader surveillance of patient populations and cohorts, so that the promise of better care for patients leaving the hospital is also reflected in improved outcomes and lower costs for the population as a whole.

# Methods

### *Study population*

We used 100% of fee-for-service Medicare beneficiaries who resided in the 306 Dartmouth Atlas hospital referral regions and had full Part A (acute care in facilities, including hospitals) and Part B (clinician services) coverage during the study periods. Beneficiaries had to be age 65 or older on July 1, 2003 for Time 1 and on July 1, 2008 for Time 2.

### *Cohort definition*

We identified six cohorts based on information from the Medicare Provider Analysis and Review (MedPAR) files: acute myocardial infarction (i.e., heart attack), congestive heart failure, pneumonia, hip fracture, all medical discharges and all surgical discharges (Table A).

**Table A. Cohort definition**

| Cohort | ICD-9 Codes |
|---|---|
| **Acute myocardial infarction**<br>**CMS definition - principal diagnosis code**<br>(excluded one-day stay) | 410.00, 410.01, 410.10, 410.11, 410.20, 410.21, 410.30, 410.31, 410.40, 410.41, 410.50, 410.51, 410.60, 410.61, 410.70, 410.71, 410.80, 410.81, 410.90, and 410.91 |
| **Congestive heart failure**<br>CMS definition - principal diagnosis code | 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.0, 428.1, 428.20, 428.21, 428.22, 428.23, 428.30, 428.31, 428.32, 428.33, 428.40, 428.41, 428.42, 428.43, and 428.9 |
| **Pneumonia**<br>CMS definition - principal diagnosis code | 480.0, 480.1, 480.2, 480.3, 480.8, 480.9, 481, 482.0, 482.1, 482.2, 482.30, 482.31, 482.32, 482.39, 482.40, 482.41, 482.49, 482.81, 482.82, 482.83, 482.84, 482.89, 482.9, 483.0, 483.1, 483.8, 485, 486, and 487.0 |
| **Hip fracture**<br>Dartmouth Atlas definition – principal diagnosis code | 820xx |
| **All medical discharges** | All medical DRGs |
| **All surgical discharges** | All surgical DRGs |

### *Cohort index hospitalization*

For each study period, we first identified hospital claims from short-term acute or critical access hospitals among the study population for each cohort. The first period of index discharges was July 1, 2003 - June 30, 2004 and the second was July 1, 2008 - June 30, 2009. For simplicity and to clearly indicate that each cohort reflects 12 months of Medicare claims, these are labeled as 2004 and 2009. We excluded cohort hospitalizations with the discharge status on the claim indicating expired (died in the hospital), left against medical advice or discharged to hospice. For the remaining cohort hospitalization records, we excluded hospitalizations when the patient had any acute care hospitalizations in the 90 days prior to cohort admission date. Transfers (defined as (1) within one-day transfer, (2) both stays had the same cohort event, and (3) both indicated transfer status) were considered as a single cohort hospitalization. For each study period, only one cohort hospitalization (index hospitalization) was selected for each patient for each cohort (we randomly selected one if more than one hospitalization met the criteria). For this report, we

further excluded index hospitalizations with the discharge status field indicating another acute care hospitals that did not meet the transfer criteria. For the rest of cohort index hospitalizations, we classified them as discharged to home (with or without home health services), to facility-based rehabilitation (skilled nursing facilities, inpatient rehabilitation facilities, long-term acute care hospitals and swing beds within hospitals) or other facility (such as an intermediate care facility) based on the discharge status field on the claims. For hospital-specific analyses, each patient was assigned to the hospital of discharge. Table B shows cohort size and the percent discharged to facility-based rehabilitation.

**Table B. Cohort size and the percent discharge to facility-based rehabilitation**

| Cohort | 2004 | 2009 |
|---|---|---|
| Acute myocardial infarction | 166,642 (22.5%) | 134,433 (22.4%) |
| Congestive heart failure | 321,321 (19.0%) | 248,426 (21.0%) |
| Pneumonia | 372,433 (26.6%) | 249,429 (26.6%) |
| Hip fracture | 164,465 (86.5%) | 148,745 (89.8%) |
| All medical discharges | 3,632,811 (22.6%) | 3,250,574 (24.8%) |
| All surgical discharges | 2,013,795 (28.4%) | 1,809,343 (30.5%) |

### *Outcome measures*

We linked patients to their utilization records and measured care 14 or 30 days post-discharge for each cohort and each study period. We calculated age, sex and race-adjusted rates for both hospital referral regions and index cohort hospitals using the indirect method.

Post-discharge utilization claims were extracted from the MedPAR files for inpatient care, Carrier claim files (i.e., Physician/Supplier Part B) for clinician visits, and Outpatient claim files for emergency room visits and visits to rural health centers/federally qualified health centers. We also extracted payment amounts from MedPAR files, Carrier claim files, Outpatient claim files, Home Health Agency claim files, Hospice claim files and Durable Medical Equipment claim files for any care after patients were discharged for each cohort and for each study period. In addition, we identified post-discharge deaths from the Denominator file.

For this report, we examined four post-discharge events: 30-day readmissions (any claims from short-term acute or critical access hospitals), 30-day emergency room visits (with or without an admission), 14-day ambulatory care visits to any clinician and 14-day ambulatory care visits to primary care (restricted to CMS specialties: family medicine, general internal medicine, general practice and geriatrics) clinicians after the index discharge for each cohort and each study period. For comparison, we also calculated underlying rates of cohort hospitalizations for hospital referral regions for 2004 and 2009 according to the Dartmouth Atlas population-based admission measurement methods. Table C shows the definitions for emergency room and ambulatory care visits.

## Table C. Definitions of emergency room and ambulatory care visits

| Emergency room visits | | |
|---|---|---|
| **Total emergency room visits from**<br>**1) Outpatient claims:**<br>Revenue center code: 0450-0459 (emergency room) and 0981 (professional fees-emergency room)<br>And<br>Revenue center visit date not within an acute short-stay or critical access hospital claim that has emergency room payment.<br>Or<br>**2) Hospital claims:**<br>Any acute short-stay or critical access hospital claims from the MedPAR files with emergency room payment and did not have associated Outpatient claims defined as above. | Carrier claims:<br>CPT codes: 99201-99205, 99211-99215, 99381-99387, 99391-99397, 99241-99245, 99271-99275<br>And<br>Place of service = office (place of service code 11), outpatient hospital (22), rural health clinic (72) or federally qualified health center (50)<br>And<br>CMS specialty code:<br>01 = General practice<br>02 = General surgery<br>03 = Allergy/immunology<br>04 = Otolaryngology<br>05 = Anesthesiology<br>06 = Cardiology<br>07 = Dermatology<br>08 = Family practice<br>10 = Gastroenterology<br>11 = Internal medicine<br>13 = Neurology<br>14 = Neurosurgery<br>16 = Obstetrics/gynecology<br>18 = Ophthalmology<br>20 = Orthopedic surgery<br>22 = Pathology<br>24 = Plastic and reconstructive surgery<br>25 = Physical medicine and rehabilitation<br>26 = Psychiatry<br>28 = Colorectal surgery (formerly proctology)<br>29 = Pulmonary disease<br>30 = Diagnostic radiology<br>33 = Thoracic surgery<br>34 = Urology<br>36 = Nuclear medicine<br>37 = Pediatric medicine<br>38 = Geriatric medicine<br>39 = Nephrology<br>40 = Hand surgery | 44 = Infectious disease<br>46 = Endocrinology (eff 5/92)<br>50 = Nurse practitioner<br>66 = Rheumatology (eff 5/92)<br>70 = Multispecialty clinic or group practice<br>76 = Peripheral vascular disease (eff 5/92)<br>77 = Vascular surgery (eff 5/92)<br>78 = Cardiac surgery (eff 5/92)<br>79 = Addiction medicine (eff 5/92)<br>81 = Critical care (intensivists) (eff 5/92)<br>82 = Hematology (eff 5/92)<br>83 = Hematology/oncology (eff 5/92)<br>84 = Preventive medicine (eff 5/92)<br>85 = Maxillofacial surgery (eff 5/92)<br>86 = Neuropsychiatry (eff 5/92)<br>89 = Certified clinical nurse specialist<br>90 = Medical oncology (eff 5/92)<br>91 = Surgical oncology (eff 5/92)<br>92 = Radiation oncology (eff 5/92)<br>93 = Emergency (eff 5/92)<br>94 = Interventional radiology (eff 5/92)<br>97 = Physician assistant (eff 5/92)<br>98 = Gynecologist/oncologist (eff 10/94)<br>99 = Unknown physician specialty |
| | Outpatient claims:<br>Revenue center code: 0510-0529<br>And<br>Provider ID from Provider of Services file as rural health centers or federally qualified health centers | |

**Appendix Table 1. Care following discharge for medical and surgical conditions among hospital referral regions (2009)**

| HRR name | State | Medical discharges per 1,000 Medicare beneficiaries | Number of patients in cohort | | Percent readmitted within 30 days of discharge | | Percent seeing a primary care clinician within 14 days of discharge to home | | Percent having an ambulatory visit within 14 days of discharge to home | Percent having an emergency room visit within 30 days of discharge | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Medical | Surgical | Medical | Surgical | Medical | Surgical | Medical | Medical | Surgical |
| Birmingham | AL | 258.4 | 30,722 | 16,802 | 15.6 | 12.4 | 41.7 | 18.0 | 58.6 | 17.6 | 14.5 |
| Dothan | AL | 273.6 | 7,025 | 3,524 | 14.9 | 11.7 | 39.5 | 19.6 | 56.4 | 16.2 | 12.9 |
| Huntsville | AL | 239.8 | 8,478 | 4,895 | 15.6 | 12.5 | 41.7 | 17.5 | 58.9 | 18.6 | 15.1 |
| Mobile | AL | 240.4 | 9,617 | 5,842 | 16.4 | 12.2 | 38.7 | 18.1 | 62.2 | 18.1 | 13.7 |
| Montgomery | AL | 265.8 | 5,654 | 2,759 | 16.5 | 12.3 | 46.7 | 17.7 | 61.4 | 18.5 | 14.6 |
| Tuscaloosa | AL | 290.9 | 4,255 | 1,848 | 15.2 | 11.9 | 39.2 | 20.6 | 55.7 | 16.9 | 13.5 |
| Anchorage | AK | 180.9 | 4,028 | 2,852 | 14.7 | 10.2 | 34.4 | 20.1 | 50.5 | 17.1 | 14.2 |
| Mesa | AZ | 206.2 | 7,157 | 5,054 | 16.0 | 12.7 | 46.6 | 24.7 | 67.5 | 19.8 | 17.0 |
| Phoenix | AZ | 192.2 | 21,091 | 16,060 | 15.9 | 11.9 | 43.3 | 21.7 | 65.1 | 20.3 | 16.3 |
| Sun City | AZ | 209.0 | 4,965 | 3,680 | 15.2 | 12.2 | 49.6 | 26.1 | 70.6 | 19.0 | 14.6 |
| Tucson | AZ | 171.6 | 8,431 | 6,697 | 15.8 | 12.3 | 47.2 | 21.9 | 65.2 | 19.2 | 15.2 |
| Fort Smith | AR | 244.0 | 4,897 | 2,535 | 15.8 | 10.4 | 42.2 | 20.5 | 55.4 | 19.1 | 13.8 |
| Jonesboro | AR | 298.8 | 4,006 | 2,167 | 16.2 | 13.3 | 42.5 | 22.7 | 57.0 | 19.2 | 14.7 |
| Little Rock | AR | 242.9 | 23,251 | 14,722 | 16.8 | 11.4 | 44.4 | 20.5 | 61.1 | 17.9 | 13.3 |
| Springdale | AR | 226.1 | 5,527 | 3,423 | 15.4 | 11.0 | 46.7 | 22.8 | 64.2 | 17.1 | 14.2 |
| Texarkana | AR | 263.9 | 4,248 | 2,295 | 16.4 | 12.9 | 44.8 | 20.3 | 61.6 | 21.4 | 16.8 |
| Orange County | CA | 189.3 | 18,407 | 10,905 | 15.7 | 11.9 | 40.5 | 21.5 | 67.2 | 17.8 | 14.1 |
| Bakersfield | CA | 232.8 | 6,887 | 4,156 | 17.0 | 13.4 | 48.1 | 26.1 | 69.5 | 20.8 | 16.1 |
| Chico | CA | 218.4 | 4,508 | 2,855 | 15.1 | 11.8 | 48.6 | 24.4 | 69.6 | 20.2 | 16.3 |
| Contra Costa County | CA | 180.1 | 5,603 | 3,284 | 16.2 | 12.3 | 43.0 | 20.4 | 63.1 | 21.6 | 17.2 |
| Fresno | CA | 195.5 | 7,501 | 4,829 | 16.2 | 11.0 | 47.6 | 20.7 | 68.6 | 21.4 | 15.1 |
| Los Angeles | CA | 230.3 | 60,532 | 29,959 | 16.5 | 12.6 | 37.7 | 22.5 | 62.5 | 17.2 | 13.2 |
| Modesto | CA | 208.0 | 6,322 | 4,049 | 17.0 | 12.0 | 52.7 | 26.8 | 68.3 | 22.1 | 17.5 |
| Napa | CA | 185.5 | 2,980 | 2,225 | 14.0 | 10.4 | 41.9 | 23.2 | 63.3 | 19.5 | 15.5 |
| Alameda County | CA | 192.0 | 7,852 | 3,676 | 16.6 | 13.0 | 39.8 | 21.5 | 62.9 | 20.6 | 14.8 |
| Palm Springs/Rancho Mirage | CA | 179.8 | 3,814 | 3,055 | 15.0 | 11.4 | 36.4 | 15.3 | 65.5 | 18.5 | 15.2 |
| Redding | CA | 166.0 | 3,924 | 3,186 | 14.5 | 9.6 | 46.0 | 21.2 | 63.9 | 20.0 | 14.7 |
| Sacramento | CA | 170.1 | 15,439 | 9,554 | 14.7 | 10.7 | 49.4 | 21.2 | 65.7 | 20.3 | 15.4 |
| Salinas | CA | 159.0 | 3,263 | 2,274 | 13.8 | 10.7 | 43.9 | 21.3 | 67.4 | 17.2 | 15.3 |
| San Bernardino | CA | 237.6 | 12,629 | 6,461 | 16.4 | 12.6 | 42.1 | 23.1 | 62.5 | 20.5 | 16.1 |
| San Diego | CA | 174.2 | 18,206 | 12,086 | 16.0 | 11.3 | 40.9 | 20.2 | 64.9 | 20.4 | 15.1 |
| San Francisco | CA | 166.4 | 8,871 | 4,721 | 16.4 | 11.6 | 37.3 | 18.9 | 56.3 | 20.2 | 14.7 |
| San Jose | CA | 151.1 | 7,806 | 4,673 | 14.5 | 11.1 | 42.9 | 20.2 | 67.2 | 18.8 | 14.4 |
| San Luis Obispo | CA | 152.8 | 2,533 | 1,859 | 15.9 | 10.0 | 47.3 | 18.9 | 67.4 | 21.6 | 15.2 |
| San Mateo County | CA | 139.2 | 4,177 | 2,816 | 15.1 | 10.7 | 40.0 | 16.9 | 64.8 | 18.0 | 13.2 |
| Santa Barbara | CA | 137.5 | 3,243 | 2,493 | 14.5 | 9.5 | 45.8 | 19.7 | 67.1 | 20.4 | 14.5 |
| Santa Cruz | CA | 152.4 | 1,929 | 1,342 | 13.5 | 9.6 | 42.0 | 17.3 | 68.0 | 17.1 | 12.8 |
| Santa Rosa | CA | 140.8 | 3,181 | 2,163 | 14.0 | 8.9 | 49.7 | 22.5 | 68.3 | 18.6 | 13.3 |
| Stockton | CA | 198.5 | 3,682 | 2,168 | 15.9 | 11.3 | 51.1 | 20.4 | 67.1 | 20.2 | 12.6 |
| Ventura | CA | 174.5 | 5,634 | 4,159 | 15.5 | 11.5 | 38.9 | 18.1 | 70.4 | 19.1 | 14.3 |
| Boulder | CO | 167.8 | 1,700 | 1,171 | 15.1 | 11.5 | 41.6 | 21.7 | 68.1 | 18.3 | 13.8 |
| Colorado Springs | CO | 193.9 | 6,916 | 4,248 | 14.5 | 10.6 | 40.6 | 19.7 | 62.6 | 17.6 | 14.1 |
| Denver | CO | 184.1 | 14,574 | 8,965 | 15.6 | 11.2 | 50.7 | 27.4 | 68.9 | 18.7 | 15.5 |
| Fort Collins | CO | 195.1 | 3,225 | 2,010 | 14.3 | 10.6 | 49.5 | 22.0 | 69.3 | 17.4 | 12.9 |

**Appendix Table 1. Care following discharge for medical and surgical conditions among hospital referral regions (2009)**

| HRR name | State | Medical discharges per 1,000 Medicare beneficiaries | Number of patients in cohort | | Percent readmitted within 30 days of discharge | | Percent seeing a primary care clinician within 14 days of discharge to home | | Percent having an ambulatory visit within 14 days of discharge to home | Percent having an emergency room visit within 30 days of discharge | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Medical | Surgical | Medical | Surgical | Medical | Surgical | Medical | Medical | Surgical |
| Grand Junction | CO | 148.3 | 2,279 | 1,738 | 13.6 | 10.5 | 55.4 | 24.7 | 67.4 | 17.3 | 15.5 |
| Greeley | CO | 215.1 | 3,709 | 2,258 | 14.7 | 11.6 | 52.1 | 23.5 | 69.2 | 17.1 | 14.6 |
| Pueblo | CO | 206.0 | 1,942 | 1,130 | 14.1 | 9.5 | 60.4 | 33.3 | 70.1 | 18.0 | 14.3 |
| Bridgeport | CT | 189.4 | 7,017 | 4,284 | 15.9 | 13.2 | 41.8 | 20.0 | 66.6 | 20.2 | 16.3 |
| Hartford | CT | 210.3 | 20,670 | 10,799 | 15.7 | 13.1 | 41.6 | 17.6 | 64.2 | 19.6 | 16.4 |
| New Haven | CT | 233.4 | 20,265 | 10,166 | 16.6 | 14.1 | 42.6 | 18.1 | 66.4 | 19.9 | 16.5 |
| Wilmington | DE | 224.5 | 10,396 | 5,786 | 16.4 | 12.9 | 42.5 | 18.0 | 62.0 | 18.6 | 14.9 |
| Washington | DC | 212.6 | 28,513 | 13,820 | 17.0 | 14.8 | 37.7 | 17.8 | 61.4 | 19.2 | 15.7 |
| Bradenton | FL | 193.3 | 4,836 | 3,554 | 15.9 | 11.1 | 46.2 | 23.2 | 69.1 | 17.7 | 13.8 |
| Clearwater | FL | 211.9 | 7,673 | 4,313 | 15.8 | 12.5 | 45.3 | 23.4 | 67.2 | 17.3 | 13.2 |
| Fort Lauderdale | FL | 204.5 | 33,020 | 20,867 | 16.2 | 12.7 | 43.0 | 25.7 | 72.0 | 17.9 | 14.2 |
| Fort Myers | FL | 195.7 | 18,661 | 14,235 | 15.0 | 11.5 | 45.8 | 21.1 | 70.3 | 17.5 | 13.4 |
| Gainesville | FL | 248.6 | 7,978 | 4,737 | 16.9 | 12.8 | 44.4 | 23.3 | 62.3 | 18.5 | 14.5 |
| Hudson | FL | 258.3 | 7,260 | 4,228 | 15.4 | 13.5 | 45.0 | 27.0 | 66.0 | 16.3 | 14.5 |
| Jacksonville | FL | 251.5 | 19,317 | 10,565 | 16.2 | 13.7 | 42.6 | 21.6 | 63.0 | 18.2 | 15.2 |
| Lakeland | FL | 258.1 | 4,578 | 2,622 | 17.3 | 13.7 | 47.1 | 25.9 | 66.1 | 18.0 | 15.0 |
| Miami | FL | 276.1 | 25,603 | 11,215 | 17.4 | 15.7 | 29.4 | 21.4 | 54.0 | 20.0 | 17.6 |
| Ocala | FL | 200.0 | 10,959 | 8,801 | 15.0 | 12.5 | 47.3 | 25.9 | 69.0 | 16.4 | 13.7 |
| Orlando | FL | 246.8 | 46,909 | 26,764 | 16.2 | 13.8 | 44.8 | 24.5 | 68.4 | 17.8 | 15.1 |
| Ormond Beach | FL | 189.9 | 5,445 | 3,376 | 15.4 | 12.3 | 49.8 | 25.1 | 69.1 | 19.9 | 16.0 |
| Panama City | FL | 263.9 | 3,597 | 2,099 | 14.3 | 12.9 | 50.1 | 28.5 | 66.1 | 17.5 | 14.8 |
| Pensacola | FL | 260.0 | 11,075 | 6,813 | 16.1 | 12.3 | 43.6 | 20.5 | 63.9 | 18.7 | 16.0 |
| Sarasota | FL | 151.0 | 7,493 | 6,369 | 14.2 | 10.6 | 42.0 | 17.5 | 70.8 | 17.3 | 13.9 |
| St. Petersburg | FL | 247.2 | 5,821 | 3,098 | 16.3 | 13.2 | 43.8 | 23.4 | 63.5 | 17.4 | 14.1 |
| Tallahassee | FL | 222.4 | 8,715 | 4,505 | 14.7 | 11.4 | 42.5 | 20.5 | 59.8 | 17.0 | 13.7 |
| Tampa | FL | 246.0 | 11,672 | 6,584 | 17.2 | 14.2 | 41.9 | 24.8 | 63.4 | 18.1 | 15.2 |
| Albany | GA | 177.6 | 2,219 | 1,257 | 15.5 | 10.7 | 43.9 | 21.3 | 64.6 | 19.6 | 13.4 |
| Atlanta | GA | 205.5 | 46,676 | 26,594 | 16.0 | 12.1 | 38.9 | 17.4 | 63.7 | 20.0 | 15.6 |
| Augusta | GA | 200.7 | 7,042 | 4,113 | 16.2 | 11.8 | 37.4 | 13.2 | 60.6 | 19.4 | 14.1 |
| Columbus | GA | 197.1 | 3,522 | 2,175 | 14.5 | 11.1 | 49.9 | 22.7 | 66.8 | 18.7 | 15.4 |
| Macon | GA | 247.0 | 9,265 | 5,062 | 15.9 | 13.2 | 46.0 | 23.1 | 64.1 | 19.7 | 15.7 |
| Rome | GA | 242.0 | 3,944 | 2,445 | 14.8 | 12.8 | 42.3 | 18.8 | 59.5 | 20.4 | 18.2 |
| Savannah | GA | 218.2 | 9,656 | 5,504 | 15.5 | 11.3 | 40.7 | 20.4 | 66.0 | 18.8 | 14.3 |
| Honolulu | HI | 97.9 | 7,409 | 4,044 | 14.4 | 10.5 | 53.9 | 29.8 | 69.4 | 19.4 | 14.4 |
| Boise | ID | 150.9 | 5,765 | 4,366 | 13.7 | 9.1 | 40.7 | 13.7 | 65.5 | 19.9 | 13.6 |
| Idaho Falls | ID | 131.7 | 1,400 | 1,239 | 13.5 | 9.7 | 40.3 | 15.7 | 62.0 | 15.8 | 12.1 |
| Aurora | IL | 225.1 | 2,262 | 1,373 | 18.0 | 11.5 | 47.7 | 27.1 | 65.9 | 20.7 | 16.5 |
| Blue Island | IL | 297.9 | 15,223 | 6,650 | 17.2 | 15.0 | 42.8 | 28.6 | 60.9 | 17.2 | 14.9 |
| Chicago | IL | 280.7 | 28,005 | 10,554 | 17.4 | 14.9 | 37.6 | 25.8 | 54.4 | 17.9 | 15.0 |
| Elgin | IL | 266.7 | 8,748 | 4,654 | 16.7 | 15.5 | 47.7 | 31.6 | 64.7 | 17.2 | 16.2 |
| Evanston | IL | 219.4 | 14,985 | 8,024 | 17.0 | 13.1 | 47.6 | 26.9 | 64.9 | 19.1 | 16.0 |
| Hinsdale | IL | 230.5 | 5,236 | 3,019 | 16.6 | 12.5 | 42.0 | 25.3 | 61.6 | 18.8 | 16.1 |
| Joliet | IL | 309.5 | 10,031 | 4,915 | 18.0 | 15.3 | 42.3 | 28.2 | 63.0 | 19.0 | 16.8 |
| Melrose Park | IL | 237.1 | 16,519 | 8,802 | 17.2 | 12.9 | 45.7 | 29.0 | 61.7 | 17.8 | 14.4 |

**Appendix Table 1. Care following discharge for medical and surgical conditions among hospital referral regions (2009)**

| HRR name | State | Medical discharges per 1,000 Medicare beneficiaries | Number of patients in cohort | | Percent readmitted within 30 days of discharge | | Percent seeing a primary care clinician within 14 days of discharge to home | | Percent having an ambulatory visit within 14 days of discharge to home | Percent having an emergency room visit within 30 days of discharge | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Medical | Surgical | Medical | Surgical | Medical | Surgical | Medical | Medical | Surgical |
| Peoria | IL | 251.0 | 10,803 | 5,597 | 16.1 | 13.8 | 45.0 | 20.6 | 63.2 | 19.1 | 16.4 |
| Rockford | IL | 239.3 | 10,023 | 5,542 | 16.0 | 13.4 | 49.5 | 25.1 | 66.3 | 19.7 | 16.1 |
| Springfield | IL | 257.8 | 16,493 | 8,755 | 15.6 | 12.4 | 49.2 | 26.2 | 65.7 | 18.3 | 15.0 |
| Urbana | IL | 244.6 | 5,894 | 3,138 | 16.0 | 13.4 | 51.1 | 24.1 | 69.0 | 19.8 | 16.5 |
| Bloomington | IL | 189.6 | 1,873 | 1,314 | 14.5 | 12.0 | 46.5 | 19.3 | 66.9 | 19.6 | 16.6 |
| Evansville | IN | 271.6 | 11,869 | 5,765 | 15.7 | 12.7 | 48.0 | 23.8 | 62.3 | 18.4 | 14.8 |
| Fort Wayne | IN | 212.7 | 8,926 | 5,010 | 15.2 | 11.6 | 45.0 | 19.3 | 62.2 | 17.7 | 14.7 |
| Gary | IN | 287.3 | 9,163 | 4,360 | 16.5 | 13.2 | 41.8 | 23.2 | 59.8 | 16.8 | 14.3 |
| Indianapolis | IN | 229.0 | 34,481 | 19,194 | 15.4 | 11.6 | 39.9 | 20.0 | 58.4 | 19.6 | 15.6 |
| Lafayette | IN | 215.1 | 2,447 | 1,349 | 14.1 | 11.6 | 50.1 | 25.6 | 67.1 | 19.2 | 14.5 |
| Muncie | IN | 204.0 | 2,381 | 1,597 | 14.7 | 11.0 | 50.6 | 22.7 | 63.1 | 18.3 | 14.4 |
| Munster | IN | 297.3 | 5,663 | 2,941 | 17.7 | 14.8 | 36.9 | 22.4 | 60.1 | 16.6 | 14.1 |
| South Bend | IN | 201.3 | 8,173 | 5,044 | 14.5 | 10.1 | 42.4 | 16.8 | 62.3 | 17.7 | 14.5 |
| Terre Haute | IN | 265.7 | 2,966 | 1,646 | 16.8 | 14.1 | 48.7 | 26.0 | 69.0 | 20.4 | 17.0 |
| Cedar Rapids | IA | 185.4 | 3,271 | 2,143 | 14.9 | 10.8 | 46.9 | 22.1 | 67.1 | 16.1 | 13.3 |
| Davenport | IA | 219.3 | 7,658 | 4,724 | 15.8 | 12.1 | 43.8 | 20.2 | 63.5 | 18.0 | 14.5 |
| Des Moines | IA | 202.4 | 14,871 | 8,885 | 15.3 | 11.5 | 47.1 | 31.9 | 66.1 | 17.0 | 14.0 |
| Dubuque | IA | 174.1 | 1,515 | 1,036 | 14.5 | 9.6 | 40.2 | 18.7 | 63.0 | 16.6 | 12.0 |
| Iowa City | IA | 209.1 | 4,581 | 2,443 | 15.3 | 11.4 | 49.2 | 22.1 | 64.3 | 17.7 | 13.7 |
| Mason City | IA | 209.9 | 2,947 | 1,737 | 15.4 | 8.9 | 49.0 | 25.6 | 70.9 | 17.1 | 14.3 |
| Sioux City | IA | 223.8 | 4,105 | 2,275 | 15.1 | 11.3 | 55.4 | 34.3 | 69.2 | 16.8 | 14.9 |
| Waterloo | IA | 195.7 | 3,077 | 2,197 | 14.0 | 11.0 | 51.5 | 32.3 | 71.1 | 17.1 | 15.1 |
| Topeka | KS | 213.6 | 6,311 | 3,628 | 15.0 | 11.4 | 50.0 | 24.5 | 66.2 | 16.7 | 13.7 |
| Wichita | KS | 225.7 | 19,580 | 12,089 | 15.7 | 11.6 | 50.9 | 31.1 | 68.6 | 15.6 | 13.7 |
| Covington | KY | 304.2 | 4,887 | 2,494 | 17.0 | 13.1 | 44.0 | 21.6 | 61.1 | 19.5 | 15.7 |
| Lexington | KY | 321.9 | 20,385 | 10,122 | 17.8 | 14.7 | 44.3 | 24.7 | 60.7 | 21.6 | 18.6 |
| Louisville | KY | 267.0 | 23,587 | 12,623 | 16.4 | 12.4 | 44.6 | 23.0 | 60.4 | 19.4 | 15.3 |
| Owensboro | KY | 268.6 | 2,642 | 1,304 | 14.3 | 11.4 | 32.9 | 15.3 | 56.9 | 15.9 | 13.4 |
| Paducah | KY | 326.3 | 8,591 | 3,854 | 16.3 | 12.7 | 38.6 | 18.2 | 56.4 | 17.9 | 14.4 |
| Alexandria | LA | 309.4 | 4,902 | 2,663 | 16.9 | 13.6 | 35.6 | 13.5 | 54.5 | 20.0 | 15.5 |
| Baton Rouge | LA | 237.6 | 7,827 | 3,809 | 16.4 | 11.5 | 37.5 | 13.2 | 60.9 | 18.6 | 13.3 |
| Houma | LA | 245.2 | 3,054 | 1,758 | 17.6 | 13.6 | 39.1 | 18.1 | 63.6 | 20.9 | 15.5 |
| Lafayette | LA | 257.1 | 8,682 | 4,418 | 17.6 | 12.3 | 37.4 | 14.7 | 59.6 | 19.8 | 14.6 |
| Lake Charles | LA | 252.9 | 3,548 | 1,921 | 16.7 | 10.4 | 42.6 | 16.2 | 60.3 | 19.4 | 12.8 |
| Metairie | LA | 245.9 | 4,292 | 2,494 | 16.5 | 12.7 | 28.2 | 12.6 | 53.4 | 19.9 | 14.8 |
| Monroe | LA | 313.8 | 5,126 | 2,262 | 16.4 | 11.3 | 43.6 | 21.5 | 60.4 | 19.0 | 13.0 |
| New Orleans | LA | 217.7 | 4,123 | 1,689 | 16.6 | 11.1 | 25.6 | 11.9 | 49.1 | 20.5 | 14.5 |
| Shreveport | LA | 284.0 | 11,865 | 5,452 | 16.6 | 11.1 | 39.3 | 16.6 | 57.9 | 17.8 | 12.3 |
| Slidell | LA | 270.6 | 2,078 | 1,337 | 16.6 | 11.5 | 34.1 | 12.8 | 58.1 | 19.5 | 16.3 |
| Bangor | ME | 248.9 | 7,085 | 3,630 | 15.0 | 11.9 | 35.0 | 24.2 | 55.7 | 21.2 | 18.2 |
| Portland | ME | 208.8 | 15,488 | 8,413 | 14.8 | 12.3 | 46.7 | 21.7 | 62.5 | 20.8 | 17.3 |
| Baltimore | MD | 288.3 | 39,504 | 18,642 | * | * | 41.5 | 18.8 | 58.3 | 19.5 | 16.8 |
| Salisbury | MD | 226.6 | 8,119 | 4,978 | * | * | 41.7 | 16.5 | 64.1 | 20.1 | 15.2 |
| Takoma Park | MD | 200.6 | 8,408 | 3,955 | * | * | 36.4 | 15.5 | 62.2 | 19.3 | 16.1 |

*Rates for Maryland HRRs have been suppressed.

**Appendix Table 1. Care following discharge for medical and surgical conditions among hospital referral regions (2009)**

| HRR name | State | Medical discharges per 1,000 Medicare beneficiaries | Number of patients in cohort | | Percent readmitted within 30 days of discharge | | Percent seeing a primary care clinician within 14 days of discharge to home | | Percent having an ambulatory visit within 14 days of discharge to home | Percent having an emergency room visit within 30 days of discharge | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Medical | Surgical | Medical | Surgical | Medical | Surgical | Medical | Medical | Surgical |
| Boston | MA | 257.1 | 65,239 | 29,231 | 16.4 | 13.4 | 39.2 | 20.0 | 60.5 | 19.9 | 17.0 |
| Springfield | MA | 222.8 | 10,020 | 4,062 | 15.7 | 12.1 | 53.7 | 28.3 | 69.5 | 21.3 | 17.8 |
| Worcester | MA | 261.4 | 6,900 | 2,965 | 17.0 | 14.0 | 46.8 | 23.6 | 64.1 | 21.6 | 19.0 |
| Ann Arbor | MI | 262.1 | 15,835 | 8,043 | 16.5 | 13.7 | 52.8 | 26.9 | 67.4 | 19.7 | 17.4 |
| Dearborn | MI | 320.0 | 7,901 | 4,004 | 18.0 | 15.2 | 53.2 | 29.7 | 66.5 | 20.8 | 18.1 |
| Detroit | MI | 298.4 | 26,707 | 11,820 | 17.9 | 15.2 | 46.1 | 25.4 | 63.8 | 20.4 | 18.1 |
| Flint | MI | 289.0 | 8,347 | 4,211 | 16.5 | 13.9 | 52.3 | 32.0 | 65.1 | 19.1 | 16.8 |
| Grand Rapids | MI | 206.1 | 9,082 | 5,930 | 15.7 | 11.4 | 48.7 | 19.4 | 61.1 | 21.0 | 15.9 |
| Kalamazoo | MI | 225.3 | 7,679 | 4,819 | 15.3 | 12.2 | 47.6 | 19.1 | 66.3 | 19.4 | 16.3 |
| Lansing | MI | 238.6 | 7,031 | 4,263 | 15.5 | 11.2 | 47.6 | 23.7 | 63.6 | 20.3 | 15.1 |
| Marquette | MI | 212.7 | 2,725 | 1,704 | 15.6 | 10.7 | 52.1 | 31.0 | 63.6 | 21.4 | 16.9 |
| Muskegon | MI | 177.8 | 2,638 | 1,849 | 14.3 | 8.8 | 54.7 | 20.2 | 67.4 | 21.1 | 15.7 |
| Petoskey | MI | 198.1 | 2,281 | 1,814 | 15.7 | 12.0 | 50.4 | 24.4 | 63.5 | 18.6 | 15.2 |
| Pontiac | MI | 275.3 | 5,152 | 2,897 | 18.9 | 12.9 | 46.5 | 24.2 | 64.3 | 21.9 | 16.5 |
| Royal Oak | MI | 270.3 | 10,091 | 4,861 | 18.8 | 15.3 | 46.1 | 23.9 | 64.2 | 21.2 | 18.1 |
| Saginaw | MI | 253.3 | 11,266 | 7,596 | 15.7 | 12.5 | 48.3 | 27.2 | 62.6 | 19.7 | 17.0 |
| St. Joseph | MI | 187.6 | 1,758 | 1,375 | 13.8 | 10.6 | 44.3 | 16.4 | 64.2 | 17.6 | 14.4 |
| Traverse City | MI | 223.9 | 3,688 | 2,566 | 14.2 | 12.0 | 47.5 | 23.8 | 61.0 | 19.0 | 17.8 |
| Duluth | MN | 202.3 | 4,421 | 2,743 | 14.7 | 12.1 | 41.7 | 24.2 | 54.8 | 18.2 | 13.7 |
| Minneapolis | MN | 199.2 | 24,061 | 15,554 | 15.4 | 11.3 | 47.6 | 29.5 | 62.3 | 17.9 | 14.6 |
| Rochester | MN | 180.1 | 5,121 | 3,366 | 14.8 | 11.5 | 52.1 | 28.8 | 67.0 | 19.2 | 15.2 |
| St. Cloud | MN | 220.8 | 2,348 | 1,447 | 16.0 | 10.0 | 47.2 | 25.3 | 62.0 | 16.6 | 11.9 |
| St. Paul | MN | 203.3 | 6,993 | 4,741 | 15.8 | 11.6 | 48.2 | 30.4 | 59.2 | 18.3 | 14.3 |
| Gulfport | MS | 263.6 | 2,396 | 1,626 | 17.3 | 13.9 | 38.1 | 14.4 | 58.0 | 19.2 | 16.5 |
| Hattiesburg | MS | 266.9 | 4,658 | 2,614 | 17.0 | 12.2 | 40.3 | 15.9 | 61.0 | 19.6 | 14.1 |
| Jackson | MS | 267.8 | 16,012 | 7,260 | 16.3 | 11.8 | 37.6 | 17.7 | 55.4 | 17.7 | 13.6 |
| Meridian | MS | 258.2 | 3,606 | 1,633 | 14.9 | 11.5 | 33.6 | 13.1 | 58.1 | 18.1 | 12.3 |
| Oxford | MS | 277.2 | 2,339 | 1,141 | 18.8 | 10.8 | 39.0 | 21.3 | 57.1 | 18.3 | 12.2 |
| Tupelo | MS | 242.0 | 6,067 | 3,349 | 16.3 | 11.6 | 37.9 | 15.9 | 59.1 | 19.7 | 14.7 |
| Cape Girardeau | MO | 250.7 | 4,612 | 2,474 | 15.6 | 10.8 | 47.7 | 18.6 | 62.9 | 19.1 | 14.8 |
| Columbia | MO | 237.3 | 10,889 | 6,734 | 16.4 | 12.0 | 42.1 | 20.5 | 59.7 | 18.5 | 14.5 |
| Joplin | MO | 275.4 | 6,494 | 3,787 | 16.8 | 12.8 | 43.3 | 19.1 | 58.3 | 20.1 | 15.7 |
| Kansas City | MO | 245.2 | 28,929 | 15,477 | 16.3 | 13.0 | 45.6 | 23.9 | 61.4 | 18.6 | 15.3 |
| Springfield | MO | 200.4 | 10,338 | 6,729 | 14.8 | 11.8 | 47.0 | 19.2 | 63.4 | 18.4 | 15.7 |
| St. Louis | MO | 278.3 | 46,376 | 23,228 | 17.3 | 14.0 | 41.2 | 20.5 | 58.1 | 19.1 | 15.8 |
| Billings | MT | 190.8 | 7,038 | 4,508 | 14.9 | 10.1 | 43.4 | 23.3 | 64.1 | 17.7 | 13.8 |
| Great Falls | MT | 236.4 | 2,324 | 1,241 | 14.2 | 10.7 | 41.8 | 25.3 | 59.9 | 13.9 | 12.8 |
| Missoula | MT | 183.1 | 4,708 | 2,954 | 14.3 | 10.8 | 40.9 | 19.3 | 60.4 | 17.1 | 14.2 |
| Lincoln | NE | 205.4 | 8,226 | 5,880 | 15.8 | 11.5 | 61.4 | 45.6 | 73.8 | 15.3 | 12.3 |
| Omaha | NE | 215.9 | 16,628 | 10,562 | 15.8 | 11.8 | 54.5 | 33.5 | 71.1 | 16.1 | 13.4 |
| Las Vegas | NV | 229.5 | 13,008 | 7,756 | 16.4 | 13.6 | 42.8 | 25.5 | 62.9 | 19.4 | 16.4 |
| Reno | NV | 177.3 | 6,509 | 4,561 | 16.1 | 10.7 | 42.1 | 17.8 | 63.4 | 20.6 | 15.2 |
| Lebanon | NH | 178.8 | 5,609 | 3,122 | 14.9 | 12.3 | 39.6 | 21.7 | 55.0 | 20.0 | 16.2 |
| Manchester | NH | 189.7 | 10,082 | 5,532 | 14.8 | 11.4 | 47.0 | 18.9 | 64.8 | 20.2 | 16.3 |

**Appendix Table 1. Care following discharge for medical and surgical conditions among hospital referral regions (2009)**

| HRR name | State | Medical discharges per 1,000 Medicare beneficiaries | Number of patients in cohort | | Percent readmitted within 30 days of discharge | | Percent seeing a primary care clinician within 14 days of discharge to home | | Percent having an ambulatory visit within 14 days of discharge to home | Percent having an emergency room visit within 30 days of discharge | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Medical | Surgical | Medical | Surgical | Medical | Surgical | Medical | Medical | Surgical |
| Camden | NJ | 251.6 | 44,170 | 23,857 | 17.0 | 14.4 | 38.3 | 21.5 | 61.0 | 20.3 | 17.4 |
| Hackensack | NJ | 238.7 | 17,085 | 8,857 | 17.0 | 16.9 | 31.9 | 18.9 | 61.3 | 18.5 | 15.8 |
| Morristown | NJ | 201.5 | 12,043 | 7,114 | 16.3 | 13.4 | 37.0 | 17.1 | 66.4 | 18.1 | 15.3 |
| New Brunswick | NJ | 230.0 | 12,330 | 6,445 | 17.2 | 15.5 | 33.4 | 17.0 | 65.6 | 19.1 | 17.3 |
| Newark | NJ | 246.8 | 16,508 | 7,661 | 18.0 | 15.7 | 34.1 | 19.9 | 60.8 | 19.2 | 16.8 |
| Paterson | NJ | 238.4 | 5,071 | 2,526 | 16.6 | 15.3 | 37.0 | 22.3 | 62.8 | 18.9 | 16.7 |
| Ridgewood | NJ | 225.1 | 5,654 | 3,073 | 16.9 | 16.8 | 30.3 | 19.4 | 63.7 | 18.0 | 14.3 |
| Albuquerque | NM | 175.4 | 11,801 | 6,972 | 13.9 | 10.5 | 43.2 | 21.6 | 60.2 | 17.4 | 14.8 |
| Albany | NY | 229.0 | 24,138 | 11,455 | 16.5 | 15.1 | 41.9 | 19.6 | 64.7 | 20.2 | 15.8 |
| Binghamton | NY | 222.5 | 5,588 | 2,838 | 15.2 | 11.2 | 45.5 | 18.2 | 65.4 | 18.7 | 14.6 |
| Bronx | NY | 301.6 | 10,151 | 3,145 | 17.7 | 19.0 | 31.7 | 19.9 | 51.5 | 18.1 | 17.1 |
| Buffalo | NY | 229.6 | 11,964 | 5,388 | 15.5 | 12.9 | 42.0 | 23.2 | 59.4 | 18.4 | 14.8 |
| Elmira | NY | 267.8 | 5,748 | 2,635 | 17.3 | 13.5 | 40.6 | 21.6 | 59.6 | 20.4 | 14.7 |
| East Long Island | NY | 248.7 | 55,386 | 28,193 | 17.1 | 16.7 | 38.2 | 23.9 | 63.7 | 17.9 | 15.2 |
| Manhattan | NY | 247.9 | 45,970 | 20,427 | 17.5 | 17.0 | 31.8 | 20.1 | 55.3 | 16.8 | 14.1 |
| Rochester | NY | 220.5 | 9,086 | 4,585 | 15.5 | 12.7 | 49.6 | 25.1 | 66.0 | 19.8 | 16.1 |
| Syracuse | NY | 218.9 | 13,365 | 6,767 | 16.3 | 12.5 | 44.2 | 20.4 | 65.6 | 19.0 | 15.8 |
| White Plains | NY | 240.7 | 15,449 | 7,236 | 16.1 | 17.4 | 36.0 | 19.1 | 65.0 | 18.1 | 16.0 |
| Asheville | NC | 185.5 | 9,571 | 6,189 | 13.8 | 10.3 | 49.3 | 22.7 | 64.2 | 18.1 | 13.8 |
| Charlotte | NC | 217.7 | 25,505 | 13,814 | 15.1 | 11.1 | 48.1 | 19.8 | 67.0 | 19.7 | 14.9 |
| Durham | NC | 227.4 | 16,806 | 8,261 | 15.8 | 12.3 | 47.5 | 22.3 | 68.3 | 19.6 | 15.4 |
| Greensboro | NC | 205.2 | 5,712 | 3,054 | 15.1 | 12.1 | 46.3 | 18.1 | 64.9 | 18.3 | 14.6 |
| Greenville | NC | 247.2 | 12,666 | 5,969 | 15.8 | 12.1 | 54.2 | 24.2 | 72.3 | 19.7 | 15.0 |
| Hickory | NC | 187.4 | 3,389 | 2,243 | 14.4 | 10.6 | 52.4 | 25.4 | 67.1 | 20.0 | 14.5 |
| Raleigh | NC | 228.5 | 20,076 | 10,732 | 15.3 | 12.3 | 46.6 | 24.1 | 65.8 | 19.6 | 14.9 |
| Wilmington | NC | 204.0 | 5,988 | 3,577 | 16.0 | 11.9 | 49.2 | 22.1 | 69.4 | 19.7 | 16.7 |
| Winston-Salem | NC | 247.1 | 12,672 | 6,139 | 16.6 | 11.6 | 42.6 | 19.4 | 61.2 | 20.3 | 14.2 |
| Bismarck | ND | 189.8 | 3,203 | 2,431 | 14.0 | 10.7 | 46.5 | 25.3 | 66.8 | 14.7 | 13.5 |
| Fargo/Moorhead MN | ND | 185.5 | 6,007 | 4,165 | 14.8 | 10.3 | 52.0 | 30.2 | 67.0 | 16.9 | 13.9 |
| Grand Forks | ND | 220.4 | 2,261 | 1,495 | 16.7 | 11.2 | 49.7 | 27.4 | 68.7 | 16.5 | 11.8 |
| Minot | ND | 180.8 | 1,672 | 1,261 | 14.5 | 9.7 | 39.7 | 21.9 | 63.5 | 17.8 | 14.9 |
| Akron | OH | 269.6 | 8,436 | 3,738 | 15.6 | 14.3 | 43.3 | 21.0 | 57.4 | 18.5 | 17.6 |
| Canton | OH | 235.8 | 7,551 | 3,804 | 15.2 | 12.7 | 46.6 | 23.9 | 61.8 | 18.2 | 15.7 |
| Cincinnati | OH | 247.6 | 17,582 | 9,870 | 16.6 | 13.0 | 43.9 | 18.4 | 62.2 | 20.3 | 16.5 |
| Cleveland | OH | 258.8 | 28,901 | 13,632 | 17.2 | 14.4 | 42.0 | 22.5 | 59.9 | 19.0 | 16.2 |
| Columbus | OH | 255.3 | 32,073 | 18,818 | 16.7 | 13.8 | 45.8 | 26.8 | 60.3 | 20.4 | 17.5 |
| Dayton | OH | 235.4 | 13,744 | 7,742 | 15.6 | 12.5 | 44.8 | 23.6 | 64.1 | 18.9 | 16.0 |
| Elyria | OH | 307.8 | 4,146 | 2,190 | 17.4 | 15.2 | 38.1 | 19.1 | 58.8 | 18.2 | 15.2 |
| Kettering | OH | 214.8 | 4,861 | 3,138 | 15.6 | 11.0 | 43.7 | 19.4 | 64.3 | 19.9 | 15.5 |
| Toledo | OH | 254.4 | 12,758 | 7,367 | 15.5 | 12.9 | 45.6 | 23.1 | 61.8 | 19.1 | 16.6 |
| Youngstown | OH | 287.6 | 9,991 | 4,876 | 16.3 | 14.7 | 51.6 | 31.5 | 64.1 | 18.3 | 17.6 |
| Lawton | OK | 256.1 | 3,007 | 1,699 | 16.3 | 10.2 | 46.3 | 19.7 | 59.5 | 19.2 | 13.8 |
| Oklahoma City | OK | 246.3 | 25,166 | 15,003 | 15.9 | 12.4 | 39.9 | 16.2 | 57.9 | 18.7 | 14.0 |
| Tulsa | OK | 243.1 | 16,128 | 9,461 | 15.7 | 11.5 | 45.2 | 21.8 | 60.4 | 18.5 | 14.4 |

**Appendix Table 1. Care following discharge for medical and surgical conditions among hospital referral regions (2009)**

| HRR name | State | Medical discharges per 1,000 Medicare beneficiaries | Number of patients in cohort | | Percent readmitted within 30 days of discharge | | Percent seeing a primary care clinician within 14 days of discharge to home | | Percent having an ambulatory visit within 14 days of discharge to home | Percent having an emergency room visit within 30 days of discharge | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Medical | Surgical | Medical | Surgical | Medical | Surgical | Medical | Medical | Surgical |
| Bend | OR | 133.0 | 1,443 | 1,474 | 14.7 | 8.3 | 49.5 | 24.6 | 71.7 | 19.7 | 13.2 |
| Eugene | OR | 161.8 | 5,619 | 4,428 | 14.7 | 9.8 | 50.0 | 24.3 | 63.5 | 20.3 | 14.1 |
| Medford | OR | 156.8 | 4,663 | 3,565 | 14.2 | 9.3 | 49.0 | 18.7 | 65.8 | 20.9 | 15.2 |
| Portland | OR | 169.3 | 13,188 | 8,953 | 14.8 | 10.1 | 44.6 | 19.3 | 62.3 | 21.2 | 16.0 |
| Salem | OR | 131.1 | 1,148 | 1,036 | 16.2 | 9.3 | 39.7 | 19.3 | 61.5 | 23.8 | 15.1 |
| Allentown | PA | 256.2 | 19,235 | 9,896 | 16.1 | 13.8 | 42.8 | 20.8 | 60.7 | 18.3 | 15.5 |
| Altoona | PA | 240.9 | 3,438 | 1,954 | 16.2 | 13.8 | 44.1 | 23.7 | 57.3 | 18.6 | 15.2 |
| Danville | PA | 236.2 | 6,992 | 3,449 | 15.6 | 10.8 | 53.5 | 25.5 | 66.2 | 19.5 | 14.1 |
| Erie | PA | 243.1 | 10,071 | 5,521 | 15.0 | 11.9 | 46.1 | 29.9 | 58.9 | 17.9 | 14.7 |
| Harrisburg | PA | 203.9 | 12,454 | 7,587 | 15.5 | 12.0 | 48.9 | 21.6 | 65.5 | 17.7 | 13.8 |
| Johnstown | PA | 287.6 | 2,385 | 1,172 | 17.1 | 14.9 | 39.9 | 27.2 | 50.0 | 19.9 | 17.5 |
| Lancaster | PA | 193.7 | 7,702 | 4,961 | 14.1 | 10.6 | 51.5 | 34.2 | 67.6 | 15.9 | 12.8 |
| Philadelphia | PA | 260.5 | 44,721 | 20,007 | 16.8 | 14.1 | 37.3 | 20.0 | 57.7 | 18.9 | 15.8 |
| Pittsburgh | PA | 283.8 | 32,149 | 14,537 | 17.0 | 14.2 | 34.0 | 20.0 | 48.8 | 19.2 | 16.0 |
| Reading | PA | 239.9 | 8,093 | 4,358 | 15.3 | 12.1 | 43.3 | 20.8 | 59.2 | 17.4 | 13.4 |
| Sayre | PA | 260.9 | 3,232 | 1,657 | 17.2 | 12.6 | 45.8 | 25.2 | 66.1 | 21.2 | 16.7 |
| Scranton | PA | 248.5 | 5,756 | 2,811 | 16.0 | 11.6 | 36.9 | 20.6 | 50.5 | 17.9 | 13.1 |
| Wilkes-Barre | PA | 210.4 | 4,198 | 2,281 | 14.5 | 11.0 | 40.3 | 28.8 | 52.3 | 15.5 | 11.7 |
| York | PA | 192.4 | 5,216 | 3,056 | 15.3 | 11.2 | 51.7 | 25.5 | 64.8 | 16.3 | 12.5 |
| Providence | RI | 221.5 | 11,632 | 5,805 | 16.3 | 14.1 | 39.3 | 18.2 | 58.8 | 20.8 | 18.1 |
| Charleston | SC | 212.1 | 12,566 | 7,738 | 16.2 | 12.3 | 45.0 | 19.6 | 65.7 | 19.2 | 14.9 |
| Columbia | SC | 196.7 | 13,185 | 8,435 | 15.8 | 10.4 | 43.0 | 18.4 | 64.7 | 18.2 | 12.2 |
| Florence | SC | 282.4 | 6,164 | 3,037 | 15.6 | 12.6 | 53.3 | 22.5 | 67.1 | 18.2 | 14.5 |
| Greenville | SC | 184.4 | 9,262 | 7,022 | 14.1 | 10.1 | 44.9 | 19.2 | 64.7 | 17.9 | 12.4 |
| Spartanburg | SC | 234.1 | 4,789 | 2,659 | 15.2 | 10.3 | 48.8 | 22.0 | 67.3 | 17.5 | 11.7 |
| Rapid City | SD | 166.3 | 2,264 | 1,712 | 13.0 | 7.5 | 44.7 | 24.8 | 59.7 | 14.9 | 10.9 |
| Sioux Falls | SD | 205.8 | 12,095 | 8,337 | 15.5 | 10.9 | 49.8 | 30.1 | 65.4 | 15.5 | 11.7 |
| Chattanooga | TN | 216.8 | 8,715 | 5,648 | 15.3 | 12.2 | 39.9 | 18.6 | 59.4 | 19.0 | 15.7 |
| Jackson | TN | 267.6 | 5,904 | 3,036 | 17.1 | 13.6 | 42.9 | 21.5 | 63.3 | 20.8 | 16.9 |
| Johnson City | TN | 291.4 | 3,948 | 1,874 | 16.8 | 13.7 | 44.8 | 23.8 | 60.1 | 19.9 | 15.2 |
| Kingsport | TN | 349.5 | 7,276 | 2,926 | 17.8 | 14.4 | 41.8 | 23.6 | 57.3 | 23.7 | 19.2 |
| Knoxville | TN | 271.8 | 18,043 | 9,414 | 16.4 | 12.6 | 44.1 | 19.9 | 60.4 | 20.8 | 16.3 |
| Memphis | TN | 256.0 | 22,694 | 10,900 | 16.1 | 12.6 | 38.5 | 19.1 | 59.0 | 18.1 | 14.5 |
| Nashville | TN | 282.3 | 33,201 | 16,748 | 16.6 | 12.8 | 45.5 | 20.3 | 63.3 | 18.7 | 15.0 |
| Abilene | TX | 262.4 | 5,213 | 3,424 | 15.7 | 11.6 | 43.6 | 20.7 | 60.5 | 16.9 | 14.3 |
| Amarillo | TX | 206.2 | 5,444 | 3,705 | 16.3 | 11.7 | 39.1 | 15.2 | 62.3 | 17.5 | 12.6 |
| Austin | TX | 194.3 | 11,348 | 7,497 | 14.7 | 11.6 | 38.6 | 17.1 | 61.8 | 18.5 | 14.5 |
| Beaumont | TX | 243.7 | 6,230 | 3,342 | 17.1 | 12.0 | 38.5 | 19.5 | 58.1 | 21.1 | 15.0 |
| Bryan | TX | 225.4 | 2,560 | 1,511 | 14.6 | 13.5 | 43.8 | 20.9 | 60.0 | 18.8 | 15.9 |
| Corpus Christi | TX | 245.2 | 5,531 | 2,971 | 15.9 | 11.9 | 45.6 | 24.2 | 60.1 | 20.2 | 14.3 |
| Dallas | TX | 225.4 | 38,624 | 22,214 | 16.3 | 12.0 | 38.0 | 17.1 | 58.8 | 19.4 | 14.3 |
| El Paso | TX | 201.7 | 8,770 | 5,326 | 15.5 | 12.9 | 36.1 | 19.1 | 55.2 | 18.5 | 15.6 |
| Fort Worth | TX | 234.0 | 16,837 | 9,619 | 15.9 | 12.6 | 41.2 | 18.4 | 59.7 | 20.5 | 16.4 |
| Harlingen | TX | 257.5 | 5,698 | 2,887 | 17.1 | 12.9 | 53.0 | 35.7 | 69.6 | 20.2 | 14.0 |

**Appendix Table 1. Care following discharge for medical and surgical conditions among hospital referral regions (2009)**

| HRR name | State | Medical discharges per 1,000 Medicare beneficiaries | Number of patients in cohort | | Percent readmitted within 30 days of discharge | | Percent seeing a primary care clinician within 14 days of discharge to home | | Percent having an ambulatory visit within 14 days of discharge to home | Percent having an emergency room visit within 30 days of discharge | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Medical | Surgical | Medical | Surgical | Medical | Surgical | Medical | Medical | Surgical |
| Houston | TX | 223.6 | 46,034 | 26,354 | 16.2 | 12.4 | 36.6 | 18.1 | 59.7 | 18.4 | 14.2 |
| Longview | TX | 240.2 | 3,008 | 1,774 | 17.0 | 10.6 | 41.4 | 19.1 | 57.7 | 21.0 | 13.5 |
| Lubbock | TX | 260.1 | 9,556 | 5,720 | 15.9 | 12.4 | 32.5 | 14.0 | 55.0 | 18.4 | 15.4 |
| McAllen | TX | 264.6 | 5,813 | 3,137 | 15.8 | 13.0 | 58.5 | 44.7 | 72.4 | 16.6 | 12.8 |
| Odessa | TX | 207.3 | 3,614 | 2,153 | 15.8 | 10.2 | 40.2 | 21.0 | 63.6 | 19.9 | 12.9 |
| San Angelo | TX | 222.3 | 2,503 | 1,593 | 16.7 | 11.5 | 44.4 | 20.2 | 62.9 | 19.3 | 14.9 |
| San Antonio | TX | 205.8 | 21,573 | 12,993 | 16.0 | 12.0 | 40.7 | 21.5 | 62.2 | 17.9 | 13.8 |
| Temple | TX | 221.9 | 3,259 | 1,600 | 16.0 | 12.2 | 48.4 | 20.8 | 63.8 | 19.2 | 15.5 |
| Tyler | TX | 242.4 | 9,099 | 5,295 | 15.3 | 10.9 | 40.5 | 19.6 | 58.4 | 19.4 | 14.3 |
| Victoria | TX | 304.9 | 3,118 | 1,541 | 15.8 | 11.9 | 51.0 | 27.4 | 65.0 | 16.5 | 12.8 |
| Waco | TX | 224.9 | 4,026 | 2,259 | 16.5 | 13.3 | 46.3 | 17.1 | 62.5 | 20.4 | 15.7 |
| Wichita Falls | TX | 249.4 | 3,375 | 1,926 | 15.3 | 11.9 | 43.2 | 21.8 | 62.4 | 17.9 | 14.7 |
| Ogden | UT | 122.3 | 2,057 | 1,833 | 11.5 | 8.8 | 54.7 | 18.6 | 70.7 | 17.3 | 12.7 |
| Provo | UT | 139.7 | 1,992 | 1,852 | 13.0 | 10.5 | 46.6 | 16.8 | 64.2 | 16.3 | 13.6 |
| Salt Lake City | UT | 145.9 | 10,585 | 8,692 | 13.6 | 9.8 | 46.1 | 19.7 | 63.0 | 17.6 | 14.0 |
| Burlington | VT | 207.9 | 8,300 | 4,621 | 15.9 | 11.3 | 43.3 | 24.8 | 60.1 | 20.9 | 17.1 |
| Arlington | VA | 161.3 | 12,976 | 7,540 | 15.9 | 12.3 | 41.0 | 18.4 | 63.5 | 19.8 | 16.0 |
| Charlottesville | VA | 216.5 | 7,979 | 4,063 | 15.6 | 12.8 | 49.7 | 28.1 | 65.3 | 19.4 | 17.1 |
| Lynchburg | VA | 246.0 | 4,282 | 1,976 | 15.4 | 13.2 | 49.7 | 22.9 | 64.5 | 15.6 | 13.5 |
| Newport News | VA | 175.9 | 5,994 | 3,984 | 14.5 | 10.1 | 47.9 | 18.2 | 69.7 | 19.7 | 14.1 |
| Norfolk | VA | 211.3 | 14,097 | 7,493 | 15.2 | 12.2 | 44.3 | 20.2 | 63.5 | 19.6 | 15.6 |
| Richmond | VA | 210.6 | 19,862 | 11,086 | 15.7 | 11.7 | 45.6 | 18.3 | 63.7 | 18.4 | 15.3 |
| Roanoke | VA | 242.6 | 11,217 | 5,615 | 16.1 | 12.6 | 44.1 | 21.2 | 63.1 | 20.5 | 16.8 |
| Winchester | VA | 218.5 | 5,177 | 2,819 | 15.2 | 12.8 | 41.3 | 19.8 | 58.3 | 18.6 | 16.8 |
| Everett | WA | 172.8 | 4,441 | 3,236 | 15.3 | 10.2 | 56.0 | 23.7 | 71.1 | 19.5 | 14.3 |
| Olympia | WA | 178.3 | 3,246 | 2,334 | 14.6 | 10.7 | 47.4 | 19.5 | 66.7 | 20.8 | 16.6 |
| Seattle | WA | 160.4 | 19,828 | 13,875 | 15.4 | 10.3 | 45.1 | 18.6 | 68.2 | 20.5 | 14.5 |
| Spokane | WA | 169.1 | 14,618 | 10,564 | 14.0 | 9.7 | 46.1 | 20.9 | 65.0 | 20.0 | 15.4 |
| Tacoma | WA | 199.6 | 6,159 | 3,929 | 15.9 | 11.9 | 50.9 | 20.8 | 69.2 | 20.4 | 16.3 |
| Yakima | WA | 194.3 | 2,887 | 1,771 | 14.0 | 9.8 | 54.2 | 19.5 | 69.8 | 19.4 | 15.9 |
| Charleston | WV | 313.3 | 12,890 | 6,446 | 17.5 | 13.8 | 38.8 | 24.0 | 52.4 | 21.8 | 17.9 |
| Huntington | WV | 294.0 | 5,528 | 3,091 | 16.6 | 13.5 | 36.1 | 20.7 | 51.7 | 20.8 | 18.6 |
| Morgantown | WV | 278.8 | 5,892 | 2,802 | 16.8 | 12.4 | 36.5 | 20.4 | 53.7 | 20.1 | 15.6 |
| Appleton | WI | 185.9 | 2,593 | 1,743 | 15.7 | 10.4 | 42.9 | 16.4 | 61.9 | 18.0 | 13.5 |
| Green Bay | WI | 193.8 | 5,614 | 3,839 | 14.0 | 10.9 | 40.6 | 18.5 | 61.0 | 17.4 | 13.5 |
| La Crosse | WI | 185.3 | 3,420 | 2,097 | 13.8 | 10.9 | 51.5 | 26.4 | 68.7 | 17.1 | 14.5 |
| Madison | WI | 198.7 | 11,518 | 6,716 | 14.9 | 11.8 | 50.8 | 22.6 | 66.4 | 18.2 | 14.6 |
| Marshfield | WI | 208.5 | 4,555 | 2,842 | 14.1 | 11.2 | 46.5 | 21.4 | 64.6 | 18.0 | 15.6 |
| Milwaukee | WI | 219.4 | 29,783 | 16,989 | 15.8 | 12.3 | 47.3 | 22.1 | 62.9 | 18.5 | 14.8 |
| Neenah | WI | 197.6 | 2,235 | 1,282 | 14.2 | 10.9 | 41.6 | 20.3 | 59.5 | 17.4 | 14.1 |
| Wausau | WI | 209.6 | 2,607 | 1,590 | 15.8 | 10.0 | 49.7 | 17.9 | 68.1 | 19.4 | 13.5 |
| Casper | WY | 211.6 | 2,793 | 1,677 | 16.4 | 11.8 | 46.5 | 25.8 | 63.1 | 19.8 | 14.5 |
| **United States** | **US** | **228.4** | **3,250,574** | **1,809,343** | **16.1** | **12.7** | **42.9** | **21.8** | **62.5** | **18.9** | **15.2** |

**Appendix Table 2. Care following discharge for medical and surgical conditions among selected academic medical centers (2009)**

| Hospital name | City | Number of patients in cohort | | Percent readmitted within 30 days of discharge | | Percent seeing a primary care clinician within 14 days of discharge to home | | Percent having an ambulatory visit within 14 days of discharge to home | Percent having an emergency room visit within 30 days of discharge | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Medical | Surgical | Medical | Surgical | Medical | Surgical | Medical | Medical | Surgical |
| University of Alabama Hospital | Birmingham, AL | 1,209 | 1,839 | 18.6 | 17.2 | 28.5 | 20.3 | 50.4 | 18.8 | 19.1 |
| University Medical Center | Tucson, AZ | 698 | 881 | 17.6 | 15.3 | 45.6 | 26.1 | 62.4 | 22.6 | 17.2 |
| UAMS Medical Center | Little Rock, AR | 860 | 696 | 20.7 | 16.6 | 21.8 | 18.9 | 52.7 | 23.5 | 20.2 |
| UC San Diego Med Ctr | San Diego, CA | 944 | 884 | 17.7 | 11.7 | 41.0 | 22.1 | 65.2 | 22.2 | 16.6 |
| UCLA Medical Center | Los Angeles, CA | 839 | 1,239 | 16.7 | 15.0 | 38.3 | 23.0 | 70.3 | 19.5 | 17.9 |
| Loma Linda University Med Ctr | Loma Linda, CA | 1,119 | 1,181 | 16.5 | 11.4 | 46.0 | 16.5 | 63.5 | 21.8 | 15.2 |
| Stanford Hospital and Clinics | Stanford, CA | 1,361 | 2,057 | 16.6 | 10.6 | 42.7 | 21.7 | 69.1 | 17.4 | 14.2 |
| UCSF Medical Center | San Francisco, CA | 1,143 | 1,592 | 18.8 | 15.3 | 37.1 | 25.6 | 57.9 | 22.5 | 19.2 |
| UC Davis Med Ctr | Sacramento, CA | 1,004 | 1,160 | 15.1 | 14.5 | 44.5 | 22.5 | 57.5 | 18.1 | 18.6 |
| Cedars-Sinai Medical Center | Los Angeles, CA | 4,109 | 4,156 | 16.2 | 12.0 | 30.0 | 17.9 | 65.9 | 16.8 | 13.1 |
| University of Colorado Hospital | Aurora, CO | 790 | 846 | 16.9 | 14.2 | 39.9 | 26.0 | 66.4 | 19.9 | 18.8 |
| Yale-New Haven Hospital | New Haven, CT | 3,131 | 2,159 | 17.6 | 16.3 | 39.3 | 17.2 | 65.7 | 20.0 | 18.1 |
| University of CT Health Ctr | Farmington, CT | 823 | 741 | 17.9 | 14.1 | 42.5 | 17.7 | 63.2 | 21.6 | 16.0 |
| George Washington Univ Hosp | Washington, DC | 900 | 658 | 16.1 | 14.9 | 32.1 | 16.9 | 60.4 | 19.6 | 17.8 |
| Howard University Hospital | Washington, DC | 616 | 120 | 16.3 | 0.0 | 22.2 | 0.0 | 43.4 | 18.4 | 0.0 |
| MedStar-Georgetown Med Ctr | Washington, DC | 683 | 799 | 21.1 | 15.3 | 24.6 | 15.3 | 55.9 | 22.5 | 18.4 |
| Jackson Health System | Miami, FL | 1,625 | 1,009 | 19.2 | 15.5 | 28.6 | 17.5 | 47.2 | 20.2 | 16.4 |
| Shands at the University of FL | Gainesville, FL | 2,214 | 2,173 | 18.5 | 16.1 | 41.4 | 24.7 | 60.6 | 19.9 | 16.6 |
| Tampa General Hospital | Tampa, FL | 1,308 | 1,950 | 18.2 | 14.1 | 33.1 | 18.5 | 59.3 | 18.0 | 15.5 |
| Emory University Hospital | Atlanta, GA | 1,202 | 2,176 | 18.0 | 12.2 | 35.2 | 18.1 | 61.1 | 18.7 | 15.1 |
| Medical College of Georgia Hosp | Augusta, GA | 801 | 507 | 18.7 | 16.0 | 34.1 | 16.9 | 55.0 | 23.3 | 17.4 |
| Grady Memorial Hospital | Atlanta, GA | 1,108 | 217 | 15.4 | 13.0 | 25.7 | 10.4 | 34.9 | 21.2 | 16.6 |
| University of Chicago Hospital | Chicago, IL | 1,211 | 1,282 | 20.7 | 14.4 | 31.3 | 16.9 | 60.6 | 20.5 | 16.6 |
| Rush University Medical Center | Chicago, IL | 1,475 | 1,992 | 18.0 | 11.7 | 33.1 | 12.7 | 54.2 | 18.3 | 14.0 |
| Loyola University Medical Center | Maywood, IL | 1,518 | 1,673 | 17.7 | 16.0 | 29.8 | 11.3 | 59.6 | 18.0 | 16.9 |
| Northwestern Memorial Hospital | Chicago, IL | 3,058 | 2,498 | 16.7 | 13.7 | 39.4 | 19.5 | 65.0 | 17.4 | 15.4 |
| Clarian Health Partners | Indianapolis, IN | 2,468 | 2,465 | 18.3 | 15.5 | 33.4 | 24.5 | 53.3 | 22.4 | 19.1 |
| University of IA Hosps & Clinics | Iowa City, IA | 1,311 | 1,490 | 18.2 | 16.0 | 36.7 | 25.2 | 55.8 | 18.1 | 18.0 |
| University of Kansas Hospital | Kansas City, KS | 1,040 | 1,313 | 19.6 | 15.5 | 28.9 | 23.7 | 53.2 | 19.6 | 16.8 |
| University of Kentucky Hospital | Lexington, KY | 1,068 | 1,359 | 18.7 | 13.8 | 32.7 | 14.3 | 55.9 | 22.8 | 16.4 |
| University of Maryland Med Ctr | Baltimore, MD | 1,144 | 1,247 | * | * | 33.2 | 23.4 | 54.4 | 20.8 | 21.3 |
| Johns Hopkins Hospital | Baltimore, MD | 1,653 | 2,273 | * | * | 30.8 | 21.4 | 52.0 | 19.0 | 16.9 |
| Boston Medical Center | Boston, MA | 1,401 | 836 | 16.2 | 16.5 | 35.1 | 21.9 | 54.0 | 20.8 | 22.1 |
| Massachusetts General Hospital | Boston, MA | 3,513 | 4,029 | 17.6 | 14.4 | 35.5 | 19.8 | 54.7 | 20.1 | 17.8 |
| Beth Israel Deaconess Med Ctr | Boston, MA | 2,602 | 2,080 | 20.0 | 16.4 | 39.6 | 27.0 | 63.4 | 21.6 | 19.1 |
| Brigham and Women's Hospital | Boston, MA | 2,049 | 3,267 | 20.0 | 15.8 | 37.0 | 21.8 | 63.2 | 18.9 | 17.7 |
| Tufts Medical Center | Boston, MA | 920 | 896 | 19.9 | 18.6 | 41.9 | 22.2 | 65.0 | 20.8 | 22.6 |
| UMass Memorial Medical Center | Worcester, MA | 3,115 | 1,807 | 17.2 | 16.2 | 43.2 | 24.3 | 63.7 | 20.0 | 20.5 |
| University of Michigan Hospitals | Ann Arbor, MI | 1,864 | 1,838 | 17.4 | 15.8 | 42.9 | 23.7 | 64.1 | 19.9 | 19.5 |
| Harper University Hospital | Detroit, MI | 1,185 | 798 | 17.0 | 13.7 | 39.0 | 22.7 | 59.0 | 19.3 | 16.4 |
| Mayo Clinic (St. Mary's) | Rochester, MN | 3,163 | 4,386 | 15.8 | 13.7 | 54.2 | 36.2 | 69.6 | 18.1 | 17.4 |
| University of Minnesota Med Ctr | Minneapolis, MN | 562 | 775 | 22.2 | 16.6 | 36.7 | 28.3 | 62.6 | 21.6 | 16.3 |
| Univ of MS Hosps & Clinics | Jackson, MS | 631 | 729 | 18.9 | 11.8 | 25.1 | 17.3 | 45.6 | 20.8 | 13.7 |

*Rates for Maryland hospitals have been suppressed.

**Appendix Table 2. Care following discharge for medical and surgical conditions among selected academic medical centers (2009)**

| Hospital name | City | Number of patients in cohort | | Percent readmitted within 30 days of discharge | | Percent seeing a primary care clinician within 14 days of discharge to home | | Percent having an ambulatory visit within 14 days of discharge to home | Percent having an emergency room visit within 30 days of discharge | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Medical | Surgical | Medical | Surgical | Medical | Surgical | Medical | Medical | Surgical |
| **Barnes-Jewish Hospital** | St. Louis, MO | 3,260 | 3,071 | 19.1 | 17.5 | 31.9 | 20.0 | 53.6 | 18.1 | 18.1 |
| **St. Louis University Hospital** | St. Louis, MO | 860 | 434 | 21.1 | 19.7 | 29.7 | 20.1 | 48.3 | 21.0 | 22.0 |
| **University of MO Hosp & Clinic** | Columbia, MO | 768 | 657 | 17.9 | 14.5 | 40.2 | 25.3 | 58.7 | 19.0 | 16.3 |
| **Nebraska Medical Center** | Omaha, NE | 1,693 | 1,455 | 19.4 | 14.8 | 43.1 | 28.6 | 65.6 | 19.1 | 16.0 |
| **Creighton University Med Ctr** | Omaha, NE | 532 | 438 | 18.1 | 15.1 | 47.2 | 40.7 | 65.8 | 21.0 | 17.2 |
| **Dartmouth-Hitchcock Med Ctr** | Lebanon, NH | 1,410 | 2,350 | 16.8 | 14.4 | 39.1 | 25.8 | 57.6 | 20.7 | 19.4 |
| **RWJ University Hospital** | New Brunswick, NJ | 2,653 | 2,196 | 19.0 | 16.9 | 32.0 | 16.4 | 68.7 | 20.2 | 19.0 |
| **UMDNJ University Hospital** | Newark, NJ | 491 | 384 | 22.3 | 19.2 | 34.9 | 16.9 | 52.5 | 26.0 | 20.8 |
| **University of New Mexico Hosp** | Albuquerque, NM | 640 | 444 | 17.0 | 14.2 | 30.1 | 24.4 | 52.5 | 20.0 | 17.3 |
| **Kaleida Health** | Buffalo, NY | 3,438 | 1,951 | 14.1 | 14.7 | 40.8 | 25.9 | 61.1 | 16.8 | 15.9 |
| **Albany Medical Center** | Albany, NY | 1,296 | 1,588 | 16.8 | 19.0 | 39.8 | 20.8 | 65.0 | 17.7 | 15.8 |
| **Mount Sinai Hospital** | New York, NY | 3,751 | 3,862 | 19.1 | 16.7 | 25.0 | 18.6 | 54.1 | 19.3 | 13.3 |
| **Montefiore Medical Center** | Bronx, NY | 5,095 | 1,710 | 17.6 | 19.4 | 33.8 | 17.9 | 56.3 | 17.7 | 18.8 |
| **New York-Presbyterian Hospital** | New York, NY | 5,890 | 5,873 | 17.5 | 16.8 | 24.8 | 15.7 | 54.2 | 16.0 | 14.9 |
| **NYU Medical Center** | New York, NY | 2,487 | 3,035 | 15.8 | 14.1 | 18.9 | 17.6 | 54.5 | 14.6 | 11.7 |
| **Upstate Medical University** | Syracuse, NY | 972 | 712 | 16.1 | 16.1 | 33.1 | 22.2 | 60.2 | 19.0 | 19.2 |
| **Strong Memorial Hospital** | Rochester, NY | 1,147 | 1,223 | 14.1 | 12.8 | 51.6 | 30.3 | 68.5 | 18.1 | 16.9 |
| **Stony Brook University Hospital** | Stony Brook, NY | 1,946 | 1,451 | 18.7 | 18.6 | 42.8 | 35.0 | 65.0 | 20.4 | 20.2 |
| **Duke University Hospital** | Durham, NC | 2,084 | 2,675 | 18.6 | 15.6 | 40.7 | 28.7 | 66.6 | 19.6 | 19.4 |
| **Pitt County Memorial Hospital** | Greenville, NC | 2,990 | 2,450 | 16.0 | 13.5 | 51.5 | 27.5 | 72.9 | 20.4 | 17.3 |
| **North Carolina Baptist Hospital** | Winston-Salem, NC | 2,054 | 1,704 | 18.6 | 16.6 | 39.4 | 25.4 | 57.0 | 19.1 | 18.2 |
| **University of NC Hosps** | Chapel Hill, NC | 1,722 | 1,123 | 18.9 | 16.4 | 43.7 | 23.9 | 65.7 | 21.3 | 17.9 |
| **University Hospital** | Cincinnati, OH | 881 | 725 | 17.5 | 19.8 | 44.7 | 20.4 | 60.5 | 19.9 | 20.1 |
| **University of Toledo Med Ctr** | Toledo, OH | 703 | 835 | 17.3 | 17.6 | 41.9 | 26.8 | 60.8 | 20.1 | 18.2 |
| **Ohio State University Med Ctr** | Columbus, OH | 1,658 | 1,673 | 20.3 | 20.1 | 40.3 | 36.2 | 56.2 | 21.5 | 24.2 |
| **University Hospitals Case Med Ctr** | Cleveland, OH | 1,839 | 1,766 | 18.5 | 15.7 | 41.8 | 25.8 | 62.0 | 16.8 | 17.2 |
| **Cleveland Clinic Foundation** | Cleveland, OH | 1,979 | 4,255 | 21.3 | 17.5 | 31.8 | 27.0 | 55.7 | 20.7 | 20.7 |
| **Oklahoma University Med Ctr** | Oklahoma City, OK | 479 | 592 | 18.2 | 11.3 | 35.7 | 14.0 | 57.3 | 24.0 | 16.1 |
| **OHSU Hospital** | Portland, OR | 554 | 1,154 | 18.9 | 14.6 | 32.6 | 26.0 | 58.7 | 21.2 | 19.8 |
| **Temple University Hospital** | Philadelphia, PA | 682 | 314 | 18.6 | 17.0 | 29.9 | 23.4 | 51.6 | 22.3 | 18.6 |
| **Hospital of the Univ of PA** | Philadelphia, PA | 955 | 1,583 | 18.1 | 16.5 | 30.2 | 24.9 | 57.7 | 17.5 | 18.1 |
| **UPMC Presbyterian** | Pittsburgh, PA | 2,419 | 2,903 | 19.2 | 16.5 | 30.6 | 20.9 | 49.2 | 19.8 | 17.2 |
| **Thomas Jefferson University Hosp** | Philadelphia, PA | 2,114 | 2,428 | 18.9 | 13.4 | 30.5 | 14.3 | 53.2 | 18.8 | 15.3 |
| **Penn State Hershey Med Ctr** | Hershey, PA | 1,422 | 1,322 | 16.8 | 11.6 | 41.7 | 23.6 | 62.2 | 15.9 | 13.7 |
| **Hahnemann University Hospital** | Philadelphia, PA | 559 | 427 | 20.3 | 20.6 | 20.8 | 14.9 | 52.5 | 19.2 | 18.5 |
| **Rhode Island Hospital** | Providence, RI | 2,001 | 1,462 | 16.8 | 15.3 | 41.8 | 17.3 | 61.5 | 21.9 | 19.5 |
| **MUSC Med Ctr of Med Univ of SC** | Charleston, SC | 1,057 | 1,602 | 21.5 | 16.4 | 36.6 | 21.6 | 59.9 | 22.1 | 19.0 |
| **Vanderbilt University Med Ctr** | Nashville, TN | 1,449 | 2,289 | 16.8 | 15.6 | 28.7 | 19.2 | 55.6 | 19.3 | 17.1 |
| **Parkland Health & Hosp System** | Dallas, TX | 646 | 286 | 15.6 | 15.4 | 23.1 | 16.1 | 43.2 | 19.4 | 19.5 |
| **Univ of TX Medical Branch Hosps** | Galveston, TX | 334 | 207 | 17.6 | 18.5 | 45.1 | 19.4 | 67.9 | 14.6 | 13.1 |
| **Scott & White Memorial Hospital** | Temple, TX | 1,508 | 1,224 | 18.3 | 12.9 | 42.3 | 20.5 | 56.6 | 21.8 | 14.6 |
| **Memorial Hermann Hospital** | Houston, TX | 1,202 | 1,083 | 16.5 | 13.5 | 27.7 | 15.9 | 53.2 | 16.4 | 13.5 |
| **The Methodist Hospital** | Houston, TX | 3,282 | 3,604 | 16.6 | 12.9 | 24.6 | 14.0 | 49.9 | 16.6 | 14.2 |

**Appendix Table 2. Care following discharge for medical and surgical conditions among selected academic medical centers (2009)**

| Hospital name | City | Number of patients in cohort | | Percent readmitted within 30 days of discharge | | Percent seeing a primary care clinician within 14 days of discharge to home | | Percent having an ambulatory visit within 14 days of discharge to home | Percent having an emergency room visit within 30 days of discharge | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Medical | Surgical | Medical | Surgical | Medical | Surgical | Medical | Medical | Surgical |
| **University of Utah Health Care** | Salt Lake City, UT | 900 | 1,200 | 15.2 | 13.3 | 42.1 | 22.6 | 62.0 | 16.6 | 16.0 |
| **Fletcher Allen Health Care** | Burlington, VT | 1,873 | 2,061 | 15.3 | 10.9 | 48.9 | 30.1 | 66.6 | 22.2 | 18.9 |
| **University of Virginia Med Ctr** | Charlottesville, VA | 1,617 | 2,166 | 20.7 | 15.4 | 48.2 | 36.8 | 65.8 | 24.9 | 20.9 |
| **VCU Health System** | Richmond, VA | 856 | 1,110 | 16.4 | 14.1 | 35.5 | 20.6 | 56.5 | 19.0 | 16.6 |
| **University of Washington Med Ctr** | Seattle, WA | 643 | 1,178 | 20.5 | 13.5 | 35.6 | 18.9 | 62.5 | 18.3 | 17.7 |
| **West Virginia University Hosps** | Morgantown, WV | 980 | 924 | 19.9 | 17.0 | 33.4 | 20.5 | 53.6 | 21.1 | 18.2 |
| **University of WI Hosp & Clinics** | Madison, WI | 1,399 | 1,684 | 15.6 | 13.4 | 42.2 | 21.7 | 64.0 | 18.2 | 17.4 |
| **Froedtert Memorial Lutheran Hosp** | Milwaukee, WI | 1,618 | 1,116 | 17.8 | 16.9 | 46.6 | 15.6 | 65.6 | 19.6 | 17.7 |

## References


1 Jencks SF, Williams MV, Coleman EA. Rehospitalizations among patients in the Medicare fee-for-service program. *N Engl J Med* 2009;360(14):1418-28.

2 Klees BS, Wolfe CJ, Curtis CA. Brief Summaries of Medicare and Medicaid: Title XVIII & Title XIX of the Social Security Act as of November 1, 2010. Office of the Actuary, CMS, DHHS. *Health Care Financing Review* 2010 Statistical Supplement. Accessed August 31, 2011 at: https://www.cms.gov/MedicareProgramRatesStats/downloads/MedicareMedicaidSummaries2010.pdf.

3 Bueno H, Ross JS, Wang Y, Chen J, Vidán MT, Normand SL, Curtis JP, Drye EE, Lichtman JH, Keenan PS, Kosiborod M, Krumholz HM. Trends in length of stay and short-term outcomes among Medicare patients hospitalized for heart failure, 1993-2006. *JAMA* 2010;303(21):2141-7.

4 Bell CM, Brener SS, Gunraj N, Huo C, Bierman AS, Scales DC, Bajcar J, Zwarenstein M, Urbach DR. Association of ICU or hospital admission with unintentional discontinuation of medications for chronic diseases. *JAMA* 2011;306(8):840-7.

5 Centers for Medicare and Medicaid Services. Hospital Compare web site. Accessed August 31, 2011 at: http://www.hospitalcompare.hhs.gov/.

6 Peikes D, Chen A, Schore J, Brown R. Effects of care coordination on hospitalization, quality of care, and health care expenditures among Medicare beneficiaries: 15 randomized trials. *JAMA* 2009;301(6):603-18.

7 Minott, J. Reducing Hospital Readmissions. Washington, DC: Academy Health. 2008. Accessed August 31, 2011 at: http://www.academyhealth.Org/Files/Publications/Reducing_Hospital_Readmissions.pdf.

8 Stone J, Hoffman GJ. Medicare Hospital Readmissions: Issues, Policy Options and PPACA. U.S. Congressional Research Service R40972, September 21, 2010. Accessed August 31, 2011 at: http://www.hospitalmedicine.org/AM/pdf/advocacy/CRS_Readmissions_Report.pdf.

9 Jha AK, Orav EJ, Epstein AM. Public reporting of discharge planning and rates of readmissions. *N Engl J Med* 2009;361(27):2637-45.

10 Selected Medicare Hospital Quality Provisions Under the ACA. Association of American Medical Colleges. Accessed August 31, 2011 at: https://www.aamc.org/advocacy/medicare/153882/selected_medicare_hospital_quality_provisions_under_the_aca.html.

11 Fisher ES, Wennberg DE, Stukel TA, Gottlieb DJ. Variations in the longitudinal efficiency of academic medical centers. *Health Affairs* 2004;Suppl Variation:VAR19-32.

12 Welch HG, Sharp SM, Gottlieb DJ, Skinner JS, Wennberg JE. Geographic variation in diagnosis frequency and risk of death among Medicare beneficiaries. *JAMA* 2011;305(11):1113-8.

13 Song Y, Skinner J, Bynum J, Sutherland J, Wennberg JE, Fisher ES. Regional variations in diagnostic practices. *N Engl J Med* 2010;363(1):45-53.

14 Reid RJ, Coleman K, Johnson EA, Fishman PA, Hsu C, Soman MP, Trescott CE, Erikson M, Larson EB. The Group Health medical home at year two: cost savings, higher patient satisfaction, and less burnout for providers. *Health Affairs* 2010;29(5):835-43.

15 Fisher ES, Wennberg JE, Stukel TA, Sharp SM. Hospital readmission rates for cohorts of Medicare beneficiaries in Boston and New Haven. *N Engl J Med* 1994;331(15):989-95.

16 Sharma G, Kuo YF, Freeman JL, Zhang DD, Goodwin JS. Outpatient follow-up visit and 30-day emergency department visit and readmission in patients hospitalized for chronic obstructive pulmonary disease. *Arch Intern Med* 2010;170(18):1664-70.

17 Hernandez AF, Greiner MA, Fonarow GC, Hammill BG, Heidenreich PA, Yancy CW, Peterson ED, Curtis LH. Relationship between early physician follow-up and 30-day readmission among Medicare beneficiaries hospitalized for heart failure. *JAMA* 2010;303(17):1716-22.

18 Naylor MD, Brooten DA, Campbell RL, Maislin G, McCauley KM, Schwartz JS. Transitional care of older adults hospitalized with heart failure: A randomized, controlled trial. *J Am Geriatr Soc* 2004;52(5):675-84.

19 Coleman EA, Parry C, Chalmers S, Min SJ. The care transitions intervention: Results of a randomized controlled trial. *Arch Intern Med* 2006;166(17):1822-8.

20 Naylor MD, Aiken LH, Kurtzman ET, Olds DM, Hirschman KB. The care span: The importance of transitional care in achieving health reform. *Health Affairs* 2011 Apr;30(4):746-54.

21 Partnership for Patients: Better Care, Lower Costs. Implementation Center, U.S. Department of Health & Human Services. Accessed August 31, 2011 at: http://www.healthcare.gov/center/programs/partnership/index.html.

**The Dartmouth Atlas Project** works to accurately describe how medical resources are distributed and used in the United States. The project offers comprehensive information and analysis about national, regional, and local markets, as well as individual hospitals and their affiliated physicians, in order to provide a basis for improving health and health systems. Through this analysis, the project has demonstrated glaring variations in how health care is delivered across the United States.

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