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Methodology
U.S. News & World Report
2019-20 Best Hospitals:
Specialty Rankings

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July 9, 2019



To Whom It May Concern:

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Executive Summary

U.S. News & World Report began publishing hospital rankings in 1990, as “America’s Best Hospitals,” to identify the medical centers in various specialties best suited to patients whose illnesses pose unusual challenges because of underlying conditions, procedure difficulty, advanced age or other medical issues that add risk.

The specialty rankings have appeared annually since 1990 and their focus on identifying hospitals that excel in treating particularly difficult patients has not changed. To address patients in relatively low-acuity procedures and conditions, a complementary set of ratings, “Best Hospitals: Procedures and Conditions” is available that covers abdominal aortic aneurysm repair, aortic valve surgery, coronary artery bypass surgery, colon cancer surgery, hip replacement, knee replacement, treatment of congestive heart failure, treatment of chronic obstructive pulmonary disease, and lung cancer surgery. Details of these ratings are available at <http://health.usnews.com/health-care/best-hospitals/articles/faq-how-and-why-we-rank-and-rate-hospitals>.

The Best Hospitals specialty rankings assess hospital performance in 16 specialties or specialty areas, from Cancer to Urology. In 12 of these, whether and how high a hospital is ranked is determined by an extensive data-driven analysis combining performance measures in three primary dimensions of healthcare: structure, process/expert opinion, and outcomes. In the four other specialties, ranking relies solely on expert opinion.

The structural measures include hospital volume, nurse staffing and other resources that define the hospital environment. The data source for most structural measures is the American Hospital Association (AHA) Annual Survey. Additional resources include the National Cancer Institute’s list of NIH-designated cancer centers and the American Nurses Credentialing Center’s roster of Nurse Magnet hospitals.

Process is represented by two factors. One is a hospital’s ability to develop and sustain a system that delivers high-quality care, as determined by the surveys of board-certified physicians cited above. The other, is a new indicator of patient experience. The basis for this score is the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) patient satisfaction surveys. A hospital's linear mean overall score from HCAHPS was used to calculate the patient experience score. For the 11 cancer specialty hospitals exempt from the CMS Inpatient Prospective Payment System, analogous data from the PPS-exempt Cancer Hospital (PCH) HCAHPS dataset were used. The patient experience score is worth 5% of the total score.

Assessment of outcomes performance relies on patient survival (i.e., risk-adjusted mortality) and a new measure evaluating the rate at which hospitals discharge patients to home following

inpatient care. The Standard Analytical Files (SAF) inpatient limited datasets (SAF data), maintained by the Centers for Medicare & Medicaid Services (CMS) and also referred to as the Medicare claims files, provide detailed claims data, including mortality, and discharge disposition for beneficiaries in fee-for-service Medicare.

No application, data submission or other action is required for Best Hospitals consideration. All facilities in the AHA universe of community hospitals are automatically considered but must meet a series of eligibility requirements.

Initial eligibility requires that a hospital must meet at least one of the following four conditions:

- It is a teaching hospital, or
- It is affiliated with a medical school, or
- It has at least 200 beds, or
- It has at least 100 beds *and* offers at least four medical technologies from a list of eight that U.S. News deems significant for a Best Hospitals patient population.

Ranking in a particular specialty requires a second eligibility requirement. Hospitals must meet a volume/discharge threshold that varies by specialty. Setting discharge minimums ensures that ranking-eligible hospitals have demonstrable experience in treating a set number of complex cases in a given specialty. A hospital that does not meet the minimum requirement in a specialty is still eligible, however, if it was nominated by at least 1% of those who responded to the most recent three years of national physician surveys.

Rankings in Ophthalmology, Psychiatry, Rehabilitation, and Rheumatology are based solely on expert opinion as determined by the physician survey cited above.

For the 2019-20 rankings, 165 of over 4,500 evaluated U.S. hospitals were ranked in at least one specialty.

Since 1990, the Best Hospitals Honor Roll has recognized a small group of hospitals with high rankings in multiple Best Hospitals specialties. It was extensively revised in 2016-17 to reduce the effect of the expert opinion measure and to unify the rankings and ratings by incorporating Best Hospitals Procedures and Conditions ratings. See section *V. Honor Roll* for more details.

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I. Introduction

For families facing a serious or complex medical problem, finding the right hospital is daunting but critical. Decision tools beyond a doctor's recommendation, however, were nonexistent until 1990, when U.S. News & World Report introduced "America's Best Hospitals." That initial assessment was modest, only short alphabetical lists of hospitals that were rated—not ranked—in 12 specialties. In 1991 and thereafter, hospitals were ordinally ranked.

The 2019-20 Best Hospitals rankings have been drawn from a universe of 4,653 facilities.* The defined universe was the American Hospital Association's (AHA's) Annual Survey of Hospitals, which also provided some data for the rankings analysis. In a small number of cases, two or more AHA hospitals were combined for ranking purposes because they function as a single hospital in one or more specialties but report to AHA as separate facilities.

In 12 of the 16 adult specialty rankings, hospitals receive a composite score based on data from multiple sources. Information about unranked as well as ranked hospitals, accompanied by substantive data, are published online at www.usnews.com/besthospitals/rankings. A print edition publishes ranked hospitals, with somewhat less data displayed than online.

It is essential to use the Best Hospital rankings for their intended purpose—to help consumers determine which hospitals provide the best care for the *most serious or complicated* medical conditions and procedures, such as pancreatic cancer, or replacement of a heart valve in an elderly patient with multiple comorbidities. Relatively commonplace conditions and procedures, such as uncomplicated heart bypass surgery, knee replacement, and heart failure are the purview of a different analysis, Best Hospitals: Procedures and Conditions.†

The underlying methodology for the Best Hospitals rankings was created by the National Opinion Research Center (NORC) at the University of Chicago in the early 1990s. NORC collected the data and compiled the rankings from 1993 to 2004. RTI International,‡ Research Triangle Park, N.C., has produced the rankings from 2005 to the present. Over time, the methodology has been refined and extended—by incorporating patient safety data in 2009 (removed in 2019), for example, and measures for voluntary data transparency in Cardiology & Heart Surgery (added in 2016-17), and patient experience in all specialties (added in 2019). Large-scale enhancements are always under consideration such as the change introduced in the 2019 rankings for outcomes where a new risk-

* Military installations, federal institutions, rehabilitation, and acute long-term care facilities and institutional hospital units (e.g., prison hospitals, college infirmaries) are excluded from the data-driven specialties.

† Best Hospitals: Procedures and Conditions was launched in May 2015 and rates hospital performance in nine frequently encountered procedures and conditions.

‡ RTI International is a trade name of Research Triangle Institute.

adjusted mortality measure and a measure of the rate at which hospitals discharge patients to home following inpatient care were introduced.

The roster of specialties has been revised over the years as well. AIDS care, for example, was included in 1990 but was dropped in 1998 because most AIDS care had shifted to the outpatient setting. Pediatrics was moved out of the Best Hospitals universe in 2007 when separate Best Children’s Hospitals rankings were created. Best Hospitals specialties were neither added nor removed for 2019-20.[§]

The current 16 specialty rankings are:

- Cancer
- Cardiology & Heart Surgery
- Diabetes & Endocrinology
- Ear, Nose & Throat
- Gastroenterology & GI Surgery
- Geriatrics
- Gynecology
- Nephrology
- Neurology & Neurosurgery
- Ophthalmology
- Orthopedics
- Pulmonology & Lung Surgery
- Psychiatry
- Rehabilitation
- Rheumatology
- Urology

A. Data-Driven Rankings

As in previous years, rankings in 12 of the 16 specialties are based largely on hard data. An overall score (i.e., the U.S. News score) is assigned to hospitals in all data-driven specialties; i.e., all specialties other than Ophthalmology, Psychiatry, Rehabilitation, and Rheumatology, whose rankings are determined solely through expert opinion.

A hospital’s overall score reflects performance in three interlocked dimensions of healthcare: structure, process, and outcomes. The relationship was described by Avedis Donabedian in 1966; his model’s fundamental soundness has been widely accepted.¹⁻⁵

[§] Because the rankings are released in the middle of the year, U.S. News labels them with the current and following years when referring to them. This applies to Best Children’s Hospitals as well.

Structure refers to hospital resources related directly to patient care. Examples in the Best Hospitals rankings methodology include intensity of nurse staffing, availability of desirable technologies and patient services, and special status conferred by a recognized external body, such as designation as a Nurse Magnet hospital by the American Nurses Credentialing Center (ANCC) or as a National Cancer Institute (NCI) comprehensive or clinical cancer center by the National Institutes of Health (NIH).

Healthcare also is shaped by the *process* of delivering care, encompassing diagnosis, treatment, prevention, and patient education. Because many direct measures of process have limited relevance to the types of highly complex specialty care that is the focus of this project, a measure of expert opinion is used as a proxy for process quality. Specifically, process is represented by the expert opinion of a hospital to develop and sustain a system that delivers high-quality care.

The most evident *outcomes* measure is death, typically measured by *risk-adjusted mortality* (the likelihood of death when the patient's condition and the complexity of the case are taken into account). To address the role of socioeconomic factors in outcomes, the rankings include an adjustment to risk-adjusted mortality to take into account patients who are both Medicare- and Medicaid-eligible. Another outcome now included is discharging patients to home, which focuses on the rate at which patients go home directly after inpatient care rather than being transferred to another facility for continued care. This measures how effective inpatient care delivered by hospitals is at addressing patient medical needs.

Available metrics do not always neatly conform to a single dimension. Patient experience, for example, is an outcome that reflects both the patient's satisfaction with the care they received as well as how well the hospital addressed their medical needs. Although patient experience overlaps with both process and outcomes, we consider it a fourth component in the Best Hospitals methodology, evaluated separately from structure, process/expert opinion, and outcomes.

A fifth component, public transparency, was added to Cardiology & Heart Surgery for the 2016-17 rankings. Hospitals received credit for participating in American College of Cardiology (ACC) or the Society of Thoracic Surgeons (STS) data-reporting initiatives if they also agreed to allow their ACC- and/or STS-calculated results to be publicly reported on the organizations' websites.

Many of the individual measures in the data-driven rankings come from secondary data sources such as the AHA Annual Survey Database, which provides information about various structural hospital characteristics.

The five major components of the data-driven rankings are briefly described below and in greater detail later in this report.

Structure

These elements represent volume (i.e., discharges), technology, and other features that characterize the hospital environment. Some elements such as nurse staffing, intensivists, and Nurse Magnet status are included in all specialties, while other elements are specialty-specific. The source for many of these data elements in the 2019-20 rankings was the 2017 AHA Annual Survey, the most recent available.

The source of volume data was the Standard Analytical Files (SAF), maintained by the Centers for Medicare & Medicaid Services (CMS) and also referred to as the Medicare claims files, which provide detailed claims data, for all traditional (fee-for-service) Medicare beneficiaries who use hospital inpatient services. To account for Medicare Advantage patients, volume was calculated for hospitals in each specialty using an adjustment described below (see, Number of Patients on page 14). As a result, the volumes reported represent estimates rather than observed volumes of care at each hospital.

Process/expert opinion

The process component of the overall score is represented by the expert opinion of a hospital. For these rankings, the concept of expert opinion speaks to an institutional ability to develop and sustain a system that delivers high-quality care to especially challenging patients.

A hospital's expert opinion score is based on the average number of nominations from the three most recent annual surveys of board-certified physicians conducted for the Best Hospitals rankings which, for the 2019-20 rankings, were conducted in 2017, 2018, and 2019.

The 2019 sample was drawn from the Doximity Masterfile. Similar to the AMA Physician Masterfile, which was used as the sampling frame prior to 2016, Doximity's comprehensive Physician Database includes nearly every practicing U.S. physician. More information on the sampling approach for the physician survey can be found in section *II.D*.

The physician sample was stratified by census region—West, Northeast, South and Midwest (https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf)—and by specialty to ensure appropriate representation. The final aggregated sample included both federal and nonfederal medical and osteopathic physicians in all 50 states and the District of Columbia.

The surveyed physicians were asked to nominate the hospitals in their specific field of care, leaving aside issues of expense or location, that they consider best for patients with serious or difficult conditions. They could list as many as five hospitals. (The 2019-20 questionnaire and associated contact materials are shown in *Appendix A*.)

Outcomes

The primary outcomes measure in the 12 data-driven rankings is 30-day patient survival; i.e., how many patients are alive at 30 days after inpatient hospital admission. Like the volume indicator, the mortality measure is derived from SAF data, so only patients receiving care under traditional Medicare and 65 years of age or older were included. In the 2019-20 rankings, for each hospital and specialty, U.S. News computed an adjusted mortality rate based on the Medicare Severity Diagnosis-Related Group (MS-DRGs) appearing in the SAF data for the group of DRGs that appear in *Appendix C* for each of the specialties. Prior to this change, the methodology applied the All Patient Refined Diagnosis Related Group (APR-DRGs) to the SAF data to identify DRGs and create a risk adjusted survival outcome. The new method for 2019-20 was applied to the three most recent fiscal years (FY2015, FY2016, and FY2017) of Medicare claims submitted for reimbursement to CMS that appeared in the SAF data. A revised version of the 2017 Inpatient Standard Analytical File was released by CMS in March of 2019, which included approximately 150,000 additional beneficiaries that were not contained in the original file from November 2018. The inclusion of this file increased volume across all specialties, with the largest increase occurring in the orthopedic and geriatric specialties.

This year, the rankings also include a new outcome measure, discharging patients to home. This measure reflects the risk-adjusted rate at which patients are discharged to home rather than another facility (e.g., skilled nursing facility, long-term acute care facility, another acute care hospital) for additional care.

Both of the claims-based outcomes described above were risk-adjusted using a hierarchical logistic regression model that controlled for potential confounders, with a random intercept for hospital identity. Details on the model specified for each cohort are described in section *II.C. Outcomes*. In all instances, continuous variables were treated as such in our composite modeling in order to make maximum use of the information contained in the variable, and to minimize the risk of measurement error due to categorization.

Patient Experience

Patient experience is used to assess the patient-reported outcomes of care at hospitals eligible for the rankings. This measure reflects the patient experience of care as reported on the

HCAHPS survey of recently discharged patients or family members for patients who have died during hospitalization or since hospital discharge. The rankings utilize the linear mean score rather than the HCAHPS star rating for the ranking calculation because the former is a continuous measure and provides more information for analysis. However, the star ratings are shown in the ranking tables online and in the methodology report as they provide an accessible and easy way for consumers to understand the score. The HCAHPS dataset used for analysis was dated January 1, 2017 through December 31, 2017.

Public Transparency (Cardiology and Heart Surgery Only)

As described in Section A, a component worth 3% of the overall score was added for the Cardiology & Heart Surgery specialty in 2016-17. Hospitals received credit for participating in transparency initiatives by publicly reporting quality metrics through websites maintained by the American College of Cardiology (www.cardiosmart.org) and the Society of Thoracic Surgeons (www.sts.org) as of February 1, 2019. Support for the use of this measure consists of a demonstrated association between public reporting of evidence-based hospital performance metrics with better quality of care and improved hospital performance.⁶⁻¹¹ Given the relationship between public reporting and outcomes, the rankings are likely to include additional measures of transparency in future years.

Weighting

For the 2019-20 rankings, the weight for each component remains the same as in 2018-19. Weights are shown in *Table 1*.

Table 1. 2019-20 Overall Weight by Component

Component	Cardiology & Heart Surgery Weight (%)	Weight, All Other Specialties (%)
Outcomes	37.5%	37.5%
• 30-day Survival	30.0%	30.0%
• Discharging patients to home	7.5%	7.5%
Structure	30.0%	30.0%
Process/expert opinion	24.5%	27.5%
Patient experience	5.0%	5.0%
Public transparency	3.0%	0.0%

B. Expert Opinion-Based Rankings

In the four specialties—Ophthalmology, Psychiatry, Rehabilitation and Rheumatology—in which ranking reflects the results of the expert opinion survey alone, that is because many structural and outcomes measures are not applicable since care is largely delivered on an outpatient basis and poses a very small risk of death. For this report, these specialties are referred to as *expert opinion-based specialties* and the associated rankings as *expert opinion-based rankings*.

C. Report Outline

The remainder of this report is structured as follows:

- **Section II** describes the data-driven components in detail. (For a more detailed review of the foundation, development and use of the individual measures and the composite index, see “Best Hospitals: A Description of the Methodology for the Index of Hospital Quality.”¹²)
- **Section III** describes the process used to develop the rankings for the four expert opinion-based specialties.
- **Section IV** describes the number of hospitals ranked in at least one specialty.
- **Section V** presents the Honor Roll, an additional classification that denotes excellence across a broad range of specialties, procedures and conditions.
- **Section VI** summarizes changes in the methodology from 2005 to the present.
- **Section VII** describes improvements under consideration.

II. Data-Driven Rankings

This section describes hospital eligibility criteria and the procedures used to derive the overall score for the 12 data-driven specialties. Hospitals ranked in 2019-20 as a result of new or merged corporate entities in the AHA database are treated as single units and are listed as such in this report.

A. Eligibility

All 4,653 community hospitals included in the FY2017 AHA universe were automatically considered for ranking;** no request, application or other action was required. For the data-driven specialties, the methodology involved two stages of eligibility criteria; hospitals had to satisfy the requirements of each stage to be eligible in a given specialty.

Stage 1. A hospital that met *any* of the following criteria was initially eligible:

- Member, Council of Teaching Hospitals (COTH)
- Medical school affiliation (AMA or American Osteopathic Association [AOA])
- At least 200 hospital beds set up and staffed (from FY2017 AHA Annual Survey of Hospitals, variable BDTOT)
- At least 100 hospital beds set up and staffed *and* availability of at least four of eight important key technologies (see *Advanced Technologies*).

Hospitals that met Stage 1 and responded to the AHA Annual Survey of Hospitals in 2015 and 2016 but not in 2017 remained eligible. For such hospitals, we used survey data from 2016. Nonresponders lacking data from the current survey and one of the previous two surveys were evaluated without AHA data. A total of 2,241 hospitals successfully passed the first stage of the eligibility process.

Stage 2. To be eligible for ranking in a specialty, a hospital had to have a specified number of discharges in a defined list of specialty-specific diagnoses submitted for CMS reimbursement in FY2015, FY2016, and FY2017 combined. Setting discharge minimums involving complex care ensures that ranking-eligible hospitals can demonstrate that they have treated adequate numbers of challenging cases in a given specialty. Minimums for all specialties will be reviewed for future rankings and adjusted as needed.

Table 2 presents the minimum MA-adjusted discharge volumes (unless otherwise specified) required for eligibility and numbers of hospitals meeting the MA-adjusted volume criteria for the data-driven specialties. If a hospital did not meet the volume requirements, it was still considered eligible in a specialty if its expert opinion score was 1% or greater. The total number of hospitals in each specialty that became eligible due to their expert opinion score is also shown in **Table 2**.

** Military installations, federal institutions, rehabilitation, and acute long-term care facilities, and also institutional hospital units (e.g., prison hospitals, college infirmaries) were excluded.

A total of 1,868 hospitals met the volume criteria in at least one specialty, and two other hospitals became eligible because they had a 1% or higher expert opinion score in at least one specialty. In all, 1,870 unique hospitals were deemed eligible for at least 1 of the 12 data-driven specialties under the full criteria.

In Geriatrics, an additional step excluded hospitals classified in the AHA survey data as surgical hospitals or as specializing in heart or orthopedics. The basis for the exclusions was that Geriatrics as defined in Best Hospitals represents a broad swath of patients across all service lines. A surgical or specialty hospital treats subsets of those patients whose clinical needs may not be comparable. This change is reflected in the count of eligible Geriatric hospitals provided in *Table 2*.

Table 2. Discharge Thresholds by Specialty

Specialty	Discharge Thresholds, Total (Surgical)	Number of Eligible Hospitals Based on Minimum Discharges	Additional Hospitals with \geq 1% Expert Opinion Score	Final Eligible Total
Cancer	227 (45)	885	0	885
Cardiology & Heart Surgery ^a	1931 (800)	590	0	590
Diabetes & Endocrinology ^b	210 (0)	635	4	639
Ear, Nose & Throat ^b	120 (8)	93	7	100
Gastroenterology & GI Surgery	549 (160)	1,549	0	1,549
Geriatrics ^c	3391 (0)	1,506	0	1,506
Gynecology ^b	100 (10)	258	7	265
Nephrology	217 (0)	1,631	0	1,631
Neurology & Neurosurgery	325 (29)	1,226	0	1,226
Orthopedics	313 (277)	1,624	0	1,624
Pulmonology & Lung Surgery ^d	1412 (0)	1,651	0	1,651
Urology	68 (34)	1,495	0	1,495
Total (unique hospitals) ^e	Not Applicable	1,868	15	1,870

^a In addition to discharge- or expert opinion-based eligibility, a hospital must offer cardiac intensive care, adult interventional cardiac catheterization and adult cardiac surgery.

^b Total discharge minimums for this specialty are based on the unadjusted volume.

^c In addition to discharge- or expert opinion-based eligibility, a hospital must offer at least one of the following services: arthritis treatment center, adult day care program, patient representative services, geriatric services, meals on wheels, assisted living, transportation to health facility, or Alzheimer's center service.

^d In addition to discharge- or expert opinion-based eligibility, a hospital must have a ratio of sepsis to all other cases in Pulmonology and Lung Surgery that is lower than 3 standard deviations above the mean to be eligible.

^e The totals are not sums. The same hospitals may be eligible in multiple specialties. This line represents the total unique hospitals in each category across all specialties.

We then conducted separate analyses for each specialty to rank the top 50 hospitals in each data-driven specialty and provide overall scores for all evaluated hospitals. *Figure 1* illustrates the eligibility and analysis process for the data-driven specialties, as described in the steps above.

B. Structure

The structural dimension defines the tools, human and otherwise, available at hospitals for treating patients. Healthcare research overwhelmingly supports the use of a structural measure to assess quality of care. No prior research, however, has identified a structural indicator that summarizes all others or that adequately represents the structural dimension construct on its own. Therefore, the structural component is represented by a composite variable consisting of different specialty-specific measures with different weights.

For the 2019-20 rankings, the source of most structural elements was the FY2017 AHA Annual Survey Database. Additional components came from external organizations including the National Cancer Institute (NCI), American Nurses Credentialing Center (ANCC), Foundation for the Accreditation of Cellular Therapy (FACT), National Institute on Aging (NIA), National Association of Epilepsy Centers (NAEC), CMS and HSCRC.

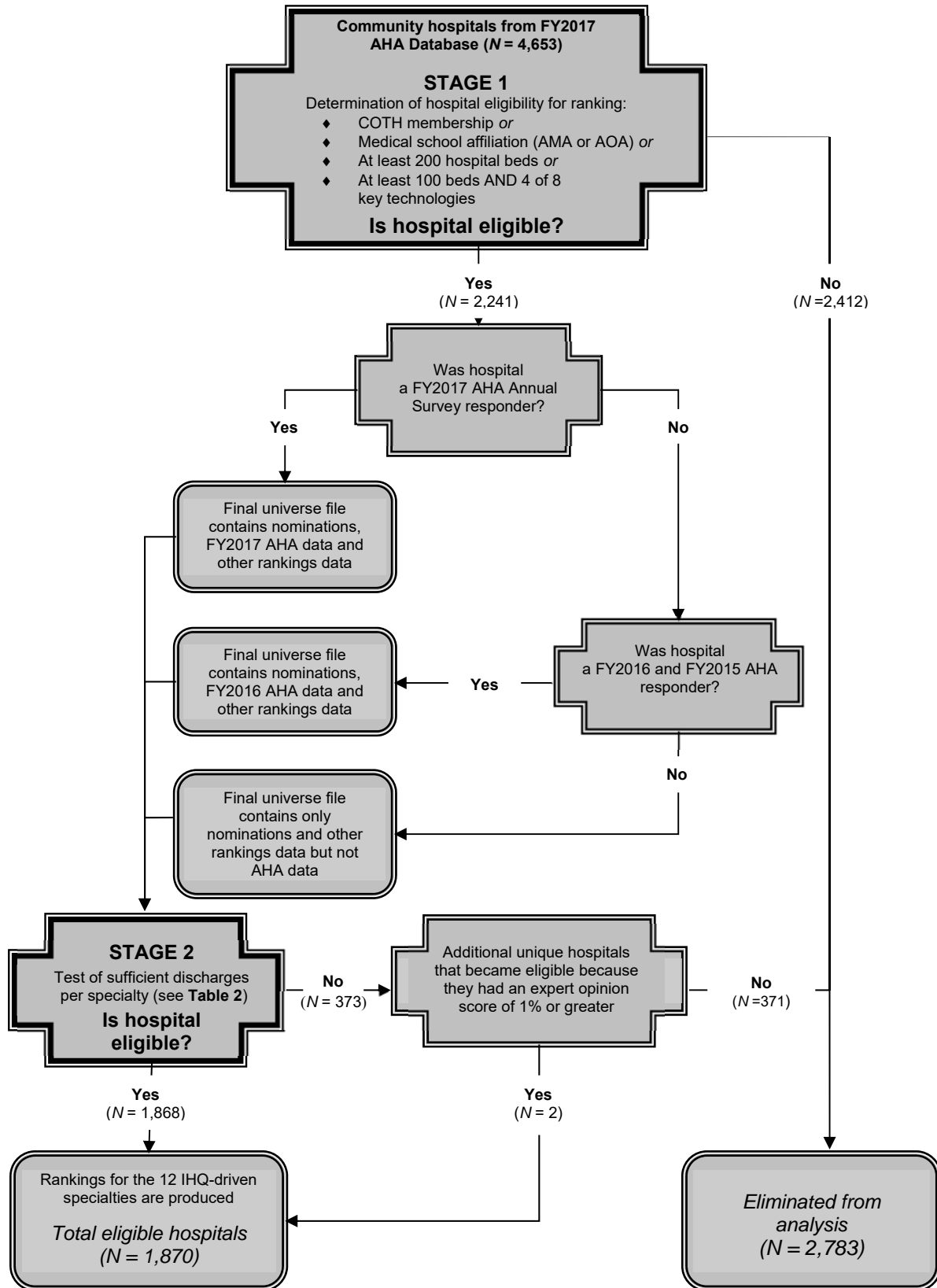
AHA Annual Survey

AHA has surveyed hospitals annually since 1946. The AHA Annual Survey of Hospitals is the most comprehensive and dependable database of information on institutional healthcare,¹³ with an average annual response rate of 85%. The database contains hospital-specific data items for more than 6,200 hospitals and healthcare systems. More than 900 data fields cover organizational structure, personnel, hospital facilities and services, and financial performance. (The specific mapping of Best Hospitals variables to AHA data elements is shown in *Appendix B*.)

Hospitals that did not respond to the 2017 AHA Annual Survey but responded to the 2016 survey were evaluated using their 2016 responses. Hospitals that did not respond to the AHA survey in either year were evaluated without AHA data, receiving no points for measures in the AHA annual survey.

The following items from the AHA Annual Survey Database provided most of the structural score for the data-driven specialties.

Figure 1. Eligibility and Analysis Process, Data-Driven Specialties



Advanced Technologies

The elements in this measure are reviewed every year in each specialty to remain consistent with the key technologies and advanced care expected from a “best hospital.” In the 2019-20 rankings, credit was awarded to hospitals that either (1) own or provide a specified service at the hospital or its subsidiaries, (2) provide the service through their health system (in their local community), or (3) provide the service through formal arrangements with local institutions not in their health system.

Of the 15 technologies that are relevant in one or more specialties, 8 comprise the Technology index that is one of the eligibility doorways: Hospitals that provide at least 4 of the 8 relevant technologies and have 100 beds or more are eligible for ranking (see Section ***II.A. Eligibility***).

Brief descriptions of the technologies in the 2019-20 index follow. The definitions are taken largely from the 2017 AHA Annual Survey, expanded as necessary:

- **Ablation of Barrett’s esophagus.** A premalignant condition that can lead to adenocarcinoma of the esophagus. The nonsurgical ablation of premalignant tissue in Barrett’s esophagus is done by the application of thermal energy or light through an endoscope passed from the mouth into the esophagus.
- **Computer-assisted orthopedic surgery.** A group of orthopedic devices that produce three-dimensional images to assist in surgical procedures.
- **Diagnostic radioisotope services.** A procedure that uses radioactive isotopes (radiopharmaceuticals) as tracers to detect abnormal conditions or diseases.
- **Endoscopic retrograde cholangiopancreatography.** A procedure in which a catheter is introduced through an endoscope into the bile and pancreatic ducts. Injection of contrast material permits detailed x-ray of these structures. The procedure is used diagnostically as well as therapeutically to relieve obstruction or remove stones.
- **Endoscopic ultrasound.** A specially designed endoscope that incorporates an ultrasound transducer to obtain detailed images of organs in the chest and abdomen. The endoscope can be passed through the mouth or anus. Combined with needle biopsy, the procedure can assist in diagnosis of disease and staging of cancer.
- **Full-field digital mammography.** A procedure that combines x-ray generators and tubes used in analog screen-film mammography with a detector plate that converts the x-rays into a digital signal to help diagnose breast cancer.

- **Image-guided radiation therapy.** An automated system that provides high-resolution x-ray images to pinpoint tumor sites, adjusts patient positioning as necessary and completes treatment within the standard treatment time slot, allowing for more effective cancer treatments.
- **Intensity-modulated radiation therapy (IMRT).** A type of radiation therapy used to treat tumors. IMRT manipulates beams of radiation to the shape of the tumor. Beams of varying intensity can be used to radiate the tumor with precision. By using IMRT, physicians can focus on the tumor and avoid exposing healthy tissue to radiation, which causes a variety of negative treatment side effects.
- **Multislice spiral computed tomography (CT).** A procedure that uses x-rays and data processing to produce multiple narrow slices that can be recombined into detailed three-dimensional pictures of the internal anatomy.^{††}
- **PET/CT scanner.** A machine that combines positron emission tomography (PET) and CT capabilities in one device to provide metabolic functional information and images of physical structures in the body for diagnostics and monitoring chemotherapy, radiotherapy, and surgical planning.
- **Robotic surgery.** The use of computer-guided imaging and manipulative devices to perform surgery without the surgeon's direct intervention.
- **Shaped-beam radiation.** A noninvasive procedure that delivers a therapeutic dose of radiation to a defined area of a tumor to shrink or destroy cancerous cells.
- **Single-photon-emission CT.** A nuclear medicine imaging technology that combines radioactive material with CT imaging to highlight blood flow to tissues and organs.
- **Stereotactic radiosurgery.** A radiotherapy modality that delivers a high dosage of radiation to a discrete treatment area in as few as one treatment session. Variants include Gamma knife and Cyberknife.
- **Transplant services.** Includes Medicare-approved organ transplant programs in heart, liver, lung, or kidney transplant recognized by CMS. In addition, hospitals listed as bone marrow and tissue transplant centers by AHA are recognized. Transplant services are specific to the specialty. In the Cancer specialty, transplant services include bone marrow and other tissue transplants; Gastroenterology & GI Surgery includes liver transplant; Cardiology & Heart Surgery includes heart transplant and tissue transplant; Nephrology includes kidney transplant; Pulmonology & Lung Surgery includes lung transplant; Orthopedics includes tissue transplant.

^{††}The indicator for multislice spiral CT includes both standard (less than 64 slices) and advanced (64 or more slices) versions of the technology. Hospitals can receive credit for either version.

Specialty-specific mixes of key technologies are used in computing the U.S. News scores (see Section *II.G. Calculation of the Overall Score for the Data-Driven Specialties*). *Table 3* presents the complete list of key technologies considered for each specialty in 2019-20.

Number of Patients

This measure reflects the volume of medical and surgical discharges in indicated specialty-specific MS-DRG groupings submitted for CMS reimbursement in FY2015, FY2016, and FY2017 combined^{‡‡}. The list of MS-DRGs in each specialty is displayed in *Appendix C*. Volume is part of the structural score in all 12 data-driven specialties. Volumes include all cases, including transfers, that appeared in SAF data for the specified MS-DRGs listed in *Appendix C*.

One change made to the volume definitions for the 2019-20 rankings in orthopedics was the removal of DRG 470 from analyses. This procedure code was removed due to coverage of these orthopedic surgeries in the Best Hospitals for Procedures and Conditions ratings where it is covered under Hip and Knee replacement. This change will result in lower volumes due to the removal of routine surgeries that do not represent complex care which is the focus of these rankings.

Volume data, as described on Page 4, include Medicare fee-for-service patients who were 65 years of age or older; Medicare Advantage managed-care patients are not included in SAF data. Patient selection for outcomes analysis is the same, as described on Page 5. To account for Medicare Advantage patients, reported volumes received an adjustment based on the location of the hospital—specifically the county’s Medicare Advantage penetration. The numerator for the volume calculation was the number of fee-for-service discharges meeting the criteria for inclusion in the specialty. The denominator was the proportion of Medicare beneficiaries enrolled in fee-for-service (as opposed to Medicare Advantage) in the county in which the hospital is located. The denominator was calculated by subtracting from 1.0 the CMS Medicare Advantage penetration estimates, expressed as a decimal less than 1.0, for March 2016, the midpoint of the analysis time period. As a result, the volumes reported represent estimates rather than observed volumes of care at each hospital.

‡‡ A revised version of the 2017 Inpatient Standard Analytical File was released by CMS in March of 2019 which was incorporated into the analysis.

Table 3. Technologies by Specialty

Technology	Technology Index	Cancer	Cardiology & Heart Surgery^{ss}	Diabetes & Endocrinology	Ear, Nose & Throat	Gastroenterology & GI Surgery	Geriatrics	Gynecology	Nephrology	Neurology & Neurosurgery	Orthopedics	Pulmonology & Lung Surgery	Urology
Ablation of Barrett's esophagus						•							
Computer-assisted orthopedic surgery											•		
Diagnostic radioisotope services	•			•		•			•	•		•	•
Endoscopic retrograde cholangiopancreatography						•							
Endoscopic ultrasound						•							
Full-field digital mammography	•	•						•					
Image-guided radiation therapy	•	•		•		•		•	•	•		•	•
Intensity-modulated radiation therapy		•											•
Multislice spiral CT	•		•						•			•	
PET/CT scanner	•	•	•	•				•	•	•		•	•
Robotic surgery	•	•	•					•	•				•
Shaped-beam radiation		•											
Single-photon-emission CT	•		•							•			
Stereotactic radiosurgery	•	•		•	•	•		•	•	•		•	•
Transplant services		•	•			•			•		•	•	
Total Elements	8	8	6	4	1	7	0	5	7	5	2	6	6

• Included in the measure for the specialty.

^{ss} Five measures are listed, but hospitals can receive up to six points in Cardiology & Heart Surgery because two points are possible for transplant services—one point for heart transplant services and one point for tissue transplant services.

To reduce the effect of outliers, we adjusted raw specialty volumes with values above the 75th percentile. Hospitals with volumes at or above the 75th percentile in each specialty were assigned an *outlier-adjusted volume*, created from a weighted average of the hospital's observed volume and the volume for all hospitals at or under the 75th percentile. This adjustment factor was equal to the average volume for all hospitals at or below the 75th percentile. For each percentile above the 75th, the weight applied to the adjustment factor was increased by a value of .01. Therefore, if:

- a = amount over the 75th percentile (.01, .02,25),
- b = average volume for hospitals at or under the 75th percentile, and
- c = an individual hospital's raw volume,

then the volume for hospitals in the top quartile in the rankings = $a*b + (1-a)*c$.

The value displayed in print is the MA-adjusted, outlier-unadjusted raw volume. **Table 4** provides the minimum MA-adjusted, outlier-unadjusted volume, the MA-adjusted, outlier-unadjusted 75th-percentile volume, and the maximum MA-adjusted, outlier-unadjusted volume in each specialty along with the average volume for hospitals below the 75th percentile.

Table 4. Discharge Distribution by Specialty

Specialty	Minimum Volume	75th Percentile Volume	Maximum Volume	Average Volume, 1 st -75 th percentile
Cancer	230	898	13,804	490
Cardiology & Heart Surgery	1,966	6,224	23,973	3,939
Diabetes & Endocrinology	174	588	3,108	403
Ear, Nose & Throat	25	382	1,021	250
Gastroenterology & GI Surgery	549	2,304	15,559	1,309
Geriatrics	3,391	13,452	94,815	7,608
Gynecology	2	341	827	218
Nephrology	217	866	6,819	496
Neurology & Neurosurgery	325	2,344	11,905	1,176
Orthopedics	317	1,659	10,742	836
Pulmonology & Lung Surgery	1,412	4,389	26,531	2,698
Urology	68	389	4,654	206

Nurse Staffing

The nurse staffing index is a ratio that reflects the combined intensity of inpatient and outpatient nursing. The numerator is the total number of on-staff registered nurses (RNs), expressed as full-time equivalents (FTEs); for example, two half-time nurses are the equivalent of one FTE. Only nurses with an RN degree from an approved nursing school and current state registration are

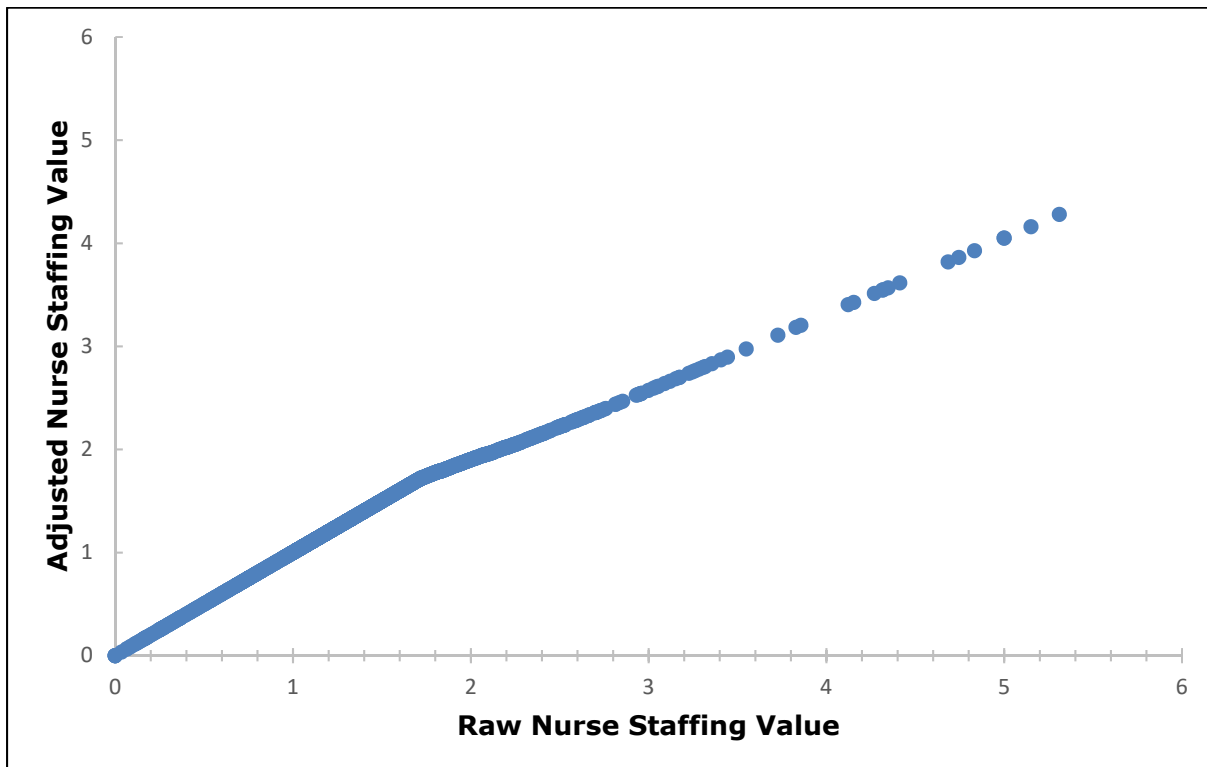
considered. The denominator is the adjusted average daily census of patients, a variable created by AHA for U.S. News.

The measure estimates the total amount of care devoted to both inpatients and outpatients by reflecting days of inpatient care plus the estimated volume of outpatients. This index gives more weight to inpatient care while recognizing that outpatient care represents most hospital visits. The components of this index are derived from the AHA database. As with volume, extreme values were similarly adjusted to reduce the influence of wide variation. Therefore, the nurse staffing value for hospitals in the top quartile, which was at or above a nurse staffing value of 1.25 for 2019-20, is equal to $a*b + (1-a)*c$, where:

- a = amount over the 75th percentile (.01, .02... .25),
- b = 1.25, the average nurse staffing volume for hospitals in the bottom 75th percentile, and
- c = an individual hospital's raw nurse staffing value.

Figure 2 shows an example of nurse staffing values before and after adjustment.

Figure 2. Nurse Staffing Values Before and After Adjustment



Starting with the 2017-18 rankings, three changes to the Nurse Staffing Score were implemented. First, the calculation now includes a correction for hospitals that provide skilled nursing onsite and report a total that combines both inpatient and skilled nursing. The nursing FTEs associated with the skilled nursing were removed from the numerator and a corrected adjusted average daily census was used for the denominator. The corrected adjusted average daily census values for hospitals affected by this change were calculated by the AHA and provided directly to the project.

Second, to address problems with missing values in the AHA dataset for several hospitals for the FTEN variable, which is the principal nursing FTE variable, the rankings now impute missing FTEN values. The project selects hospitals that do not have extreme nurse staffing ratios (i.e., are not outliers) and imputes the value of FTEN using the current values of the following variables in the reference population: FTEN (Full time equivalent registered nurses reported), FTERN (Full time equivalent registered nurses estimated), ADJADC (Adjusted Average Daily Census) and BDTOT (total hospital beds set up and staffed).

Third, to address volatility in the nurse staffing measure for hospitals with relatively low patient volumes, we now adjust the nurse staffing values for hospitals in the lowest quartile of adjusted average daily patient census. The nurse staffing ratio is adjusted using the formula $2a*b + (1-2a)*c$, where

- a = amount under the 25th percentile on ADJADC (.01, .02,25),
- b = average adjusted nurse staffing
- c = an individual hospital's nurse staffing.

The formula creates a blended rate that incorporates both the observed rate and the average adjusted nurse staffing rate for eligible hospitals.

Trauma Center

In a past U.S. News survey of board-certified physicians, respondents ranked the presence of an emergency room and status as a Level 1 or Level 2 trauma care provider high on a list of hospital quality indicators. Physicians in nine specialties ranked trauma center status as one of the top five indicators of quality. Their recommendations and analyses showing a strong relationship with other quality factors supported inclusion of a trauma measure in Ear, Nose & Throat, Gastroenterology & GI Surgery, Cardiology & Heart Surgery, Nephrology; Neurology & Neurosurgery, Orthopedics, Pulmonology & Lung Surgery, and Urology.

Two variables in the AHA Annual Survey Database provide the required data. Both must be answered. One variable indicates the presence of a state-certified trauma center in the hospital (as

opposed to trauma services provided only as part of a health system or joint venture). The second variable indicates trauma center level. The trauma center indicator is dichotomous. To receive credit of 1 point, a hospital must be a Level 1 or Level 2 trauma center^{***}. The AHA defines Level 1 as “a regional resource trauma center, which is capable of providing total care for every aspect of injury and plays a leadership role in trauma research and education.”¹³ Level 2 is “a community trauma center, which is capable of providing trauma care to all but the most severely injured patients who require highly specialized care.”¹³

Patient Services

Patient services encompass major conveniences for patients. Among others, they include translators, advanced or especially sophisticated care, and services either considered clinically essential in a comprehensive, high-quality hospital, such as cardiac rehabilitation, or reflective of forward thinking and sensitivity to community needs, such as genetic testing or counseling. All items are taken from the AHA Annual Survey.

Brief descriptions of patient services included in the 2019-20 index follow. The definitions are taken from the AHA Annual Survey of Hospitals (and expanded as necessary).

- **Alzheimer’s center.** A facility that cares for individuals with Alzheimer’s disease and the patients’ families through an integrated program of clinical services, research and education. As with all items in this survey, each hospital determines whether the service is offered, based on the AHA description. This index differs from designation as an NIA Alzheimer’s center, which is a higher-order designation and is treated as a separate structural measure in Geriatrics and in Neurology & Neurosurgery.
- **Arthritis treatment center.** A center specifically equipped and staffed for diagnosing and treating arthritis and other joint disorders.
- **Cardiac rehabilitation.** A medically supervised program to help heart patients recover quickly and improve their overall physical and mental functioning in order to reduce risk of another cardiac event or to keep a current heart condition from worsening.
- **Fertility clinic.** A specialized program set in an infertility center that provides counseling and education, as well as advanced reproductive techniques.

^{***} The highest two levels of this designation are equivalent to the top two levels of the American College of Surgeons trauma center certification and can be used by hospitals in states that do not certify trauma centers.

- **Genetic testing/counseling.** A service equipped with adequate laboratory facilities and directed by a qualified physician to advise parents and prospective parents on potential problems in cases of genetic defects.
- **Hospice.** A program that provides care (including pain relief) and supportive services for the terminally ill and their families.
- **Infection isolation room.** A single-occupancy room designed to minimize the possibility of infectious transmission, typically through the use of controlled ventilation, air pressure, and filtration.
- **Pain-management program.** A program that provides specialized care, medications or therapies for the management of acute or chronic pain.
- **Palliative care.** A program that provides specially trained physicians and other clinicians to relieve acute or chronic pain or to control symptoms of illness.
- **Patient-controlled analgesia.** A system that allows the patient to control intravenously administered pain medicine.
- **Psychiatry–geriatric service.** A psychiatric service that specializes in the diagnosis and treatment of geriatric medical patients.
- **Translators.** A service provided by the hospital to assist patients who do not speak English.
- **Wound-management services.** Services for patients with chronic and non-healing wounds that often result from diabetes, poor circulation, sitting or reclining improperly, and immunocompromising conditions. The goals are to progress chronic wounds through stages of healing, reduce and eliminate infections, increase physical function to minimize complications from current wounds, and prevent future chronic wounds. Services are provided on an inpatient or outpatient basis depending on the intensity of service needed.

From seven to nine services are included in each specialty. Hospitals receive 1 point for each specified service provided on- or off-site either (1) by the hospital or its subsidiaries, (2) by the hospital's health system in the local community, or (3) by another institution in the local community through formal arrangement or joint venture. *Table 5* displays patient services by specialty.

Table 5. Patient Services by Specialty

Service	Cancer	Cardiology & Heart Surgery	Diabetes & Endocrinology	Ear, Nose & Throat	Gastroenterology & GI Surgery	Geriatrics	Gynecology	Nephrology	Neurology & Neurosurgery	Orthopedics	Pulmonology & Lung Surgery	Urology
1. Alzheimer’s center						•			•			
2. Arthritis treatment center						•				•		
3. Cardiac rehabilitation		•										
4. Fertility clinic							•					•
5. Genetic testing/counseling	•		•	•	•		•	•	•		•	•
6. Hospice	•	•	•	•	•	•	•	•	•	•	•	•
7. Infection isolation room	•		•	•	•		•	•	•		•	•
8. Pain-management program	•	•	•	•	•	•	•	•	•	•	•	•
9. Palliative care	•	•	•	•	•	•	•	•	•	•	•	•
10. Patient-controlled analgesia	•	•	•	•	•	•	•	•	•	•	•	•
11. Psychiatry/geriatric service						•						
12. Translators	•	•	•	•	•	•	•	•	•	•	•	•
13. Wound-management services	•	•	•	•	•	•	•	•	•	•	•	•
Total Elements	8	7	8	8	8	9	9	8	9	7	8	9

• Included in the index for the specialty.

Intensivists

Intensivists are board-certified physicians with subspecialty or fellowship training in critical-care medicine. They specialize in managing critically ill patients in hospital intensive care units (ICUs). Recent research indicates that better outcomes are associated with the presence of intensivists.^{14,15} The intensivist measure was added in 2009. The 2019-20 rankings award 1 point to hospitals with at least one intensivist FTE, whether on staff or through another arrangement as long as at least one intensivist serves in an adult-focused intensive care unit setting within the hospital.

Previously hospitals had to have at least one FTE on staff intensivist. Credit was determined from the FY2017 AHA Annual Survey.

External Organizations

The following describes sources and organizations other than AHA, CMS and HSCRC that provided data for additional structural measures.

NCI-Designated Cancer Center

This indicator was added in 2002. The National Cancer Institute (NCI), an arm of the National Institutes of Health, is the principal federal agency tasked with conducting and sponsoring cancer research and training and promoting research and standards of care by various means, including certification as an NCI-designated cancer center. Such a center is committed to advancing cancer research and, ultimately, reducing cancer incidence and increasing the effectiveness of treatment.¹²

NCI-designated centers have three classification levels. The lowest is *cancer center*, denoting a facility that conducts a high volume of advanced federally funded laboratory research. Credit is not awarded for this designation. A *clinical cancer center*, the second level, adds clinical (“bench-to-bedside”) research. *Comprehensive cancer center*, the highest level, adds prevention research, community outreach, and service activities.¹⁶

Hospitals designated as NCI clinical or comprehensive cancer centers as of March 1, 2019, were awarded 1 point. Hospitals designated “cancer centers” did not receive credit. NCI updates the list throughout the year. The current list is at <http://cancercenters.cancer.gov/Center/CCList>.

Nurse Magnet Status

The Nurse Magnet measure, added in all specialties in 2004, is a formal designation by the Magnet Recognition Program®. The Magnet Recognition Program was developed by the ANCC to recognize health care organizations that meet certain quality indicators on specific standards of nursing excellence. The ANCC updates the list of Magnet-recognized facilities throughout the year as organizations apply for designation and re-designation status. U.S. News bases credit for this measure on Magnet Recognition as of February 1, 2019. The current list of Magnet-recognized organizations is shown at <https://www.nursingworld.org/organizational-programs/magnet/find-a-magnet-facility/>.

Hospitals received 1 point for being recognized as a Nurse Magnet hospital. For hospitals that are part of a special merger^{†††} or a multiplex healthcare system, the primary hospital (the larger of two general acute-care hospitals) is required to have Magnet Recognition status for the combination hospital to receive 1 point. If there is no defined primary hospital, then if either hospital in the special merger has Magnet Recognition status, both receive credit.

NAEC-Designated Epilepsy Center

This index was added to Neurology & Neurosurgery in 2004. One point was awarded to hospitals designated by NAEC as Level 4 epilepsy centers as of March 1, 2019. A Level 4 epilepsy center serves as a regional or national referral facility. These centers provide more complex forms of intensive neurodiagnostic monitoring, as well as more extensive medical, neuropsychological, and psychosocial treatment. Level 4 centers also offer a complete evaluation for epilepsy; surgery, including intracranial electrodes; and a broad range of surgical procedures for epilepsy.¹⁷ NAEC updates its list of hospitals throughout the year. The current list is shown at <http://www.naec-epilepsy.org/find.htm>.

NIA-Designated Alzheimer's Center

NIA Alzheimer's center certification was added to Geriatrics in 2007 and to Neurology & Neurosurgery in 2008. Evaluation and certification are conducted by NIA, an arm of NIH that translates research advances into improved diagnosis and care of Alzheimer's disease and conducts research on prevention and cures. Recognition means that a hospital provides a high level of care for Alzheimer's patients. Hospitals designated as an NIA Alzheimer's center as of March 5, 2019, received 1 point. Hospitals listed as affiliated centers did not receive credit. The current list of NIA Alzheimer's centers can be accessed at <https://www.nia.nih.gov/health/alzheimers-disease-research-centers>.

FACT Accreditation

Foundation for the Accreditation of Cellular Therapy (FACT) accreditation was added to Cancer in 2007. This designation indicates that as of March 1, 2019, a hospital met standards set by FACT for transplanting bone marrow or other cellular tissue to treat cancer. One point was given if accreditation was only for *autologous transplants*, in which a patient's own cells are removed and then returned following radiation therapy. Two points were given if accreditation was for *allogeneic*

^{†††} In a special merger, two separate hospitals operate as one and their data are combined for analysis. Brigham and Women's Hospital and Dana-Farber Cancer Center are an example in Cancer. Specialty or secondary hospitals that are combined with the primary hospital are noted on the US News website for that hospital.

transplants, involving cells donated by another person (allowing for a greater number and more kinds of cell transplants), or for both autologous and allogeneic transplants. The current list of FACT-accredited hospitals can be accessed at www.factwebsite.org.

Normalization

Starting with the 2012-13 rankings, all structural measure values were normalized prior to weighting. Normalization transforms index values into a distribution between 0 and 1 based on the range of possible values for a given measure. Normalizations were done separately for each specialty. Equation (1) is the formula for normalization:

$$\text{Normalized Value} = (X_i - \text{Minimum}_i) / (\text{Maximum}_i - \text{Minimum}_i), \quad (1)$$

where

X_i = the value for measure i ,

Maximum_i = the highest possible value for measure i and

Minimum_i = the lowest possible value for measure i .

For example, the Advanced Technologies index for Cancer is worth a maximum of 8 points. If a given hospital received 5 out of 8 points, the normalized value for the Advanced Technologies index in Cancer would be $(5-0)/(8-0) = 0.63$. For all structural measures, other than Number of Patients and Nurse Staffing, the lowest *possible* value is 0 even when the lowest *observed* value is greater than 0. For Number of Patients and Nurse Staffing, the lowest possible value was made equal to the lowest observed value and the highest possible value was made equal to the highest observed value.

Weighting

In 2012, we convened an expert panel to determine appropriate weights for each of the measures. The evaluation was done both across specialties for consistency in weighting and within specialties to identify key measures of quality in a particular specialty. Overall, weights were determined based on the importance of each measure in defining the overall structural attributes of care within hospitals. **Table 6** shows the relative weight for each of the measures that make up the structural component of the rankings, by specialty. For all specialties, the sum of the weights is 30%, the overall weight for the structural component of the overall score.

Table 6. Structural Elements and Percentages (%) of Total Score by Specialty

Item	Cancer	Cardiology & Heart Surgery	Diabetes & Endocrinology	Ear, Nose & Throat	Gastroenterology & GI Surgery	Geriatrics	Gynecology	Nephrology	Neurology & Neurosurgery	Orthopedics	Pulmonology & Lung Surgery	Urology
Advanced technologies	4.29	5.00	5.29	5.00	5.00		5.29	5.00	4.09	5.00	5.00	5.00
FACT accreditation	2.86											
Intensivists	2.86	3.33	3.53	3.33	3.33	3.53	3.53	3.33	2.73	3.33	3.33	3.33
NAEC-designated epilepsy center									2.73			
NCI-designated cancer center	2.86											
NIA-designated Alzheimer's center						5.29			2.73			
Number of patients	5.71	6.67	7.06	6.67	6.67	7.06	7.06	6.67	5.45	6.67	6.67	6.67
Nurse Magnet status	2.86	3.33	3.53	3.33	3.33	3.53	3.53	3.33	2.73	3.33	3.33	3.33
Nurse staffing	5.71	6.67	7.06	6.67	6.67	7.06	7.06	6.67	5.45	6.67	6.67	6.67
Patient services	2.86	3.33	3.53	3.33	3.33	3.53	3.53	3.33	2.73	3.33	3.33	3.33
Trauma center		1.67		1.67	1.67			1.67	1.36	1.67	1.67	1.67

NOTE: Percentages may not sum to 30 due to rounding.

C. Outcomes

The correlation between quality of care and risk-adjusted mortality is self-evident and supported by the literature.¹⁸⁻³² We calculated specialty-specific, risk-adjusted mortality rates and a new measure of discharge to home for each hospital as an outcomes measure, taking a variety of patient mix and risk factors into account. Outcomes are worth 37.5% of the overall score.

When comparing outcomes such as mortality between hospitals, adjusting for differences in the patients treated at each hospital is critical. These adjustments need to take into account not only the principal condition for which the patient is being treated but also other comorbidities and characteristics that may affect outcomes. For instance, a hospital with a 35% death rate might be

superior to a hospital with a 10% death rate, if most of the patients at the first hospital are of high risk (i.e., expected to die) and most of the patients at the second hospital are of fairly low risk.

To address the differences in risk, we used multilevel logistic regression models to adjust for differences in case mix between hospitals. Multilevel models are a form of regression that allocates variance between variables on two or more levels. We used the empirical Bayes estimate of the hospital intercept as an estimate of each hospital's value for a given outcome. Multilevel modeling accounts for clustering of patient observations within hospitals and allows for more precise evaluation of hospitals with lower patient volume and fewer outcomes.

We selected covariates for inclusion in risk-adjustment models based on the literature, discussions with clinicians in relevant specialties and experience gained from the Best Hospitals for Procedures & Conditions project where these models have been previously tested. The model indicates that an unbiased estimate of the effect of treatment at a given hospital as compared to a hospital selected at random from among those eligible for ranking with a specialty, requires adjustment for age, sex, Elixhauser comorbidities,³³ socioeconomic status (SES), and year of admission. Since the CMS claims data do not contain severity of the index condition information we cannot directly adjust for this information as was previously done with APR-DRGs. However, we have controlled for severity of index condition via restriction of cases consistent with the subset of DRGs used by the project as described at the end of this section and *Appendix C*.

For the analyses we used pooled SAF data from FY2015, FY2016, and FY2017, the latest available for analysis. SAF data are derived from reimbursement claims submitted by hospitals to Medicare. The SAF data files contains information on all fee-for-service Medicare patients' diagnoses, procedures, length of stay in the hospital and discharge status. For the 2019-20 Best Hospitals rankings, only patients 65 years of age or older at the time of care were included in the analyses.

The SAF data include the CMS DRG assigned to each case for Medicare payment. Each SAF data record contains information on the patient's diagnosis, surgery (or other medical procedure), age, sex, and discharge destination.³⁴ DRGs classify the more than 10,000 *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) diagnosis codes into more meaningful patient groups based on clinical and cost similarity. Prior to 2016, the ICD-9-CM was the official system used by the National Center for Health Statistics and CMS to assign codes to diagnoses and procedures associated with U.S. hospital utilization.³⁵ In 2016 the National Center for Health Statistics and CMS introduced the *International Classification of Diseases, Tenth Revision*, which reflects more specificity than is present in the ICD-9 coding.³⁶ For the 2019-20 rankings, SAF data from FY2015 had ICD-9-CM codes, while SAF data from FY2016 and FY 2017 were presented in ICD-10 code format. Due to the increased granularity of the ICD-10 codes, it is possible to

backwards map ICD-10 codes to ICD-9 codes. The project team utilized the backward mapping rules provided by the GEMS project at CMS (link: <https://www.cms.gov/Medicare/Coding/ICD10/index.html>).

Because MS-DRGs are relatively homogeneous groups of diagnoses and procedures, we use MS-DRGs as the basic unit for defining cases to be included in each specialty's outcome and volume measures. The MS-DRG groupings developed are based on the DRG groupings used in previous years of the study (see *Appendix C* for the MS-DRGs used for 2019-20).^{##} However, we no longer use the Severity of Illness (SOI) from the All Patient Refined Diagnosis Related Group (APR-DRG), but instead rely on selecting only MS-DRGs that represent challenging and/or critical procedures. For example, most inguinal hernia repairs pose relatively low risk and demand modest expertise, so these cases would be excluded in our analyses in favor of focusing on diagnoses and procedures that represent a higher level of severity. The process used to identify MS-DRGs is outlined below.^{\$\$\$}

1. MS-DRGs for very-low-intensity cases were excluded.
2. MS-DRGs that generally do not apply to a Medicare or elderly population were excluded.
3. Excluded and included MS-DRGs were evaluated on their embedded diagnoses.
4. Excluded and included categorizations were refined based on within-MS-DRG variation in diagnostic complexity.
5. MS-DRGs not assigned to a specific specialty were evaluated to determine whether they should be categorized more specifically.
6. MS-DRGs were attributed to multiple specialties if patients assigned to the DRGs are commonly treated by physicians in multiple specialties, or specific diagnoses or procedures were assigned to specific specialties based on principal diagnosis or procedures.
7. A final evaluation for clinical consistency was performed.

Outcome Methodology

Changes over the years have addressed specific issues in calculating mortality. These changes have addressed either specialty-specific issues (such as defining a specific population to use in Geriatrics as opposed to using all cases) or more general issues that can affect mortality outcomes

^{##} The 2010-11 Best Hospitals Ranking Methodology Report is available at www.rti.org/besthospitals.

^{\$\$\$} For a more detailed review of these procedures, see the 2005 Best Hospitals Ranking Methodology Report at www.rti.org/besthospitals.

(such as excluding transfers and switching from inpatient to 30-day mortality). Brief descriptions of these special considerations are provided below.

1. Redefining the Geriatrics patient population. Rankings in Geriatrics were dropped in 2006 but reintroduced in 2007, using a new approach to identify the target population and account for their mortality rates. Rather than using a small subset of MS-DRGs typical of geriatric patients, we elected to focus on how well hospitals treat older patients across a wide range of MS-DRGs. The Geriatrics specialty rankings now include all MS-DRGs generally appropriate to a Medicare or elderly population, but for the outcomes analysis only patients who are at least 75 years of age are included. The basic outcomes analyses of the data for this group followed the same procedures as for the other data-driven specialties.

2. Excluding transfers from mortality calculations. Since 2007, all patient transfers into the hospital have been excluded from mortality calculations. This was done to help avoid mortality rates that might be inflated by transfers of severely ill patients to tertiary care hospitals. Research has shown that because of their location, some tertiary care hospitals are particularly vulnerable to “dumping.”³⁷ This change means that patients legitimately transferred for appropriate care are lost to analysis, but it is more important to ensure that each hospital’s mortality numbers are not affected by transfers of very sick patients from hospitals unable to properly care for them. Transfers were identified using the claim source of inpatient admission variable on the SAF data files. Variable values of “4” (transfer from a hospital) or “A” (transfer from a critical access hospital) were used to identify transfers from acute hospitals or critical access hospitals. In 2017, the rankings added a new rule for excluding implicit transfers. That is, patients who are discharged and then admitted within the same day are excluded from analyses along with those who have explicit transfer indicators in the datasets.

3. Standardizing on 30-day mortality. Prior to 2007, mortality in the Best Hospitals methodology was defined as the rate of inpatient deaths (i.e., those occurring from admission to discharge). As inpatient hospital length of stay has decreased, inpatient mortality has generally decreased as well. Mortality over longer periods post-discharge, however, has not declined markedly.³⁸ Quality of care in the inpatient setting can affect patients’ health and functional status for many weeks following discharge. AHRQ states in *Refinements of the HCUP Quality Indicators Technical Summary* (2001) that “without 30-day mortality data (ascertained from death certificates), hospitals that have short lengths of stay may appear to have better patient outcomes than other hospitals with equivalent 30-day mortality.”³⁹

Thirty-day mortality may reflect factors unrelated to care provided in the hospital (e.g., quality of postacute care and lack of patient compliance with treatment regimen). Inpatient mortality, on the other hand, omits factors that tend to manifest in full after patients have been

discharged. Inpatient mortality also does not account for hospital-to-hospital differences in length of stay for comparable patients and conditions.

To address these concerns, the 2007 rankings introduced 30-day mortality (i.e., 30 days post admission) for all specialties except Cancer. This exception was made because of concern that 30-day mortality might penalize hospitals that see large numbers of cancer patients at the end of life—thus artificially inflating their mortality numbers. After further review of available data and research, however, we concluded that 30-day mortality should be consistent. Starting in 2008, 30-day mortality has been used for all data-driven specialties.****

4. Adjustment for socioeconomic status and risk. Starting in the 2017-18 rankings, a new adjustment was included at the patient level for Medicare and Medicaid dual eligibility. The dual-eligible flag is set to either 0 (not present) or 1 (present) for each case entering the risk-adjusted mortality equation. This was done to address known differences in morbidity and mortality with hospital patients associated with lower socioeconomic status (SES); dual-eligibility, or more specifically eligibility for Medicaid, is being used in this case to represent lower SES. The impact of the change was small and results in scores that better represent patient survival in the hospitals evaluated.

5. Update to the calculation of outcomes. Starting with the 2019-20 rankings, the project adopted a new risk-adjustment approach that moves away from the observed to expected ratios (OER) to RE models that have been used for the Best Hospitals for Procedures & Conditions for a number of years. RE stands for ‘random effect’ and can be thought of as a hospital level off-set. They represent the risk difference between a hospital and all hospitals in a given specialty, discounted by the reliability of that difference. The reliability is based on the volume of cases in a hospital, which means that if a hospital has 500 cases and 0 deaths, they would have a better RE, and thus better mortality score, than a hospital with 50 cases and 0 deaths; previously, these hospitals would have had the same OER of 0. The rationale for this is that in hospitals where there are more observations, there is higher certainty that the observed results are real and not due to statistical noise. The inclusion of information on certainty is the most important difference between the OER and the RE. A list and brief description of the covariates used in the risk-adjustment model is located in *Table 7*.

**** Note that the mortality methodology does not exclude palliative care (V66.5) or hospice cases due to significant inconsistencies in the way in which palliative and hospice care services are documented, defined, and coded across providers. The analyses rely on the MS-DRG system to account for patient severity and risk of mortality in the SAF data rather than removing these cases from analyses.

Table 7. Covariates used for Risk-Adjustment of RE Models

Risk-adjustment variables	Description
Patient age at admission	Patient age as a linear variable
DRG roll-up	Rolled up DRG groups that includes the variations w MCC, w CC, and w/o CC/MCC for medical and surgical treatment covered by the project (as shown in the tables in Appendix C).
Sex	Male or female
Year of hospital admission	Quality of care tends to improve over time. This means the risk of adverse outcomes is less year to year. For that reason, year of admission is included as a risk factor.
Elixhauser comorbidities	We controlled for the comorbidities identified by Elixhauser et al as being predictive of mortality.
Medicare status code	The reason or reasons why the patient is eligible for Medicare: age, disability or end-stage renal failure. This is a proxy for comorbidities.
Socioeconomic status	Patients with lower incomes are typically sicker when they arrive at the hospital and may face more challenges in obtaining or managing their care after they are discharged. This can affect their risk of death, readmission and complications. When hospitals differ by the socioeconomic status of their patients, this can create bias in comparing outcomes. Our risk models include "dual eligibility" as a measure of socioeconomic background. Patients who are eligible for both Medicare and Medicaid are treated as a separate risk group.
ICD version.	We controlled for which ICD version each visit was coded under. Visits with claims dated October 1, 2015 or later have procedures and diagnoses coded in ICD-10, and visits with claims dated September 30, 2015 or earlier are coded in ICD-9.
Source of admission.	In the discharge to home outcome measure, we controlled for whether a patient came from a skilled nursing facility.

The accuracy of risk-adjustment models is measured by two statistics, the C-statistic and the Hosmer-Lemeshow goodness of fit statistic. The C-statistic estimates the probability that if one subject who experienced an outcome (death, for example) and another who did not are drawn randomly from the data, the model will assign a higher probability of death to the person who died. When interpreting the results of a C-statistic calculation, a value of .50 indicates the model has no better than random chance at predicting the outcome. A C-statistic in the .60-.69 range indicates limited discrimination, .70-.79 indicates acceptable discrimination and above .80 indicates good discrimination.

As shown in **Table 8**, the C-statistic for mortality models implemented using clinical data range from approximately .75-.85. The new model for some of the outcome measures—Survival and Discharge to Home—were generally of similar predictive quality as those based on clinical data. The Hosmer-Lemeshow test assesses model goodness of fit within subgroups of the data and is generally

not considered informative for samples over 25,000. We used a procedure designed to evaluate Hosmer-Lemeshow fit in large samples, in which multiple Hosmer-Lemeshow tests are conducted on small samples of the data. A Hosmer-Lemeshow test results in a p-value, which below 0.05 indicates a bad fit; the closer to 1 the mean p-value is across all of the sample Hosmer-Lemeshow tests, the better fit. Overall, the results of the analyses show that the models have acceptable to good discrimination for all of the specialties.

Table 8. Predictive Accuracy of Risk-adjustment Models

Specialty	Survival		Discharge to home	
	C-statistic	Mean (min, max) of Large-sample Hosmer-Lemeshow Tests	C-statistic	Mean (min, max) of Large-sample Hosmer-Lemeshow Tests
Cancer	0.752	0.57 (0.07,0.95)	0.755	0.45 (0.09,0.97)
Cardiology & Heart Surgery	0.713	0.48 (0.09,0.89)	0.723	0.49 (0.04,0.88)
Diabetes & Endocrinology	0.735	0.32 (0.10,0.93)	0.742	0.62 (0.25,0.85)
Ear, Nose & Throat	0.790	0.38 (0.08,0.67)	0.771	0.41 (0.05,0.97)
Gastroenterology & GI Surgery	0.741	0.51 (0.03,0.89)	0.730	0.43 (0.05,0.81)
Geriatrics	0.746	0.21 (0.01,0.49)	0.749	0.38 (0.05,0.99)
Gynecology	0.898	0.47 (0.04,0.92)	0.831	0.32 (0.07,0.88)
Nephrology	0.689	0.59 (0.29,0.99)	0.726	0.48 (0.25,0.82)
Neurology & Neurosurgery	0.752	0.45 (0.01,0.90)	0.753	0.61 (0.10,0.98)
Orthopedics	0.823	0.39 (0.02,0.72)	0.861	0.42 (0.07,0.80)
Pulmonology & Lung Surgery	0.725	0.52 (0.10,0.95)	0.757	0.62 (0.15,0.82)
Urology	0.776	0.59 (0.21,0.98)	0.812	0.35 (0.05,0.95)

Additional analyses were conducted to evaluate the validity of the Best Hospitals rankings, as well as the component measures that are used to produce the rankings. In the Cardiology and Heart Surgery specialty, we evaluated ranking differences between hospitals with heart transplant programs against those without. We performed similar analyses in the Cancer specialty (for bone marrow transplant centers), Gastroenterology and GI surgery (liver transplant) and in nephrology (kidney transplant). We also looked at how hospitals with specialized AHA service codes performed on outcomes in related specialties (e.g., service code 41-cancer for the cancer specialty, service code 47-orthopedic for the orthopedics specialty, and service codes 13 and 42- surgical and heart for the cardiac specialty). Additionally, we assessed how closely specialty rankings and outcomes for a given hospital matched its rating in related Best Hospitals for Procedures and Conditions cohorts. In the Cardiology and Heart Surgery specialty, we compared ratings in coronary artery bypass, aortic valve replacement, and congestive heart failure to the specialty rank. We performed similar analyses in the

Orthopedics (comparing to hip and knee replacement), Cancer (comparing to colon and lung resection), and Pulmonology and Lung Surgery (comparing to heart failure and chronic obstructive pulmonary disease). Lastly, we performed similar analyses to understand whether hospitals operating trauma centers attained higher ranks in each specialty. In each case, the results of the risk adjusted mortality and discharge to home scores were consistent with expectations.

Survival Score

As we have since the 2011-12 project, the rankings present mortality results through the use of a survival score. Starting with the 2019-20 rankings the survival scores are based on the distribution of the mortality REs in each specialty. Survival scores are integer values ranging from 1 to 10. The mortality REs cut-offs are calculated as quintiles above and below RE mortality scores of 0.0. Scores above 0.0 indicate better-than-expected outcomes and are assigned values of 6 to 10 based on quintiles of the distribution; scores below 0.0 indicate worse than expected outcomes and are assigned values of 1 to 5 based on quintiles. The more negative the mortality RE is, the lower the survival score. The quintiles described above are used to determine survival scores with the ranges in scores shown in *Table 9*. Hospitals were assigned a score of 1-10 based on the lowest cut-off value below which the mortality REs fell. For example, a mortality RE of 0.12 in Cancer would have been assigned a survival score of 8 because 0.12 is higher than the 0.11 cut-off value.

Table 9. Survival Scores Based on REs

Specialty	1 if RE ≤	2 if RE >	3 if RE >	4 if RE >	5 if RE >	6 if RE >	7 if RE >	8 if RE >	9 if RE >	10 if RE >
Cancer	-0.15	-0.15	-0.09	-0.06	-0.03	0.00	0.06	0.11	0.17	0.25
Cardiology & Heart Surgery	-0.19	-0.19	-0.14	-0.07	-0.03	0.00	0.05	0.09	0.15	0.25
Diabetes & Endocrinology	-0.19	-0.19	-0.11	-0.07	-0.03	0.00	0.05	0.09	0.14	0.22
Ear, Nose & Throat	-0.22	-0.22	-0.16	-0.08	-0.02	0.01	0.14	0.22	0.28	0.42
Gastroenterology & GI Surgery	-0.18	-0.18	-0.12	-0.07	-0.03	0.00	0.05	0.09	0.14	0.22
Geriatrics	-0.17	-0.17	-0.11	-0.07	-0.03	0.00	0.05	0.10	0.16	0.25
Gynecology	-0.24	-0.24	-0.14	-0.10	-0.05	0.00	0.07	0.12	0.19	0.30
Nephrology	-0.20	-0.20	-0.12	-0.07	-0.04	0.00	0.05	0.10	0.15	0.25
Neurology & Neurosurgery	-0.19	-0.19	-0.13	-0.08	-0.04	0.00	0.05	0.09	0.14	0.22
Orthopedics	-0.20	-0.20	-0.14	-0.08	-0.04	0.00	0.04	0.08	0.14	0.21
Pulmonology & Lung Surgery	-0.22	-0.22	-0.13	-0.08	-0.04	0.00	0.06	0.10	0.17	0.25
Urology	-0.19	-0.19	-0.13	-0.08	-0.04	0.00	0.04	0.08	0.13	0.21

Discharge to Home Score

A new outcome for 2019-20 is the discharge to home measure which assesses how well a hospital does at managing to discharge patients to home rather than sending them on to another acute or long-term care setting following hospitalization. This measure provides unique information about hospital outcome performance that has been available in the Best Hospitals for Procedures and Conditions ratings for a number of years but is new to the Best Hospitals Specialty Rankings.

The denominator for this measure includes only patients who have been discharged following a qualifying inpatient admission. The discharge status codes used in this measure come from the claims evaluated in the CMS SAF data. Discharge status codes of 07 (left against medical advice or discontinued care), 20 (expired, did not recover - Christian Science), 30 (still a patient), 40 (expired at home, hospice claim), 41 (expired in facility, hospice claim), or 42 (expired place unknown, hospice claim) are excluded from the numerator and denominator, as are hospitalizations with a missing or invalid discharge status code. Discharge to a location other than home is indicated by one of the following patient discharge status codes: 0, 02, 03, 04, 05, 08, 09, 21, 43, 50, 51, 61, 62, 63, 64, 65, 66, 69, 70, 71, 72, 81, 82, 83, 84,85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95.

Similar to the new survival score, the discharge to home score is based on the distribution of the REs calculated for each hospital within each specialty. The discharge to home scores are integer values ranging from 1 to 10. The RE cut-offs are calculated as quintiles above and below RE discharge to home scores of 0.0. Scores above 0.0 indicate better-than-expected outcomes while scores below 0.0 indicate worse than expected outcomes. These quintiles are used to determine discharge to home score with the ranges in scores shown in *Table 10*. Hospitals were assigned a score of 1-10 based on the lowest cut-off value below which the discharge to home REs fell.

Table 10. Discharge to Home Scores Based on REs

Specialty	1 if RE ≤	2 if RE >	3 if RE >	4 if RE >	5 if RE >	6 if RE >	7 if RE >	8 if RE >	9 if RE >	10 if RE >
Cancer	-0.22	-0.22	-0.13	-0.09	-0.04	0.00	0.09	0.19	0.28	0.42
Cardiology & Heart Surgery	-0.22	-0.22	-0.13	-0.08	-0.04	0.00	0.20	0.33	0.46	0.62
Diabetes & Endocrinology	-0.29	-0.29	-0.19	-0.12	-0.06	0.00	0.07	0.16	0.25	0.38
Ear, Nose & Throat	-0.35	-0.35	-0.20	-0.13	-0.07	0.00	0.09	0.22	0.33	0.48
Gastroenterology & GI Surgery	-0.28	-0.28	-0.18	-0.11	-0.04	0.00	0.11	0.22	0.34	0.51
Geriatrics	-0.30	-0.30	-0.19	-0.12	-0.05	0.00	0.09	0.18	0.29	0.45
Gynecology	-0.40	-0.40	-0.26	-0.14	-0.07	0.00	0.10	0.19	0.29	0.45
Nephrology	-0.32	-0.32	-0.20	-0.12	-0.06	0.00	0.09	0.18	0.29	0.46
Neurology & Neurosurgery	-0.28	-0.28	-0.19	-0.12	-0.06	0.00	0.08	0.16	0.25	0.40
Orthopedics	-0.72	-0.72	-0.45	-0.28	-0.14	0.00	0.16	0.31	0.47	0.70
Pulmonology & Lung Surgery	-0.33	-0.33	-0.21	-0.12	-0.05	0.00	0.12	0.23	0.35	0.56
Urology	-0.36	-0.36	-0.23	-0.15	-0.07	0.00	0.09	0.19	0.30	0.46

D. Process/Expert Opinion

For the 2019-20 rankings, the process/expert opinion component was worth 27.5% of the overall score in all specialties except for Cardiology & Heart Surgery, in which the process/expert opinion component was worth 24.5% of the total score.

The process/expert opinion dimension of the Donabedian paradigm reflects care decisions in the hospital setting such as making choices about admission, diagnostic tests, course of treatment, choice of medication, and length of stay. It is extremely difficult to obtain national measurements of process. We contend that an appropriately qualified physician who identifies a hospital as among the “best” is, in essence, endorsing the process choices made at that hospital, and we regard the nomination of hospitals by board-certified specialists as a reasonable proxy measure.

To collect these nominations, a survey of board-certified physicians across the country is conducted each year. As with past years, the 2019-20 rankings use nominations from the most recent 3 years of physician surveys (2017, 2018, and 2019). Scores were calculated separately in each year and averaged such that each year’s scores are given equal weighting in the final expert opinion score as shown in *Table 11*.

Table 11. 2017, 2018, and 2019 Expert Opinion Weights by Survey Year

Sample Source	Expert Opinion Weight (%)
2017 Physician Survey	33.3
2018 Physician Survey	33.3
2019 Physician Survey	33.3

The sections below describe the 2019 survey. The approaches used for the 2017 and 2018 surveys are described in the corresponding methodology reports for those years, available at www.rti.org/besthospitals.

Expert opinion scores were calculated in the same manner for both data-driven and expert opinion-based specialties. The following description therefore applies to both.

2019 Survey Approach

Sample Selection

The sample for the 2019 physician survey was selected from a database of all practicing U.S. physicians compiled by Doximity, the largest online professional network of U.S. physicians. Doximity’s comprehensive Physician Database includes every practicing U.S. physician, identified by National Provider Identifier (NPI) number. Sources include the U.S. Department of Health and Human Services NPI Registry, state medical boards, and specialty boards (e.g., the American Board of Medical Specialties and the American Board of Surgery). Doximity’s proprietary database is augmented by more than 400,000 registered and verified physician members who review and update their profiles to provide another set of primary data. **Table 12** provides the population counts of specialists in the Doximity database by those who are Doximity members and nonmembers as of December 1, 2018, when the sample of Doximity nonmembers was selected.

Data Collection Procedures

In each of the 16 Best Hospitals specialties, we selected a stratified sample of Doximity members and nonmembers. Doximity members were surveyed separately from nonmembers as described below.

Table 12. Population Counts by Best Hospitals Specialty, Doximity Members and Nonmembers

Specialty	Subspecialties Included (based on board certification)	Doximity Members	Doximity Nonmembers
Cancer	Hematology, medical oncology, complex general surgical oncology, surgical oncology, gynecologic oncology, musculoskeletal oncology, radiation oncology, therapeutic radiology	16,129	6,840
Cardiology & Heart Surgery	Cardiovascular diseases, thoracic surgery, adult congenital heart disease, advanced heart failure and transplant, interventional cardiology, vascular surgery	25,087	9,668
Diabetes & Endocrinology	Endocrinology, diabetes & metabolism	4,507	2,422
Ear, Nose & Throat	Otolaryngology, plastic surgery within head & neck	8,282	3,285
Gastroenterology & GI Surgery*	Gastroenterology, colon and rectal surgery, transplant hepatology	12,330	5,734
Geriatrics	Geriatric medicine	4,302	2,484
Gynecology	Obstetrics & gynecology	26,196	13,399
Nephrology	Nephrology	6,904	3,507
Neurology & Neurosurgery	Neurology, neurological surgery, neuroradiology	16,449	7,380
Ophthalmology	Ophthalmology	12,638	6,650
Orthopedics	Orthopedic surgery, sports medicine	16,698	8,787
Psychiatry	Psychiatry	23,716	18,101
Pulmonology & Lung Surgery	Pulmonary diseases	9,568	4,571
Rehabilitation	Physical medicine & rehabilitation	6,647	3,462
Rheumatology	Rheumatology	3,523	2,128
Urology	Urology	6,569	3,353

* General surgeons certified by the American Board of Surgery were also eligible if they were members of the American Society for Metabolic and Bariatric Surgery, the American Society of Colon and Rectal Surgeons, or the Americas Hepato-Pancreato-Biliary Association.

Member survey. The Doximity member survey was sent to 199,545 physicians across the 16 specialties and was conducted from February to March 2019. Physicians received an initial email invitation with a link to the survey. The survey asked physicians to supply the names of up to five hospitals in their specialty that provide the best care to patients with serious conditions, without considering location or expense. Nonresponding physicians received one follow-up email reminder with a link to the survey. In addition, eligible Doximity members – i.e., those who were board

certified in a relevant specialty – received alerts upon login to Doximity.com or use of the Doximity app inviting them to participate.

Nonmember survey. The nonmember survey was conducted by randomly sampling 3,200 Doximity nonmembers—200 specialists in each of the 16 specialty areas. Stratifying by census region (https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf), we selected physicians in each region proportional to the size of the population. For example, if 40% of all Doximity nonmembers in a specialty had been from the South, then 40% of our sample would have included physicians in that region. Sampling physicians proportional to population size allowed us to minimize the weights needed to produce expert opinion scores that are nationally representative.

Sampled physicians were asked to complete a brief survey containing a single nomination element. The survey of nonmembers was identical to the survey of Doximity members but was conducted via mail instead of web. It asked physicians to supply the names of up to five hospitals in their specialty that provide the best care to patients with serious conditions, without considering location or expense. A copy of the mailed survey is available in *Appendix A*.

Up to four mailings were sent to sampled Doximity nonmembers. Each mailing included a cover letter, questionnaire, and business reply envelope. The first survey mailing also included a combination token incentive. The survey was conducted from January 3 through March 15, 2019.

Response Rates

The overall response rate for the 2017, 2018, and 2019 surveys was 12.7% using American Association of Public Opinion Research (AAPOR) standard response rate 6,^{†††} which treats undeliverables as ineligible. The 2019 combined response rate for the Doximity member and nonmember surveys was 12.2% using AAPOR standard response rate 6. Further details are provided below.

Member survey. Of the 199,545 Doximity members identified as eligible in one of the 16 specialties as of November 15, 2018, 24,157 completed the web survey. The final response rate was 12.1% using AAPOR standard response rate 2. *Table 13* shows response rates by region and specialty.

^{†††} Definitions are available online at http://www.aapor.org/AAPOR_Main/media/publications/Standard-Definitions20169theditionfinal.pdf

Table 13. Member Survey Response Rates by Region and Specialty, 2019

Specialty	Midwest (%)	Northeast (%)	South (%)	West (%)	Total (%)
Cancer	18.4	20.3	12.1	10.3	15.4
Cardiology & Heart Surgery	15.0	17.0	10.9	9.9	13.3
Diabetes & Endocrinology	16.3	16.3	9.8	10.5	13.4
Ear, Nose & Throat	22.2	22.4	15.7	15.4	18.5
Gastroenterology & GI Surgery	17.3	14.8	8.0	10.6	12.3
Geriatrics	8.7	14.1	6.9	8.8	9.9
Gynecology	7.0	10.6	4.5	5.5	6.7
Nephrology	15.4	19.8	9.7	11.3	13.8
Neurology & Neurosurgery	19.3	21.8	12.3	12.0	16.4
Ophthalmology	17.2	14.6	11.3	14.6	14.1
Orthopedics	11.5	17.4	8.5	7.2	11.0
Psychiatry	5.9	11.3	3.8	4.4	6.9
Pulmonology & Lung Surgery	17.5	20.5	11.1	10.1	15
Rehabilitation	15	14.6	8.8	9.5	11.9
Rheumatology	13.3	16.4	7.3	9.1	11.7
Urology	17.2	21.4	11.3	15.8	16
Overall Response Rate	14.0%	16.2%	9.1%	9.3%	12.1%

Nonmember survey. Of the 3,200 physicians sampled in 2019, 949 were deemed ineligible after determining they were no longer actively practicing or because we were unable to verify their eligibility. Of the remaining 2,251 physicians, 481 returned the completed questionnaire. That represents a final response rate of 21.4% using AAPOR standard response rate 6. *Table 14* shows response rates by region and specialty.

Survey Response Weighting

The weighting approach for the 2019 survey is described below. The approaches used for previous surveys are provided in the corresponding methodology reports for those years, which are available at www.rti.org/besthospitals.

Table 14. Nonmember Survey Response Rates by Region and Specialty, 2019

Specialty	Midwest (%)	Northeast (%)	South (%)	West (%)	Total (%)
Cancer	17.6	3.5	25.0	16.1	16.9
Diabetes & Endocrinology	16.7	20.0	25.5	21.1	21.3
Ear, Nose & Throat	30.0	33.3	17.5	19.4	22.9
Gastroenterology & GI Surgery	25.9	31.7	18.4	25.8	25.0
Geriatrics	31.6	14.0	12.5	17.2	16.5
Gynecology	22.2	20.0	24.6	22.6	22.8
Heart & Heart Surgery	21.2	26.5	18.4	15.4	20.4
Nephrology	31.2	29.0	15.4	11.8	20.8
Neurology & Neurosurgery	25.0	29.0	23.1	18.8	23.8
Ophthalmology	41.4	29.0	28.6	16.7	28.3
Orthopedics	14.3	25.0	29.1	21.2	23.5
Psychiatry	22.2	17.5	26.7	9.4	18.3
Pulmonology & Lung Surgery	22.2	9.4	16.1	18.9	16.5
Rehabilitation	19.2	11.8	18.8	16.1	16.5
Rheumatology	20.0	32.1	34.2	22.9	27.2
Urology	18.8	37.5	12.3	20.0	19.6
Overall Response Rate	23.4%	22.4%	21.5%	18.4%	21.4%

For the 2019 Doximity member survey, we used post-stratification weights for age by gender (55+ male, <55 male, and female^{###}) as well as census region. Weights were constructed and applied to each physician’s survey response to make nominations representative of all Doximity members nationally. Since all Doximity members were surveyed, weights were used to adjust for differences in nonresponse only by region and demographics.

We additionally investigated whether physicians’ hospital affiliations affected their survey responses. Although we did observe that physicians at certain hospitals had higher response rates than physicians at other hospitals, we did not find systematic bias in the expert opinion scores. This is because a given hospital is affiliated with a very small percentage of all sampled physicians.

In each specialty, the sample for the 2019 nonmember physician survey was stratified only by census region (Midwest, Northeast, South, and West). The sample size in each specialty was too

^{###} Age categories were collapsed for females because there were too few female physicians over 55 in the sample.

small to stratify by the demographic characteristics used in the Doximity sample. Weights were constructed and applied to each physician’s survey responses to make nominations representative of Doximity nonmembers nationally. Weights were based on probability of selection within each unique specialty-region combination and on adjustments to account for nonresponders.

Expert opinion scores were tabulated separately for Doximity members and nonmembers and then combined to create 2019 expert opinion scores. *Table 15* shows the expert opinion weight for Doximity members and nonmembers in each specialty for 2019. The weight is based on the proportion of Doximity members and nonmembers in the population, so the expert opinion score is representative of all physicians in the nation. Expert opinion scores for each of the past 3 years were then averaged to create the final weighted expert opinion values that appear in the methodology report.

Table 15. 2019 Expert Opinion Weights for Doximity Members and Nonmembers by Specialty

Best Hospitals Specialty	Expert Opinion Weight	
	Doximity Member (%)	Doximity Nonmember (%)
Cancer	70.2	29.8
Cardiology & Heart Surgery	72.2	27.8
Diabetes & Endocrinology	65.0	35.0
Ear, Nose & Throat	71.6	28.4
Gastroenterology & GI Surgery	68.3	31.7
Geriatrics	63.4	36.6
Gynecology	66.2	33.8
Nephrology	66.3	33.7
Neurology & Neurosurgery	69.0	31.0
Ophthalmology	65.5	34.5
Orthopedics	65.5	34.5
Psychiatry	56.7	43.3
Pulmonology & Lung Surgery	67.7	32.3
Rehabilitation	65.8	34.2
Rheumatology	62.3	37.7
Urology	66.2	33.8

Log Transformation

The online and print rankings display weighted 3-year expert opinion values. Before incorporating the values into the scoring for the 12 data-driven specialties, however, we implemented a log transformation to adjust for the skewed distribution. The log transformation was not applied in the four expert opinion-based specialties.

By its nature, a survey that solicits recommendations for “bests” will generate data that do not follow a normal distribution. Relatively few hospitals will receive even one “best” recommendation. Of those that do, even fewer will receive a significant number. The distribution of responses will inevitably be highly skewed. Because outcome and structural data are not similarly skewed, expert opinion would have a disproportionate impact if the extreme skewness was not addressed.

Log transformation in the data-driven rankings reshapes the distribution to match expert opinion data more closely to those of the other components. Transformation is applied to the weighted expert opinion data using the formula $\log(R_X + 10) - 1$, where R_X is the weighted expert opinion score for hospital X. Adding a constant of 10 moderates the effect of the transformation.

The transformed data are then scaled to a minimum of 0 and maximum of 100. **Figure 3** demonstrates the impact of the log transformation. Transformed expert opinion scores are higher than untransformed scores, but the impact is greater on low scores than on high scores, as illustrated by these examples:

- An untransformed score of 1% has a transformed value of 4 (4 times greater),
- an untransformed score of 10% has a transformed value of 29 (2.9 times greater), and
- an untransformed score of 60% has a transformed value of 81 (1.35 times greater).

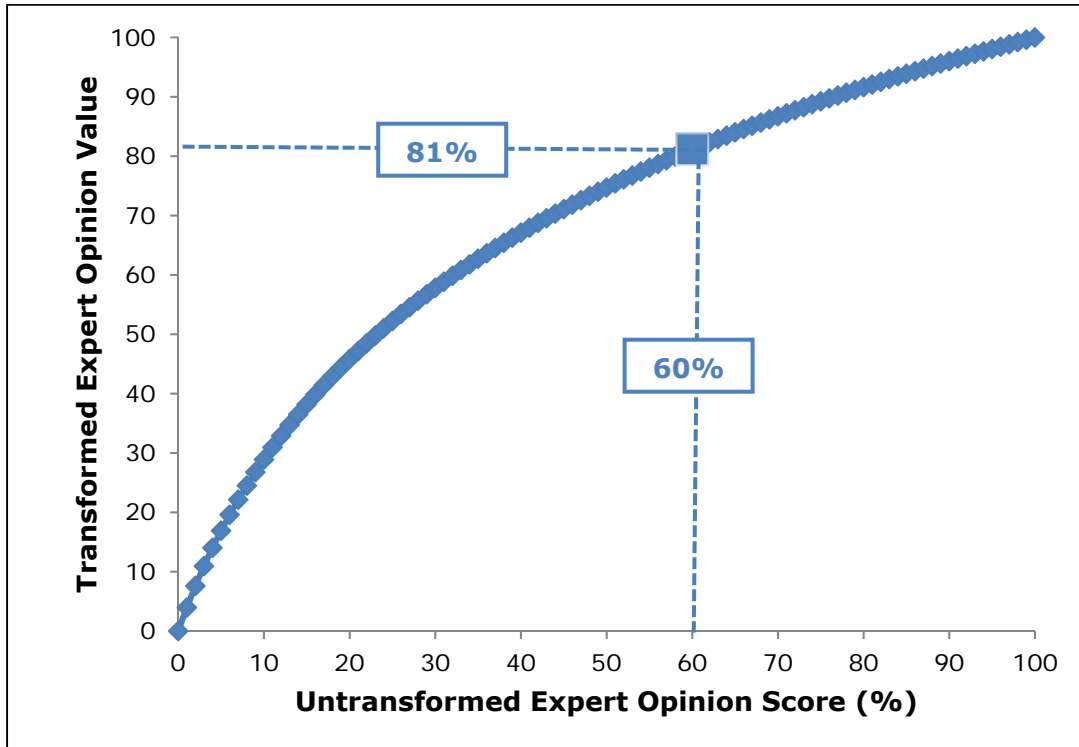
Skewness is reduced, and the overall effect of the expert opinion score on hospitals’ final standing in the rankings is diminished.

Normalization and Weighting

As with structural measures, expert opinion data were normalized before being combined with other metrics. In Diabetes & Endocrinology and Nephrology, expert opinion scores were normalized into a distribution from 0 to 1, with the lowest observed score being normalized to 0 and the highest observed score being normalized to 1. In other specialties, normalization transformed index values into a distribution between 0 and 1 based on a measure’s range of *possible* (as opposed to observed) values. The possible values for a hospital’s expert opinion score ranges from 0% (no nominations in the latest three years) to 100% (every surveyed physician nominated the hospital). A hospital’s normalized expert opinion score, after log transformation, determined the number of points the hospital received for expert opinion. If its normalized expert opinion score in Cancer was 80, for example, it received 0.80×27.5 , or 22 points, for expert opinion.

The weight of expert opinion in the overall score is 24.5% in Cardiology & Heart Surgery and 27.5% in all other data-driven specialties.

Figure 3. Expert Opinion Data Before and After Log Transformation



E. Patient Experience Score

Starting with the 2019-20 rankings, the Best Hospitals Specialty Rankings include a patient experience score based on data from the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) patient satisfaction survey

(<https://www.medicare.gov/hospitalcompare/Data/Overview.html>). This measure was incorporated in response to feedback from patients, hospital leaders and other stakeholders about the importance of the patient experience when considering healthcare quality.

For this measure, a hospital's linear mean overall score from HCAHPS (variable name H_HSP_RATING_LINEAR_SCORE) will be used to calculate the patient experience score. The data file from HCAHPS used for the 2019-20 rankings is from January 1, 2017 (measure start date), through December 31, 2017 (measure end date). For the 11 cancer specialty hospitals exempt from the CMS Inpatient Prospective Payment System, analogous data from the PPS-exempt Cancer Hospital (PCH) HCAHPS dataset were used. While PCH-HCAHPS reporting is voluntary for these

hospitals, all 11 exempt cancer hospitals have reported data to CMS for PCH-HCAHPS and are available for analysis. HCAHPS scores in both datasets could range from 0 to 100.

Note that while we use a weighted version of the HCAHPS scores in the overall rankings for each of the 12 data-driven specialties (see section *II.G. Calculation of the Overall Score for the Data-Driven* Specialties), hospital profiles on [usnews.com](https://www.usnews.com) show the CMS star ratings as a score ranging from 1-5. The star ratings are easier for comparisons between hospitals by consumers and are more easily understood than the HCAHPS score.

F. Public Transparency (Cardiology & Heart Surgery Only)

A public transparency component was added to the analysis for Cardiology & Heart Surgery in the 2016-17 rankings. The measure rewards hospitals for voluntarily reporting cardiac-care performance data to the public through one or both of two important clinical registries: the National Cardiovascular Disease Registry (NCDR), which is maintained by the American College of Cardiology (ACC), and the Adult Cardiac Surgery Database (ACSD), maintained by the Society of Thoracic Surgeons (STS). Clinicians initially created these and other clinical registries to foster quality improvement.

More recently, public transparency has been identified as an important additional application for registry-based quality measurement. The STS initiated voluntary public reporting for ACSD-participating hospitals in 2010. In late 2015, the ACC began a similar program for two of the 10 registries that comprise the NCDR, the CathPCI Registry and the ICD Registry.

Transparency via clinical registries can facilitate informed decision making by patients, which in turn may boost patient engagement in their healthcare. Transparency also creates opportunities for researchers to externally validate the results of hospital rankings such as Best Hospitals. Moreover, it demonstrates a public commitment on the part of the participating hospitals to the process of pursuing quality improvement.

Hospitals received up to 3 points for participating in public reporting with ACC and STS regardless of the specific ratings each registry reported (based on data available as of February 1, 2019). Hospitals that voluntarily publicly reported through one group but not the other received 2 points for this measure. Hospitals that publicly reported through both received 3 points. Hospitals that supplied data to the ACC or the STS but did not allow the results to be made public received 0 points.

Details of Participation Requirements (ACC)

To receive credit for ACC public reporting, hospitals must have participated in either the ICD Registry and/or the CathPCI Registry and voluntarily agreed to allow data from these registries to be posted on the ACC registry website, www.CardioSmart.org. To receive credit, the hospital had to have a public reporting status of “Participating with ACC” for at least one of those registries as of February 1, 2019. The publicly reported data include the following measures from each registry:

ICD Registry

- Angiotensin Converting Enzyme Inhibitor/Angiotensin Receptor Blocker (ACE/ARB) Therapy at Discharge for ICD Implant Patients with Left Ventricular Systolic Dysfunction (LVSD)
- Beta Blocker at Discharge for ICD Implant Patients with a Previous Myocardial Infarction
- Beta Blocker at Discharge for ICD Implant Patients With LVSD
- Composite: Discharge Medications (ACE/ARB and beta blockers) in Eligible ICD Implant Patients

CathPCI Registry

- Proportion of Patients with Aspirin Prescribed at Discharge
- Proportion of Patients with a P2Y12 Inhibitor Prescribed at Discharge (Patients with Stents)
- Proportion of Patients with a Statin Prescribed at Discharge
- Composite: Discharge Medications (Aspirin, P2Y 12 Inhibitor, and Statin) in Eligible PCI Patients

Chest Pain – MI Registry (formerly the ACTION Registry)

The Chest Pain – MI Registry is the nation’s largest quality improvement program for the care of patients with acute myocardial infarction (AMI), and has recently expanded to also include those with unstable angina and low-risk chest pain. The ACC credit measure has been updated to include this registry, as this is the first year that voluntary public reporting has become available for registry participants. The publicly reported data include the following measures:

- STEMI Performance Composite
- Overall Defect Free Care Composite (Endorsed by the National Quality Forum)

Details of Participation Requirements (STS)

To receive credit for STS public reporting, STS Adult Cardiac Surgery Database participants had to have their scores and data publicly displayed on the STS website (<http://www.sts.org>) as of February 1, 2019. STS ACSD public reporting currently includes outcomes for the following surgeries:

- Coronary artery bypass graft (CABG)
- Isolated aortic valve replacement (AVR)
- AVR plus CABG surgeries

G. Calculation of the Overall Score for the Data-Driven Specialties

All Specialties (Excluding Cardiology & Heart Surgery)

For 2019-20, The U.S. News ranking score reflects the following weights for each of the major components:

- Structure = 30%
- Process/expert opinion = 27.5%
- Outcomes = 37.5%
- Patient experience = 5%

Relative structural measure weights can be found in *Table 6*.

Rankings by U.S. News score for the top 50 hospitals in each specialty are shown in *Appendix D*. Hospitals were recognized as High Performing in a specialty, for the Best Regional Hospitals lists, if they were not ranked in the top 50 but they received a score in the top 10 percent of all hospitals receiving a score in that specialty.

Equation (2) shows the formula for calculating the raw overall score for each specialty except Cardiology & Heart Surgery. A hospital's raw score in a specialty can be thought of as a simple weighted sum of the four ranking components, as shown below:

$$Raw\ score = \{.3(\sum_{i=1}^{n_s} S_i) + .275\sum_{i=1}^{n_p} P_i + .375(\sum_{i=1}^{n_o} O_i) + .05PE_i\}, \quad (2)$$

where

- S_i = normalized value for structural measure i ,
- P_i = normalized value for process/expert opinion measure i ,
- O_i = normalized value for outcomes measure (survival) i ,
- PE_i = normalized hospital-wide patient experience score.

This formula is illustrative only. It *cannot* be used to calculate the U.S. News score for an individual hospital or replicate a published score.

For presentation purposes, raw scores were transformed to a scale that assigns a U.S. News score of 100 to the top hospital. The formula for the transformation is shown in Equation (3):

$$U.S. News Score = (raw score - minimum) / range. \quad (3)$$

Cardiology & Heart Surgery

For Cardiology & Heart Surgery, the U.S. News score included a fifth component—public transparency. This fifth component accounts for 3% of the overall score in the 2019-20 rankings. To accommodate this component, process/expert opinion weight was reduced to 24.5%. The U.S. News score for Cardiology & Heart Surgery reflects the following weights for each major component:

- Structure = 30%
- Process/expert opinion = 24.5%
- Outcomes = 37.5%
- Patient experience = 5%
- Public transparency = 3%

The formula for calculating the raw score for Cardiology & Heart Surgery is shown in Equation (4), as shown below:

$$Raw\ score = \{.3(\sum_{i=1}^{n_s} S_i) + .245\sum_{i=1}^{n_p} P_i + .375(\sum_{i=1}^{n_o} O_i) + .05PE_i + .03PT_i\}, \quad (4)$$

where

- S_i = normalized value for Cardiology & Heart Surgery structural measure i ,

- P_i = normalized value for Cardiology & Heart Surgery process/expert opinion measure i ,
- O_i = normalized value for Cardiology & Heart Surgery outcomes measure (survival) i ,
- PE_i = normalized hospital-wide patient experience score,
- PT_i = normalized public transparency score.

As with the other specialties, raw scores were transformed to a scale that assigned a score of 100 to the top hospital.

III. Expert Opinion-Based Specialties

Available data for the four expert opinion-based specialties are significantly limited. Life-threatening conditions and procedures are more uncommon in Ophthalmology, Psychiatry, and Rehabilitation, rendering mortality irrelevant as a primary outcome. Inpatient volume in Rheumatology is also extremely low, making calculation of mortality unreliable. Reliable structural measures also are unavailable in these four specialties in most cases. Therefore, expert opinion alone determines the ranking in these specialties. This section describes the eligibility and procedures used to develop the rankings for these four specialties.

A. Eligibility

In specialties driven solely by expert opinion, hospitals have never had to meet the same eligibility standards as in the data-driven specialties. Starting with the 2015-16 rankings, a hospital has to have an expert opinion score of 1% or greater to be eligible for ranking.

Ranked hospitals are those with an expert opinion score of at least 5% across the last 3 years. Hospitals with a score of at least 3% and less than 5% are recognized as High Performing in the Best Regional Hospitals lists.

B. Process/expert opinion

The data-driven specialties and expert opinion-based specialties share the same process/expert opinion component (see section *II.D.* for more information).

C. Calculation of the Rankings

As described above, scores for the expert opinion-based specialties of Ophthalmology, Psychiatry, Rehabilitation, and Rheumatology must be calculated differently from scores for the

data-driven specialties because of the unavailability of structural and outcomes measures. Thus, we rank hospitals in these specialties solely by expert opinion (see *Appendix E*).

IV. Number of Ranked Hospitals

This year, 165 different hospitals were ranked in at least one data-driven or expert opinion-based Best Hospitals specialty. Another 23 specialty hospitals that closely coordinate care with a partner hospital shared one or two specialty-specific rankings with that partner.

V. Honor Roll & Best Regional Hospitals

The Honor Roll, which since 1990 has recognized excellence across a broad range of Best Hospitals specialties, was revamped in 2016-17. The updated methodology factors in the Procedures and Conditions ratings and reduces the role of expert opinion in the Honor Roll rankings. The 2019-20 Honor Roll utilizes the same method established in 2016-17 and was determined as follows.

1. In each of the 12 data-driven specialty rankings, the No. 1-ranked hospital received 25 Honor Roll points and lower-ranked hospitals progressively received one less point down to six points for No. 20. All hospitals ranked 21–50 received 5 points. A hospital ranked No. 1 in all 12 data-driven specialties would have received $25 \times 12 = 300$ points.
2. In each of the four expert opinion-based specialties, the No. 1-ranked hospital received 10 Honor Roll points, the No. 2 hospital received 9 points and lower-ranked hospitals progressively received one less point down to No. 10, which receives 1 point. All hospitals from No. 11 to the last ranked hospital also received 1 point. A hospital ranked No. 1 in all four expert opinion-based specialties would have received 40 points.
3. In the nine procedures and conditions for which U.S. News published 2019-20 ratings,^{§§§§} hospitals received 12 points for each rating of High Performing. Hospitals that were rated High Performing in all nine procedures and conditions received 108 points.
4. The 2019-20 Honor Roll recognizes the 20 hospitals that earned the most points out of the possible total of 448 across the 16 specialties and nine procedures and conditions. The Honor Roll is ranked from No. 1 to No. 20, based on points.

The 2019-20 Honor Roll appears in *Appendix F*.

^{§§§§} Chronic obstructive pulmonary disease (COPD); congestive heart failure (CHF); coronary artery bypass surgery (CABG); hip replacement; knee replacement; abdominal aortic aneurysm repair; aortic valve repair or replacement (AVR); colon cancer surgery, and lung cancer surgery.

It's not always possible to travel distances to receive hospital-based care that is needed, therefore U.S. News ranks hospitals regionally in both states and major metro areas. Within a state or metro area, regional hospital rank is determined by a hospital's performance in the Best Hospitals Specialty Rankings and by its scores across each of the nine Procedures and Conditions cohorts. Details of the scoring methodology for the Best Regional Hospitals listings by state and metro areas are available at <http://health.usnews.com/health-care/best-hospitals/articles/faq-how-and-why-we-rank-and-rate-hospitals>.

VI. Changes to the Methodology for 2019-20

A review of the changes to the methodology for this year of the Best Hospitals Rankings is provided below. A brief description of changes made in past years can be found in Appendix D. For complete information on changes made in previous years, we recommend reviewing the project methodology reports for those years, which are available online at www.rti.org/besthospitals.

Update of the Mortality Measure and Survival Score. Starting with 2019-20, the rankings moved to a new mortality measure as the basis of the survival score. The new measure utilizes risk-adjustment methodologies developed in the Best Hospitals for Procedures and Conditions project to evaluate one of the most important outcomes of care—whether patients live or die as a result of inpatient hospitalization. The new methodology utilizes multilevel logistic regression models to adjust for differences in case mix between hospitals. The model calculates RE (random effect) scores which can be thought of as a hospital level off-set. They represent the risk difference between a hospital and all hospitals in a given specialty, discounted by the reliability of that difference (based on the volume of cases). The models make use of a variety of covariates such as patient age, gender, Medicare status, the year of the visit, Elixhauser comorbidities, dual eligibility for Medicare and Medicaid (a proxy measure of socio-economic status), the DRG group of the claim, and an indicator of whether the claim was coded in ICD-9 or ICD-10 to account for differences in coding practices.

Addition of the Discharge to Home Score. A new outcome for 2019-20 rankings is the discharge to home score, which assesses how well a hospital does at managing to discharge patients to home rather than sending them on to another acute, post-acute, or long-term care setting following hospitalization. This measure provides unique information about hospital outcome performance that has been available in the Best Hospitals for Procedures and Conditions ratings for a number of years but is new to the Best Hospitals Specialty Rankings.

Removal of the Patient Safety Score. Since 2009, the Best Hospitals Specialty Rankings have included a patient safety score, which were constructed from a selection of Patient Safety Indicators (PSIs). The PSIs that constituted the patient safety score have evolved over time as our

understanding of the validity and reliability of individual PSIs has changed. For 2019-20, we removed the patient safety score from the methodology. While the construct of patient safety remains important, we concluded that these specific measures are not ideal for comparing hospital performance.

Addition of Patient Experience Score. In response to feedback from patients, hospital leaders and other stakeholders about the importance of the patient experience when considering healthcare quality, we introduced the patient experience score. This score is based on the linear mean score data from the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) patient satisfaction survey.

Removal of DRG 470 from orthopedics. This DRG, which includes hip and knee replacement, was removed from the Best Hospitals rankings because it overlaps with cases included in the Best Hospitals for Procedures and Conditions ratings. These low-risk procedures generally do not require complex specialty care, and some health systems are increasingly treating these cases in settings different from those where complex orthopedic care is delivered

VII. Future Improvements

The Best Hospitals methodology is reexamined and refined each year. As always, RTI will closely monitor the potential of new data sources and measures. Below, we describe several methodological improvements that are being considered.

- **Evaluate additional outcome measures for possible inclusion.** We will continue to evaluate new and alternative outcome measures that may provide unique information on performance of hospital in caring for patients.
- **Add objective data to expert opinion-based specialties.** We are examining opportunities to add structural data and outcome measures to the current expert opinion-based specialties. As announced in late 2018, we are currently exploring possible methods for expanding the rehabilitation rankings to include a broader array of measures. Our aim is to introduce this new rehabilitation ranking in 2020.
- **Evaluate transparency measures for other specialties.** We will continue to evaluate new measures for transparency of outcomes, similar to the ACC and STS public transparency measure added in Cardiology & Heart Surgery.
- **Review external data sources.** We will investigate additional and new sources of data that offer quality measures for all hospitals. Potential data sources include quality indicators from AHRQ, AHA, CMS and the Joint Commission.

VIII. Contact Information

We welcome suggestions and questions. Readers and users are encouraged to contact the Best Hospitals research team at the address listed below. This report, as well as all others from 2005 forward, can be viewed or downloaded from the RTI International website at www.rti.org/BestHospitals. Specific questions or comments about this report can be sent to BestHospitals@rti.org.

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Appendix A

2019-20 Physician Survey Materials



Best Hospitals

Your nominations will be reflected in the 2019-20 U.S. News & World Report <<print_specialty>> rankings.

Please name up to 5 U.S. hospitals that in your opinion provide the best care in <<print specialty>> for patients who have the most challenging <<adult fill>>. Do not consider location or cost. For a hospital that is part of a health system or medical school, please name the individual hospital.

	Hospital	City	State
a.			
b.			
c.			
d.			
e.			

Fax response to (800) 476-9721
or return in postpaid envelope.



Conducted by:

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Appendix B
Structural Variable Map

The following variables, used to construct structural elements of the 2019-20 data-driven rankings, were taken from the 2017 Annual Survey of Hospitals Database published by the American Hospital Association, unless otherwise specified. Hospitals did not receive more than one point for any one service.

Key Technologies (8 points possible)

1 point awarded if...
DRADFHOS, DRADFSYS or DRADFVEN=1
FFDMHOS, FFDMSYS or FFDMVEN=1
IGRTHOS, IGRTSYS or IGRTVEN=1
MSCTHOS, MSCTSYS, MSCTVEN, MSCTGHOS, MSCTGSYS or MSCTGVEN=1
PETCTHOS, PETCTSYS or PETCTVEN=1
ROBOHOS, ROBOSYS or ROBOVEN=1
SPECTHOS, SPECTSYS or SPECTVEN=1
SRADHOS, SRADSYS or SRADVEN=1

Cancer Advanced Technologies (8 points possible)

1 point awarded if...
FFDMHOS, FFDMSYS or FFDMVEN=1
IGRTHOS, IGRTSYS or IGRTVEN=1
IMRTHOS, IMRTSYS or IMRTVEN=1
ROBOHOS, ROBOSYS or ROBOVEN=1
PETCTHOS, PETCTSYS or PETCTVEN=1
BEAMHOS, BEAMSYS or BEAMVEN=1
SRADHOS, SRADSYS or SRADVEN=1
OTBONHOS, OTBONSYS or OTBONVEN=1

Cardiology & Heart Surgery Advanced Technologies (6 points possible)

1 point awarded if...
MSCTHOS, MSCTSYS, MSCTVEN, MSCTGHOS, MSCTGSYS or MSCTGVEN=1
PETCTHOS, PETCTSYS or PETCTVEN=1
ROBOHOS, ROBOSYS or ROBOVEN=1
SPECTHOS, SPECTSYS, SPECTVEN=1
TISUHOS, TISUSYS or TISUVEN=1
CMS Heart Transplant Center=1

Diabetes & Endocrinology Advanced Technologies (4 points possible)

1 point awarded if...
DRADFHOS, DRADFSYS or DRADFVEN=1
IGRTHOS, IGRTSYS or IGRTVEN=1
PETCTHOS, PETCTSYS or PETCTVEN=1
SRADHOS, SRADSYS or SRADVEN=1

Ear, Nose & Throat Advanced Technologies (1 point possible)

1 point awarded if...
SRADHOS, SRADSYS or SRADVEN=1

Gastroenterology & GI Surgery Advanced Technologies (7 points possible)

1 point awarded if...
DRADFHOS, DRADFSYS or DRADFVEN=1
ENDOAHOS, ENDOASYS or ENDOAVEN=1
ENDORHOS, ENDORSYS or ENDORVEN=1
ENDOUHOS, ENDOUSYS or ENDOUVEN=1
IGRTHOS, IGRTSYS or IGRTVEN=1
SRADHOS, SRADSYS or SRADVEN=1
CMS Liver Transplant Center=1

Gynecology Advanced Technologies (5 points possible)

1 point awarded if...
FFDMHOS, FFDMSYS or FFDMVEN=1
IGRTHOS, IGRTSYS or IGRTVEN=1
PETCTHOS, PETCTSYS or PETCTVEN=1
ROBOHOS, ROBOSYS or ROBOVEN=1
SRADHOS, SRADSYS or SRADVEN=1

Nephrology Advanced Technologies (7 points possible)

1 point awarded if...
DRADFHOS, DRADFSYS or DRADFVEN=1
IGRTHOS, IGRTSYS or IGRTVEN=1
MSCTHOS, MSCTSYS, MSCTVEN, MSCTGHOS, MSCTGSYS or MSCTGVEN=1
PETCTHOS, PETCTSYS or PETCTVEN=1
ROBOHOS, ROBOSYS or ROBOVEN=1
SRADHOS, SRADSYS or SRADVEN=1
CMS Kidney Transplant Center=1

Neurology & Neurosurgery Advanced Technologies (5 points possible)

1 point awarded if...
DRADFHOS, DRADFSYS or DRADFVEN=1
IGRTHOS, IGRTSYS or IGRTVEN=1
PETCTHOS, PETCTSYS or PETCTVEN=1
SPECTHOS, SPECTSYS or SPECTVEN=1
SRADHOS, SRADSYS or SRADVEN=1

Orthopedics Advanced Technologies (2 points possible)

1 point awarded if...
CAOSHOS, CAOSSYS or CAOSVEN=1
TISUHOS, TISUSYS or TISUVEN=1

Pulmonology & Lung Surgery Advanced Technologies (6 points possible)

1 point awarded if...
DRADFHOS, DRADFSYS or DRADFVEN=1
IGRTHOS, IGRTSYS or IGRTVEN=1
MSCTHOS, MSCTSYS, MSCTVEN, MSCTGHOS, MSCTGSYS or MSCTGVEN=1
PETCTHOS, PETCTSYS or PETCTVEN=1
SRADHOS, SRADSYS or SRADVEN=1
CMS Lung Transplant Center=1

Urology Advanced Technologies (6 points possible)

1 point awarded if...
DRADFHOS, DRADFSYS or DRADFVEN=1
IGRTHOS, IGRTSYS or IGRTVEN=1
IMRTHOS, IMRTSYS or IMRTVEN=1
PETCTHOS, PETCTSYS or PETCTVEN=1
ROBOHOS, ROBOSYS or ROBOVEN=1
SRADHOS, SRADSYS or SRADVEN=1

Nurse Staffing

Index equals:
<p>Calculation for hospitals with <u>no</u> onsite skilled nursing: Full-time Equivalent Registered Nurses (FTEN) divided by Adjusted Average Daily Census (ADJADC). In cases where FTEN is missing the value is imputed using a sample of hospitals with non-extreme ratios with the following data: FTEN (Full time equivalent registered nurses reported), FTERN (Full time equivalent registered nurses estimated), ADJADC (Adjusted Average Daily Census) BDTOT (total hospital beds set up and staffed).</p>
<p>Calculation for hospitals with onsite skilled nursing: If a hospital has a nursing home type of long-term care unit (SUNITS=1) and reports registered nurse FTEs for this facility (FTERNLT>0), then calculate the ratio by dividing the Registered Nurses FTEs (FTEN) – the Registered Nurses FTEs assigned to the nursing facility (FTERNLT) by the modified Adjusted Average Daily Census (ADJADCH). Note that the ADJADCH is provided by the AHA directly to the project.</p>

Trauma Center

"Yes" if...
TRAUML90=1 or 2 and TRAUMHOS=1

Cancer Patient Services (8 points possible)

1 point awarded if...
GNTCHOS, GNTCSYS or GNTCVEN=1
HOSPCCHOS, HOSPCSYS or HOSPCVEN=1
PAINHOS, PAINSYS or PAINVEN=1
PALHOS, PALSYS or PALVEN=1
PCAHOS, PCASYS or PCAVEN=1
LINGHOS, LINGSYS or LINGVEN=1
AIRBHOS, AIRBSYS or AIRBVEN=1
WMGTHOS, WMGTSYS or WMGTVEN=1

Cardiology & Heart Surgery Patient Services (7 points possible)

1 point awarded if...
CHABHOS, CHABSYS or CHABVEN=1
HOSPCCHOS, HOSPCSYS or HOSPCVEN=1
PAINHOS, PAINSYS or PAINVEN=1
PALHOS, PALSYS or PALVEN=1
PCAHOS, PCASYS or PCAVEN=1
LINGHOS, LINGSYS or LINGVEN=1
WMGTHOS, WMGTSYS or WMGTVEN=1

Diabetes & Endocrinology Patient Services (8 points possible)

1 point awarded if...
GNTCHOS, GNTCSYS or GNTCVEN=1
HOSPCHOS, HOSPCSYS or HOSPCVEN=1
PAINHOS, PAINSYS or PAINVEN=1
PALHOS, PALSYS or PALVEN=1
PCAHOS, PCASYS or PCAVEN=1
LINGHOS, LINGSYS or LINGVEN=1
AIRBHOS, AIRBSYS or AIRBVEN=1
WMGTHOS, WMGTSYS or WMGTVEN=1

Ear, Nose & Throat Patient Services (8 points possible)

1 point awarded if...
GNTCHOS, GNTCSYS or GNTCVEN=1
HOSPCHOS, HOSPCSYS or HOSPCVEN=1
PAINHOS, PAINSYS or PAINVEN=1
PALHOS, PALSYS or PALVEN=1
PCAHOS, PCASYS or PCAVEN=1
LINGHOS, LINGSYS or LINGVEN=1
AIRBHOS, AIRBSYS or AIRBVEN=1
WMGTHOS, WMGTSYS or WMGTVEN=1

Gastroenterology & GI Surgery Patient Services (8 points possible)

1 point awarded if...
GNTCHOS, GNTCSYS or GNTCVEN=1
HOSPCHOS, HOSPCSYS or HOSPCVEN=1
PAINHOS, PAINSYS or PAINVEN=1
PALHOS, PALSYS or PALVEN=1
PCAHOS, PCASYS or PCAVEN=1
LINGHOS, LINGSYS or LINGVEN=1
AIRBHOS, AIRBSYS or AIRBVEN=1
WMGTHOS, WMGTSYS or WMGTVEN=1

Geriatric Care Patient Services (9 points possible)

1 point awarded if...
ALZHOS, ALZSYS or ALZVEN=1
ARTHCHOS, ARTHCSYS or ARTHCVEN=1
HOSPCHOS, HOSPCSYS or HOSPCVEN=1
PAINHOS, PAINSYS or PAINVEN=1
PALHOS, PALSYS or PALVEN=1
PCAHOS, PCASYS or PCAVEN=1
PSYGRHOS, PSYGRSYS or PSYGRVEN=1
LINGHOS, LINGSYS or LINGVEN=1
WMGTHOS, WMGTSYS or WMGTVEN=1

Gynecology Patient Services (9 points possible)

1 point awarded if...
FRTCHOS, FRTCSYS or FRTCVEN=1
GNTCHOS, GNTCSYS or GNTCVEN=1
HOSPCHOS, HOSPCSYS or HOSPCVEN=1
PAINHOS, PAINSYS or PAINVEN=1
PALHOS, PALSYS or PALVEN=1
PCAHOS, PCASYS or PCAVEN=1
LINGHOS, LINGSYS or LINGVEN=1
AIRBHOS, AIRBSYS or AIRBVEN=1
WMGTHOS, WMGTSYS or WMGTVEN=1

Nephrology Patient Services (8 points possible)

1 point awarded if...
GNTCHOS, GNTCSYS or GNTCVEN=1
HOSPCHOS, HOSPCSYS or HOSPCVEN=1
PAINHOS, PAINSYS or PAINVEN=1
PALHOS, PALSYS or PALVEN=1
PCAHOS, PCASYS or PCAVEN=1
LINGHOS, LINGSYS or LINGVEN=1
AIRBHOS, AIRBSYS or AIRBVEN=1
WMGTHOS, WMGTSYS or WMGTVEN=1

Neurology & Neurosurgery Patient Services (9 points possible)

1 point awarded if...
ALZHOS, ALZSYS or ALZVEN=1
GNTCHOS, GNTCSYS or GNTCVEN=1
HOSPCCHOS, HOSPCSYS or HOSPCVEN=1
PAINHOS, PAINSYS or PAINVEN=1
PALHOS, PALSYS or PALVEN=1
PCAHOS, PCASYS or PCAVEN=1
LINGHOS, LINGSYS or LINGVEN=1
AIRBHOS, AIRBSYS or AIRBVEN=1
WMGTHOS, WMGTSYS or WMGTVEN=1

Orthopedics Patient Services (7 points possible)

1 point awarded if...
ARTHCHOS, ARTHCSYS or ARTHCVEN=1
HOSPCCHOS, HOSPCSYS or HOSPCVEN=1
PAINHOS, PAINSYS or PAINVEN=1
PALHOS, PALSYS or PALVEN=1
PCAHOS, PCASYS or PCAVEN=1
LINGHOS, LINGSYS or LINGVEN=1
WMGTHOS, WMGTSYS or WMGTVEN=1

Pulmonology & Lung Surgery Patient Services (8 points possible)

1 point awarded if...
GNTCHOS, GNTCSYS or GNTCVEN=1
HOSPCCHOS, HOSPCSYS or HOSPCVEN=1
PAINHOS, PAINSYS or PAINVEN=1
PALHOS, PALSYS or PALVEN=1
PCAHOS, PCASYS or PCAVEN=1
LINGHOS, LINGSYS or LINGVEN=1
AIRBHOS, AIRBSYS or AIRBVEN=1
WMGTHOS, WMGTSYS or WMGTVEN=1

Urology Patient Services (9 points possible)

1 point awarded if...
FRTCHOS, FRTCSYS or FRTCVEN=1
GNTCHOS, GNTCSYS or GNTCVEN=1
HOSPCHOS, HOSPCSYS or HOSPCVEN=1
PAINHOS, PAINSYS or PAINVEN=1
PALHOS, PALSYS or PALVEN=1
PCAHOS, PCASYS or PCAVEN=1
LINGHOS, LINGSYS or LINGVEN=1
AIRBHOS, AIRBSYS or AIRBVEN=1
WMGTHOS, WMGTSYS or WMGTVEN=1

Intensivists

1 point awarded if...
if (FTEINT>0 or TPINT>0 or INTCAR>0 or FTEMSI>0 or FTECIC>0 or FTEOIC>0) then intens=1; if FTEINT>0 and FTEINT=sum(of FTENIC FTEPIC) then intens=0;

Appendix C
2019-20 Diagnosis Related Group (DRG)
Groupings by Specialty

Cancer

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
S	Allogeneic bone marrow transplant	014	Include all
		016	Include all
		017	Include all
S	Cranio w major dev impl/acute complex CNS PDX w MCC or chemo implant	023	Include procedures: 0010
M	Nervous system neoplasms	054	Include all
		055	Include all
M	Ear, nose, mouth & throat malignancy	146	Include all
		147	Include all
		148	Include all
M	Respiratory neoplasms	180	Include all
		181	Include all
		182	Include all
M	Digestive malignancy	374	Include all
		375	Include all
		376	Include all
M	Malignancy of hepatobiliary system or pancreas	435	Include all
		436	Include all
		437	Include all
S	Spinal fus exc cerv w spinal curv/malig/infec or 9+ fus	456	Include diagnoses: 1702, 1985, 20973
		457	See MS-DRG 456
		458	See MS-DRG 456
M	Pathological fractures & musculoskelet & conn tiss malig	542	Exclude diagnoses: 4463-4, 7331, 73310-6, 73319, 73393-8
		543	See MS-DRG 542
		544	See MS-DRG 542
S	Mastectomy for malignancy	582	Include all
		583	Include all
M	Major skin disorders	595	Include diagnoses: 1720, 1722-9, 20931-6
		596	See MS-DRG 595
M	Malignant breast disorders	597	Include all
		598	Include all
		599	Include all
S	Kidney & ureter procedures for neoplasm	656	Include all
		657	Include all
		658	Include all
M	Kidney & urinary tract neoplasms	686	Include all
		687	Include all
		688	Include all
S	Other male reproductive system O.R. proc for malignancy	715	Include all
		716	Include all
M	Malignancy, male reproductive system	722	Include all
		723	Include all
		724	Include all
S	Uterine & adnexa proc for ovarian or adnexal malignancy	736	Include all
		737	Include all
		738	Include all

Medical/Surgical	DRG Title	MS-DRG	ICD-9-CM
S	Uterine,adnexa proc for non-ovarian/adnexal malig	739	Include all
		740	Include all
		741	Include all
M	Malignancy, female reproductive system	754	Include all
		755	Include all
		756	Include all
M	Major hematol/immun diag exc sickle cell crisis & coagul	808	Include diagnoses: 99685
		809	See MS-DRG 809
		810	See MS-DRG 809
S	Lymphoma & leukemia w major O.R. procedure	820	Include all
		821	Include all
		822	Include all
S	Lymphoma & non-acute leukemia w other O.R. proc	823	Include all
		824	Include all
		825	Include all
S	Myeloprolif disord or poorly diff neopl w maj O.R. proc	826	Exclude diagnoses: v100-9, v1000-9, v1011-2, v1020-2, v1029, v1040-9, v1050-3, v1059, v1060-3, v1069, v1071-2, v1079, v1081-8, v1090-1, v1322
		827	See MS-DRG 826
		828	See MS-DRG 826
S	Myeloprolif disord or poorly diff neopl w other O.R. proc	829	See MS-DRG 826
		830	See MS-DRG 826
M	Acute leukemia w/o major O.R. procedure	834	Include all
		835	Include all
		836	Include all
M	Chemo w acute leukemia as sdx or w high dose chemo agent	837	Include all
		838	Include all
		839	Include all
M	Lymphoma & non-acute leukemia	840	Include all
		841	Include all
		842	Include all
M	Other myeloprolif dis or poorly diff neopl diag	843	Exclude diagnosis: v10, v711
		844	See MS-DRG 844
		845	See MS-DRG 844
M	Chemotherapy w/o acute leukemia as secondary diagnosis	846	Include all
		847	Include all
		848	Include all

Cardiology & Heart Surgery

Medical/Surgical	DRG Title	MS-DRG	ICD-9-CM
S	Heart transplant or implant of heart assist system	001	Include all
		002	Include all
S	Major chest procedures	163	Include procedures: 3712, 3724, 3731, 3791, 3805, 3815, 3835, 3845, 3855, 3865, 3885, 3954
		164	See MS-DRG: 163
		165	See MS-DRG: 164

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
S	Other heart assist system implant	215	Include all
S	Cardiac valve & oth maj cardiothoracic proc w card cath	216	Include all
		217	Include all
		218	Include all
S	Cardiac valve & oth maj cardiothoracic proc w/o card cath	219	Include all
		220	Include all
		221	Include all
S	Cardiac defib implant w cardiac cath w AMI/HF/shock	222	Include all
		223	Include all
S	Cardiac defib implant w cardiac cath w/o AMI/HF/shock	224	Include all
		225	Include all
S	Cardiac defibrillator implant w/o cardiac cath	226	Include all
		227	Include all
S	Other cardiothoracic procedures	228	Include all
		229	Include all
		230	Include all
S	Coronary bypass w PTCA	231	Include all
		232	Include all
S	Coronary bypass w cardiac cath	233	Include all
		234	Include all
S	Coronary bypass w/o cardiac cath	235	Include all
		236	Include all
S	Major cardiovasc procedures	237	Include all
		238	Include all
S	Permanent cardiac pacemaker implant	242	Include all
		243	Include all
		244	Include all
S	AICD Generator Procedures	245	Include all
S	Perc cardiovasc proc w drug-eluting stent	246	Include all
		247	Include all
S	Perc cardiovasc proc w non-drug-eluting stent	248	Include all
		249	Include all
S	Perc cardiovasc proc w/o coronary artery stent	250	Include all
		251	Include all
S	Other vascular procedures	252	Include all
		253	Include all
		254	Include all
S	Cardiac pacemaker revision except device replacement	260	Include all
		261	Include all
		262	Include all
S	ACID lead procedures	265	Include all
S	Endovascular Cardiac Valve Replacement	266	Include all
		267	Include all
M	Acute myocardial infarction, discharged alive	280	Include all
		281	Include all
		282	Include all
M	Acute myocardial infarction, expired	283	Include all
		284	Include all
		285	Include all
M	Circulatory disorders except AMI, w card cath	286	Include all
		287	Include all

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
M	Acute & subacute endocarditis	288	Include all
		289	Include all
		290	Include all
M	Heart failure & shock	291	Include all
		292	Include all
		293	Include all
M	Cardiac congenital & valvular disorders	306	Include all
		308	Include all
		309	Include all
M	Other circulatory system diagnoses	314	Include all
		315	Include all
		316	Include all

Diabetes & Endocrinology

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
S	Adrenal & pituitary procedures	614	Include all
		615	Include all
S	O.R. procedures for obesity	619	Include all
		620	Include all
		621	Include all
S	Skin grafts & wound debrid for endoc, nutrit & metab dis	622	Include all
		623	Include all
		624	Include all
S	Thyroid, parathyroid & thyroglossal procedures	625	Include all
		626	Include all
		627	Include all
S	Other endocrine, nutrit & metab O.R. proc	628	Include all
		629	Include all
		630	Include all
M	Diabetes	637	Include all
		638	Include all
		639	Include all
M	Misc disorders of nutrition, metabolism, fluids/electrolyes	640	Exclude diagnosis: 77934
M	Endocrine disorders	643	Include all
		644	Include all

Ear, Nose & Throat

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
S	Tracheostomy for face,mouth & neck diagnoses	011	Include all
		012	Include all
		013	Include all
S	Major head & neck procedures	129	Include all
		130	Include all
S	Cranial/Facial Procedures	131	Include all
		132	Include all

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
S	Other ear, nose, mouth & throat O.R. procedures	133	Include all
		134	Include all
S	Salivary gland procedures	139	Include all
M	Ear, nose, mouth & throat malignancy	146	Include all
		147	Include all
		148	Include all
M	Otitis media & URI	152	Include all
M	Other ear, nose, mouth and throat diagnosis	154	Include all
		155	Include all
		156	Include all

Gastroenterology & GI Surgery

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
S	Stomach, esophageal & duodenal proc	326	Include all
		327	Include all
		328	Include all
S	Major small & large bowel procedures	329	Include all
		330	Include all
		331	Include all
S	Rectal resection	332	Include all
		333	Include all
		334	Include all
S	Peritoneal adhesiolysis	335	Include all
		336	Include all
		337	Include all
S	Minor small & large bowel procedures	344	Include procedures: 4500, 4502-3, 4515, 4526, 4534, 4549, 465, 4650-2, 466, 4660-4, 4791, 480, 4825, 5783
		345	Include procedures: 4502-3, 4515, 4526, 4534, 4549, 465, 4650-2, 466, 4660-4, 4791, 480, 4825, 5783
		346	See MS-DRG 345
S	Other digestive system O.R. procedures	356	Include all
		357	Include all
		358	Include all
M	Major esophageal disorders	368	Include all
		369	Include all
		370	Include all
M	Major gastrointestinal disorders & peritoneal infections	371	Include all
		372	Include all
		373	Include all
M	Digestive malignancy	374	Include all
		375	Include all
		376	Include all
M	G.I. hemorrhage	377	Include all
		378	Include all
		379	Include all

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
M	Complicated peptic ulcer	380	Include all
		381	Include all
		382	Include all
M	Uncomplicated peptic ulcer	383	Include all
M	Inflammatory bowel disease	385	Include all
		386	Include all
		387	Include all
M	G.I. obstruction	388	Include all
		389	Include all
M	Esophagitis, gastroent & misc digest disorders	391	Include all
M	Other digestive system diagnoses	393	Include all
		394	Include all
S	Pancreas, liver & shunt procedures	405	Include all
		406	Include all
		407	Include all
S	Biliary tract proc except only cholecyst w or w/o c.d.e.	408	Include all
		409	Include all
		410	Include all
S	Cholecystectomy w c.d.e.	411	Include all
		412	Include all
		413	Include all
S	Cholecystectomy except by laparoscope w/o c.d.e.	414	Include all
		415	Include all
S	Laparoscopic cholecystectomy w/o c.d.e.	417	Include all
		418	Include all
S	Hepatobiliary diagnostic procedures	420	Include all
		421	Include all
		422	Include all
S	Other hepatobiliary or pancreas O.R. procedures	423	Include all
		424	Include all
		425	Include all
M	Cirrhosis & alcoholic hepatitis	432	Include all
		433	Include all
		434	Include all
M	Malignancy of hepatobiliary system or pancreas	435	Include all
		436	Include all
		437	Include all
M	Disorders of pancreas except malignancy	438	Include all
		439	Include all
		440	Include all
M	Disorders of liver except malig,cirr,alc hepa	441	Exclude diagnosis: 7948
		442	See MS-DRG 442

Geriatrics

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
S	Heart transplant or implant of heart assist system	001	Include all
		002	Include all
S	ECMO or trach w MV 96+ hrs or PDX exc face, mouth & neck w maj O.R.	003	Include all
S	Trach w MV 96+ hrs or PDX exc face, mouth & neck w/o maj O.R.	004	Include all
S	Liver transplant	005	Include all
		006	Include all
S	Lung transplant	007	Include all
S	Simultaneous pancreas/kidney transplant	008	Include all
S	Pancreas transplant	010	Include all
S	Tracheostomy for face,mouth & neck diagnoses	011	Include all
		012	Include all
		013	Include all
S	Allogeneic bone marrow transplant	014	Include all
		016	Include all
		017	Include all
S	Intracranial vascular procedures w PDX hemorrhage	020	Include all
		021	Include all
		022	Include all
S	Cranio w major dev impl/acute complex CNS PDX	023	Include all
		024	Include all
S	Craniotomy & endovascular intracranial procedures	025	Include all
		026	Include all
		027	Include all
S	Spinal procedures	028	Include all
		029	Include all
		030	Include all
S	Ventricular shunt procedures	031	Include all
		032	Include all
		033	Include all
S	Carotid artery stent procedure	034	Include all
		035	Include all
		036	Include all
S	Extracranial procedures	037	Include all
		038	Include all
		039	Include all
S	Periph & cranial nerve & other nerv syst proc	040	Include all
		041	Include all
		042	Include all
M	Spinal disorders & injuries	052	Include all
		053	Include all
M	Nervous system neoplasms	054	Include all
		055	Include all
M	Degenerative nervous system disorders	056	Include all
		057	Include all
M	Multiple sclerosis & cerebellar ataxia	058	Include all
		059	Include all
		060	Include all

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
M	Acute ischemic stroke w use of thrombolytic agent	061	Include all
		062	Include all
		063	Include all
M	Intracranial hemorrhage or cerebral infarction	064	Include all
		065	Include all
		066	Include all
M	Nonspecific cva & precerebral occlusion w/o infarct	067	Include all
M	Transient ischemia	068	Include all
M	Nonspecific cerebrovascular disorders	069	Include all
		070	Include all
		071	Include all
M	Cranial & peripheral nerve disorders	072	Include all
		073	Include all
M	Viral meningitis	074	Include all
		075	Include all
M	Hypertensive encephalopathy	076	Include all
		077	Include all
		078	Include all
M	Nontraumatic stupor & coma	079	Include all
		080	Include all
M	Traumatic stupor & coma, coma >1 hr	081	Include all
		082	Include all
		083	Include all
M	Traumatic stupor & coma, coma <1 hr	084	Include all
		085	Include all
		086	Include all
M	Concussion	087	Include all
		088	Include all
		089	Include all
M	Other disorders of nervous system	090	Include all
		091	Include all
		092	Include all
M	Bacterial & tuberculous infections of nervous system	093	Include all
		094	Include all
		095	Include all
M	Non-bacterial infect of nervous sys exc viral meningitis	096	Include all
		097	Include all
		098	Include all
M	Seizures	099	Include all
		100	Include all
M	Headaches	101	Include all
		102	Include all
S	Orbital procedures	103	Include all
		113	Include all
S	Extraocular procedures except orbit	114	Include all
		115	Include all
S	Intraocular procedures	116	Include all
		117	Include all
M	Acute major eye infections	121	Include all
		122	Include all
M	Neurological eye disorders	123	Include all

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
M	Other disorders of the eye	124	Include all
		125	Include all
S	Major head & neck procedures	129	Include all
		130	Include all
S	Cranial/facial procedures	131	Include all
		132	Include all
S	Other ear, nose, mouth & throat O.R. procedures	133	Include all
		134	Include all
S	Sinus & mastoid procedures	135	Include all
		136	Include all
S	Mouth procedures	137	Include all
		138	Include all
S	Salivary gland procedures	139	Include all
M	Ear, nose, mouth & throat malignancy	146	Include all
		147	Include all
		148	Include all
M	Dysequilibrium	149	Include all
M	Epistaxis	150	Include all
		151	Include all
M	Otitis media & URI	152	Include all
		153	Include all
M	Other Ear, Nose, Mouth, and Throat Diagnoses	154	Include all
		155	Include all
		156	Include all
M	Dental & Oral Diseases	157	Include all
		158	Include all
		159	Include all
S	Major chest procedures	163	Include all
		164	Include all
		165	Include all
S	Other resp system O.R. procedures	166	Include all
		167	Include all
		168	Include all
M	Pulmonary embolism	175	Include all
		176	Include all
M	Respiratory infections & inflammations	177	Include all
		178	Include all
		179	Include all
M	Respiratory neoplasms	180	Include all
		181	Include all
		182	Include all
M	Major chest trauma	183	Include all
		184	Include all
		185	Include all
M	Pleural effusion	186	Include all
		187	Include all
		188	Include all
M	Pulmonary edema & respiratory failure	189	Include all
M	Chronic obstructive pulmonary disease	190	Include all
		191	Include all
		192	Include all

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
M	Simple pneumonia & pleurisy	193	Include all
		194	Include all
		195	Include all
M	Interstitial lung disease	196	Include all
		197	Include all
		198	Include all
M	Pneumothorax	199	Include all
		200	Include all
		201	Include all
M	Bronchitis & asthma	202	Include all
M	Respiratory signs & symptoms	203	Include all
M	Respiratory signs & symptoms	204	Include all
M	Other respiratory system diagnoses	205	Include all
		206	Include all
M	Respiratory system diagnosis w ventilator support	207	Include all
		208	Include all
S	Other heart assist system implant	215	Include all
S	Cardiac valve & oth maj cardiothoracic proc w card cath	216	Include all
		217	Include all
		218	Include all
S	Cardiac valve & oth maj cardiothoracic proc w/o card cath	219	Include all
		220	Include all
		221	Include all
S	Cardiac defib implant w cardiac cath w AMI/HF/shock	222	Include all
		223	Include all
S	Cardiac defib implant w cardiac cath w/o AMI/HF/shock	224	Include all
		225	Include all
S	Cardiac defibrillator implant w/o cardiac cath	226	Include all
		227	Include all
S	Other cardiothoracic procedures	228	Include all
		229	Include all
		230	Include all
S	Coronary bypass w PTCA	231	Include all
		232	Include all
S	Coronary bypass w cardiac cath	233	Include all
		234	Include all
S	Coronary bypass w/o cardiac cath	235	Include all
		236	Include all
S	Major cardiovascular procedures	237	Include all
		238	Include all
S	Amputation for circ sys disorders exc upper limb & toe	239	Include all
		240	Include all
		241	Include all
S	Permanent cardiac pacemaker implant	242	Include all
		243	Include all
		244	Include all
S	AICD generator procedures	245	Include all
S	Perc cardiovasc proc w drug-eluting stent	246	Include all
		247	Include all
		248	Include all

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
S	Perc cardiovasc proc w non-drug-eluting stent	249	Include all
		250	Include all
		251	Include all
S	Other vascular procedures	252	Include all
		253	Include all
		254	Include all
S	Upper limb & toe amputation for circ system disorders	255	Include all
		256	Include all
		257	Include all
S	Cardiac pacemaker device replacement	258	Include all
		259	Include all
S	Cardiac pacemaker revision except device replacement	260	Include all
		261	Include all
		262	Include all
S	Vein ligation & stripping	263	Include all
S	Other circulatory system O.R. procedures	264	Include all
S	AICD lead procedures	265	Include all
S	Endovascular Cardiac Valve Replacement	266	Include all
		267	Include all
M	Acute myocardial infarction, discharged alive	280	Include all
		281	Include all
		282	Include all
M	Acute myocardial infarction, expired	283	Include all
		284	Include all
		285	Include all
M	Circulatory disorders except AMI, w card cath	286	Include all
		287	Include all
M	Acute & subacute endocarditis	288	Include all
		289	Include all
		290	Include all
M	Heart failure & shock	291	Include all
		292	Include all
		293	Include all
M	Deep vein thrombophlebitis	294	Include all
		295	Include all
M	Cardiac arrest, unexplained	296	Include all
		297	Include all
		298	Include all
M	Peripheral vascular disorders	299	Include all
		300	Include all
		301	Include all
M	Atherosclerosis	302	Include all
		303	Include all
M	Hypertension	304	Include all
		305	Include all
M	Cardiac congenital & valvular disorders	306	Include all
		307	Include all
M	Cardiac arrhythmia & conduction disorders	308	Include all
		309	Include all
		310	Include all
M	Angina pectoris	311	Include all

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
M	Syncope & collapse	312	Include all
M	Chest pain	313	Include all
M	Other circulatory system diagnoses	314	Include all
		315	Include all
		316	Include all
S	Stomach, esophageal & duodenal proc	326	Include all
		327	Include all
		328	Include all
S	Major small & large bowel procedures	329	Include all
		330	Include all
		331	Include all
S	Rectal resection	332	Include all
		333	Include all
		334	Include all
S	Peritoneal adhesiolysis	335	Include all
		336	Include all
		337	Include all
S	Appendectomy w complicated principal diag	338	Include all
		339	Include all
		340	Include all
S	Appendectomy w/o complicated principal diag	341	Include all
		342	Include all
		343	Include all
S	Minor small & large bowel procedures	344	Include all
		345	Include all
		346	Include all
S	Anal & stomal procedures	347	Include all
		348	Include all
		349	Include all
S	Inguinal & femoral hernia procedures	350	Include all
		351	Include all
		352	Include all
S	Hernia procedures except inguinal & femoral	353	Include all
		354	Include all
		355	Include all
S	Other digestive system O.R. procedures	356	Include all
		357	Include all
		358	Include all
M	Major esophageal disorders	368	Include all
		369	Include all
		370	Include all
M	Major gastrointestinal disorders & peritoneal infections	371	Include all
		372	Include all
		373	Include all
M	Digestive malignancy	374	Include all
		375	Include all
		376	Include all
M	G.I. hemorrhage	377	Include all
		378	Include all
		379	Include all

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
M	Complicated peptic ulcer	380	Include all
		381	Include all
		382	Include all
M	Uncomplicated peptic ulcer	383	Include all
		384	Include all
M	Inflammatory bowel disease	385	Include all
		386	Include all
		387	Include all
M	G.I. obstruction	388	Include all
		389	Include all
		390	Include all
M	Esophagitis, gastroent & misc digest disorders	391	Include all
		392	Include all
M	Other digestive system diagnoses	393	Include all
		394	Include all
		395	Include all
S	Pancreas, liver & shunt procedures	405	Include all
		406	Include all
		407	Include all
S	Biliary tract proc except only cholecyst w or w/o c.d.e.	408	Include all
		409	Include all
		410	Include all
S	Cholecystectomy w c.d.e.	411	Include all
		412	Include all
		413	Include all
S	Cholecystectomy except by laparoscope w/o c.d.e.	414	Include all
		415	Include all
		416	Include all
S	Laparoscopic cholecystectomy w/o c.d.e.	417	Include all
		418	Include all
		419	Include all
S	Hepatobiliary diagnostic procedures	420	Include all
		421	Include all
		422	Include all
S	Other hepatobiliary or pancreas O.R. procedures	423	Include all
		424	Include all
		425	Include all
M	Cirrhosis & alcoholic hepatitis	432	Include all
		433	Include all
		434	Include all
M	Malignancy of hepatobiliary system or pancreas	435	Include all
		436	Include all
		437	Include all
M	Disorders of pancreas except malignancy	438	Include all
		439	Include all
		440	Include all
M	Disorders of liver except malig,cirr,alc hepa	441	Include all
		442	Include all
		443	Include all

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
M	Disorders of the biliary tract	444	Include all
		445	Include all
		446	Include all
S	Combined anterior/posterior spinal fusion	453	Include all
		454	Include all
		455	Include all
S	Spinal fus exc cerv w spinal curv/malig/infec or 9+ fus	456	Include all
		457	Include all
		458	Include all
S	Spinal fusion except cervical	459	Include all
		460	Include all
S	Bilateral or multiple major joint procs of lower extremity	461	Include all
		462	Include all
S	Wnd debrid & skn grft exc hand, for musculo-conn tiss dis	463	Include all
		464	Include all
		465	Include all
S	Revision of hip or knee replacement	466	Include all
		467	Include all
		468	Include all
S	Major joint replacement or reattachment of lower extremity	469	Include all
		470	Include all
S	Cervical spinal fusion	471	Include all
		472	Include all
		473	Include all
S	Amputation for musculoskeletal sys & conn tissue dis	474	Include all
		475	Include all
		476	Include all
S	Biopsies of musculoskeletal system & connective tissue	477	Include all
		478	Include all
		479	Include all
S	Hip & femur procedures except major joint	480	Include all
		481	Include all
		482	Include all
S	Major joint & limb reattachment proc of upper extremity	483	Include all
S	Knee procedures w pdx of infection	485	Include all
		486	Include all
		487	Include all
S	Knee procedures w/o pdx of infection	488	Include all
		489	Include all
S	Lower extrem & humer proc except hip,foot,femur	492	Include all
		493	Include all
		494	Include all
S	Local excision & removal int fix devices exc hip & femur	495	Include all
		496	Include all
		497	Include all
S	Local excision & removal int fix devices of hip & femur	498	Include all
		499	Include all
S	Soft tissue procedures	500	Include all
		501	Include all
		502	Include all

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
S	Foot procedures	503	Include all
		504	Include all
		505	Include all
S	Major thumb or joint procedures	506	Include all
S	Major shoulder or elbow joint procedures	507	Include all
		508	Include all
S	Arthroscopy	509	Include all
S	Shoulder,elbow or forearm proc,exc major joint proc	510	Include all
		511	Include all
		512	Include all
S	Hand or wrist proc, except major thumb or joint proc	513	Include all
		514	Include all
S	Other musculoskelet sys & conn tiss O.R. proc	515	Include all
		516	Include all
		517	Include all
S	Back & Neck Procedures Except Spinal Fusion	518	Include all
		519	Include all
		520	Include all
M	Fractures of femur	533	Include all
		534	Include all
M	Fractures of hip & pelvis	535	Include all
		536	Include all
M	Sprains, strains, & dislocations of hip, pelvis & thigh	537	Include all
		538	Include all
M	Osteomyelitis	539	Include all
		540	Include all
		541	Include all
M	Pathological fractures & musculoskelet & conn tiss malig	542	Include all
		543	Include all
		544	Include all
M	Connective tissue disorders	545	Include all
		546	Include all
		547	Include all
M	Septic arthritis	548	Include all
		549	Include all
		550	Include all
M	Medical back problems	551	Include all
		552	Include all
M	Bone diseases & arthropathies	553	Include all
		554	Include all
M	Signs & symptoms of musculoskeletal system & conn tissue	555	Include all
		556	Include all
M	Tendonitis, myositis & bursitis	557	Include all
		558	Include all
M	Aftercare, musculoskeletal system & connective tissue	559	Include all
		560	Include all
		561	Include all
M	Fx, sprn, strn & disl except femur, hip, pelvis & thigh	562	Include all
		563	Include all

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
M	Other musculoskeletal sys & connective tissue diagnoses	564	Include all
		565	Include all
		566	Include all
S	Skin debridement	570	Include all
		571	Include all
		572	Include all
S	Skin graft for skin ulcer or cellulitis	573	Include all
		574	Include all
		575	Include all
S	Skin graft except for skin ulcer or cellulitis	576	Include all
		577	Include all
		578	Include all
S	Other skin, subcut tiss & breast proc	579	Include all
		580	Include all
		581	Include all
S	Mastectomy for malignancy	582	Include all
		583	Include all
S	Breast biopsy, local excision & other breast procedures	584	Include all
		585	Include all
M	Skin ulcers	592	Include all
		593	Include all
		594	Include all
M	Major skin disorders	595	Include all
		596	Include all
M	Malignant breast disorders	597	Include all
		598	Include all
		599	Include all
M	Non-malignant breast disorders	600	Include all
		601	Include all
M	Cellulitis	602	Include all
		603	Include all
M	Trauma to the skin, subcut tiss & breast	604	Include all
		605	Include all
M	Minor skin disorders	606	Include all
		607	Include all
S	Adrenal & pituitary procedures	614	Include all
		615	Include all
S	Amputat of lower limb for endocrine,nutrit,& metabol dis	616	Include all
		617	Include all
		618	Include all
S	O.R. procedures for obesity	619	Include all
		620	Include all
		621	Include all
S	Skin grafts & wound debrid for endoc, nutrit & metab dis	622	Include all
		623	Include all
		624	Include all
S	Thyroid, parathyroid & thyroglossal procedures	625	Include all
		626	Include all
		627	Include all

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
S	Other endocrine, nutrit & metab O.R. proc	628	Include all
		629	Include all
		630	Include all
M	Diabetes	637	Include all
		638	Include all
		639	Include all
M	Misc disorders of nutrition, metabolism, fluids/electrolyes	640	Include all
		641	Include all
M	Inborn and other disorders of metabolism	642	Include all
M	Endocrine disorders	643	Include all
		644	Include all
		645	Include all
S	Kidney transplant	652	Include all
S	Major bladder procedures	653	Include all
		654	Include all
		655	Include all
S	Kidney & ureter procedures for neoplasm	656	Include all
		657	Include all
		658	Include all
S	Kidney & ureter procedures for non-neoplasm	659	Include all
		660	Include all
		661	Include all
S	Minor bladder procedures	662	Include all
		663	Include all
		664	Include all
S	Prostatectomy	665	Include all
		666	Include all
		667	Include all
S	Transurethral procedures	668	Include all
		669	Include all
		670	Include all
S	Urethral procedures	671	Include all
		672	Include all
S	Other kidney & urinary tract procedures	673	Include all
		674	Include all
		675	Include all
M	Renal failure	682	Include all
		683	Include all
		684	Include all
M	Admit for renal dialysis	685	Include all
M	Kidney & urinary tract neoplasms	686	Include all
		687	Include all
		688	Include all
M	Kidney & urinary tract infections	689	Include all
		690	Include all
M	Urinary stones w esw lithotripsy	691	Include all
		692	Include all
M	Urinary stones w/o esw lithotripsy	693	Include all
		694	Include all
M	Kidney & urinary tract signs & symptoms	695	Include all
		696	Include all

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
M	Urethral stricture	697	Include all
M	Other kidney & urinary tract diagnoses	698	Include all
		699	Include all
		700	Include all
		707	Include all
S	Major male pelvic procedures	708	Include all
		709	Include all
S	Penis procedures	710	Include all
		711	Include all
S	Testes procedures	712	Include all
		713	Include all
S	Transurethral prostatectomy	714	Include all
		715	Include all
S	Other male reproductive system O.R. proc for malignancy	716	Include all
		717	Include all
S	Other male reproductive system O.R. proc exc malignancy	718	Include all
		722	Include all
M	Malignancy, male reproductive system	723	Include all
		724	Include all
		725	Include all
M	Benign prostatic hypertrophy	726	Include all
		727	Include all
M	Inflammation of the male reproductive system	728	Include all
		729	Include all
M	Other male reproductive system diagnoses	730	Include all
		734	Include all
S	Pelvic evisceration, rad hysterectomy & rad vulvectomy	735	Include all
		736	Include all
S	Uterine & adnexa proc for ovarian or adnexal malignancy	737	Include all
		738	Include all
		739	Include all
S	Uterine,adnexa proc for non-ovarian/adnexal malig	740	Include all
		741	Include all
		742	Include all
S	Uterine & adnexa proc for non-malignancy	743	Include all
		744	Include all
S	D&C, conization, laparoscopy & tubal interruption	745	Include all
		746	Include all
S	Vagina, cervix & vulva procedures	747	Include all
		748	Include all
S	Female reproductive system reconstructive procedures	749	Include all
		750	Include all
M	Malignancy, female reproductive system	754	Include all
		755	Include all
		756	Include all
M	Infections, female reproductive system	757	Include all
		758	Include all
		759	Include all
M	Menstrual & other female reproductive system disorders	760	Include all
		761	Include all

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
S	Splenectomy	799	Include all
		800	Include all
		801	Include all
S	Other O.R. proc of the blood & blood forming organs	802	Include all
		803	Include all
		804	Include all
M	Major hematol/immun diag exc sickle cell crisis & coagul	808	Include all
		809	Include all
		810	Include all
M	Red blood cell disorders	811	Include all
		812	Include all
M	Coagulation disorders	813	Include all
M	Reticuloendothelial & immunity disorders	814	Include all
		815	Include all
		816	Include all
S	Lymphoma & leukemia w major O.R. procedure	820	Include all
		821	Include all
		822	Include all
S	Lymphoma & non-acute leukemia w other O.R. proc	823	Include all
		824	Include all
		825	Include all
S	Myeloprolif disord or poorly diff neopl w maj O.R. proc	826	Include all
		827	Include all
		828	Include all
S	Myeloprolif disord or poorly diff neopl w other O.R. proc	829	Include all
		830	Include all
M	Acute leukemia w/o major O.R. procedure	834	Include all
		835	Include all
		836	Include all
M	Chemo w acute leukemia as sdx or w high dose chemo agent	837	Include all
		838	Include all
		839	Include all
M	Lymphoma & non-acute leukemia	840	Include all
		841	Include all
		842	Include all
M	Other myeloprolif dis or poorly diff neopl diag	843	Include all
		844	Include all
		845	Include all
M	Chemotherapy w/o acute leukemia as secondary diagnosis	846	Include all
		847	Include all
		848	Include all
M	Radiotherapy	849	Include all
S	Infectious & parasitic diseases w O.R. procedure	853	Include all
		854	Include all
		855	Include all
S	Postoperative or post-traumatic infections w O.R. proc	856	Include all
		857	Include all
		858	Include all
M	Postoperative & post-traumatic infections	862	Include all
		863	Include all
M	Fever of unknown origin	864	Include all

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
M	Fever	865	Include all
M	Viral illness	866	Include all
M	Other infectious & parasitic diseases diagnoses	867	Include all
		868	Include all
		869	Include all
M	Septicemia or severe sepsis w MV 96+ hours	870	Include all
		871	Include all
		872	Include all
S	O.R. procedure w principal diagnoses of mental illness	876	Include all
M	Acute adjustment reaction & psychosocial dysfunction	880	Include all
M	Depressive neuroses	881	Include all
M	Neuroses except depressive	882	Include all
M	Disorders of personality & impulse control	883	Include all
M	Organic disturbances & mental retardation	884	Include all
M	Psychoses	885	Include all
M	Behavioral & developmental disorders	886	Include all
M	Other mental disorder diagnoses	887	Include all
M	Alcohol/drug abuse or dependence, left ama	894	Include all
M	Alcohol/drug abuse or dependence w rehabilitation therapy	895	Include all
		896	Include all
		897	Include all
S	Wound debridements for injuries	901	Include all
		902	Include all
		903	Include all
S	Skin grafts for injuries	904	Include all
		905	Include all
S	Hand procedures for injuries	906	Include all
S	Other O.R. procedures for injuries	907	Include all
		908	Include all
		909	Include all
M	Traumatic injury	913	Include all
		914	Include all
M	Allergic reactions	915	Include all
		916	Include all
M	Poisoning & toxic effects of drugs	917	Include all
		918	Include all
M	Complications of treatment	919	Include all
		920	Include all
		921	Include all
M	Other injury, poisoning & toxic effect diag	922	Include all
		923	Include all
S	Extensive burns or full thickness burns w MV 96+ hrs w skin graft	927	Include all
S	Full thickness burn w skin graft or inhal inj	928	Include all
		929	Include all
M	Extensive burns or full thickness burns w MV 96+ hrs w/o skin graft	933	Include all
M	Full thickness burn w/o skin grft or inhal inj	934	Include all
M	Non-extensive burns	935	Include all
S	O.R. proc w diagnoses of other contact w health services	939	Include all
		940	Include all
		941	Include all

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
M	Rehabilitation	945	Include all
		946	Include all
M	Signs & symptoms	947	Include all
		948	Include all
M	Aftercare	949	Include all
		950	Include all
M	Other factors influencing health status	951	Include all
S	Craniotomy for multiple significant trauma	955	Include all
S	Limb reattachment, hip & femur proc for multiple significant trauma	956	Include all
S	Other O.R. procedures for multiple significant trauma	957	Include all
		958	Include all
		959	Include all
M	Other multiple significant trauma	963	Include all
		964	Include all
		965	Include all
S	HIV w extensive O.R. procedure	969	Include all
		970	Include all
M	HIV w major related condition	974	Include all
		975	Include all
		976	Include all
M	HIV w or w/o other related condition	977	Include all
S	Extensive O.R. procedure unrelated to principal diagnosis	981	Include all
		982	Include all
		983	Include all
S	Prostatic O.R. procedure unrelated to principal diagnosis	984	Include all
		985	Include all
		986	Include all
S	Non-extensive O.R. proc unrelated to principal diagnosis	987	Include all
		988	Include all
		989	Include all

Gynecology

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
S	Pelvic evisceration, rad hysterectomy & rad vulvectomy	734	Include all
		735	Include all
S	Uterine & adnexa proc for ovarian or adnexal malignancy	736	Include all
		737	Include all
		738	Include all
S	Uterine,adnexa proc for non-ovarian/adnexal malig	739	Include all
		740	Include all
		741	Include all
S	Uterine & adnexa proc for non-malignancy	742	Include all
		743	Include all
S	Vagina, cervix & vulva procedures	746	Include all
		747	Include all
S	Other female reproductive system O.R. procedures	749	Include all
		750	Include all

Medical/Surgical	DRG Title	MS-DRG	ICD-9-CM
M	Malignancy, female reproductive system	754	Include all
		755	Include all
		756	Include all
M	Infections, female reproductive system	757	Include all
		758	Include all
		759	Include all
M	Menstrual & other female reproductive system disorders	760	Include all
		761	Include all

Nephrology

Medical/Surgical	DRG Title	MS-DRG	ICD-9-CM
S	Simultaneous pancreas/kidney transplant	008	Include all
S	Kidney transplant	652	Include all
S	Major bladder procedures	653	Include all
		654	Include all
		655	Include all
		656	Include procedures 3924, 550, 5501-4, 551, 5511-2, 5524, 5529, 553, 5531-5, 5539, 554, 555, 5551-4, 5561, 557, 558, 5581-7, 5589, 5591, 5597, 5598, 5599
S	Kidney & ureter procedures for neoplasm	657	See MS-DRG 656
		658	See MS-DRG 656
		659	See MS-DRG 656
S	Kidney & ureter procedures for non-neoplasm	660	See MS-DRG 656
		661	See MS-DRG 656
		673	Include procedures 3806-7, 3816, 3836-7, 3846-7, 3866-7, 387, 3886-7, 3927, 3942-3, 3949-50, 3952, 3956-9, 3971
S	Other kidney & urinary tract procedures	674	Include procedures 3807, 3816, 3836-7, 3846-7, 3866-7, 387, 3886-7, 3927, 3942-3, 3949-50, 3952, 3956-9, 3971
		675	See MS-DRG 674
		682	Include all
M	Renal failure	683	Include all
		684	Include all
		686	Include diagnoses: 1890-1, 1980, 2230
M	Kidney & urinary tract neoplasms	687	See MS-DRG 686
		688	See MS-DRG 686
		689	Include diagnoses: 0160, 590, 0786, 0954, 5900-3, 5908-9, 59010-11, 59080-1
M	Kidney & urinary tract infections	695	Include all

Medical/Surgical	DRG Title	MS-DRG	ICD-9-CM
M	Other kidney & urinary tract diagnoses	698	Include diagnoses: 2504, 580-3, 587, 589, 866, 4401, 4421, 4473, 4533, 5800, 5804, 5808-13, 5818-22, 5824, 5828-32, 5834, 5836-9, 5890-1, 5899, 5930-2, 5936, 8660, 86600-3, 8661, 86610-3, 27410, 27419, 44323, 44581, 58081, 58089, 58181, 58189, 58281, 58289, 58381, 58389, V420, V594
		699	See MS-DRG 698
		700	See MS-DRG 698

Neurology & Neurosurgery

Medical/Surgical	DRG Title	MS-DRG	ICD-9-CM
S	Intracranial vascular procedures w PDX hemorrhage	020	Include all
		021	Include all
		022	Include all
S	Cranio w major dev impl/acute complex CNS PDX	023	Include all
		024	Include all
S	Craniotomy & endovascular intracranial procedures	025	Include all
		026	Include all
		027	Include all
S	Ventricular shunt procedures	031	Include all
		032	Include all
		033	Include all
S	Carotid artery stent procedure	034	Include all
		035	Include all
		036	Include all
S	Extracranial procedures	037	Include all
		038	Include all
		039	Include all
S	Periph & cranial nerve & other nerv syst proc	040	Include all
		041	Include all
		042	Include all
M	Spinal disorders & injuries	052	Include all
		053	Include all
M	Nervous system neoplasms	054	Include all
		055	Include all
M	Degenerative nervous system disorders	056	Include all
		057	Include all
M	Multiple sclerosis & cerebellar ataxia	058	Include all
		059	Include all
		060	Include all
M	Acute ischemic stroke w use of thrombolytic agent	061	Include all
		062	Include all
		063	Include all
M	Intracranial hemorrhage or cerebral infarction	064	Include all
		065	Include all
		066	Include all

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
M	Nonspecific cva & precerebral occlusion w/o infarct	067	Include all
		068	Include all
M	Transient ischemia	069	Include all
M	Nonspecific cerebrovascular disorders	070	Include all
		071	Include all
M	Cranial & peripheral nerve disorders	073	Include all
		074	Include all
M	Viral meningitis	075	Include all
		076	Include all
M	Hypertensive encephalopathy	077	Include all
		078	Include all
		079	Include all
M	Nontraumatic stupor & coma	080	Include all
		081	Include all
M	Traumatic stupor & coma, coma >1 hr	082	Include all
		083	Include all
		084	Include all
M	Traumatic stupor & coma, coma <1 hr	085	Include all
		086	Include all
		087	Include all
M	Other disorders of nervous system	091	Include all
		092	Include all
		093	Include all
M	Bacterial & tuberculous infections of nervous system	094	Include all
		095	Include all
		096	Include all
M	Non-bacterial infect of nervous sys exc viral meningitis	097	Include all
		098	Include all
		099	Include all
M	Seizures w MCC	100	Include all
S	Craniotomy for multiple significant trauma	955	Include all

Orthopedics

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
S	Spinal procedures	028	Exclude procedures: 0301-2, 0309, 031, 0321, 0329, 0332, 0339, 034, 0351-3, 0359, 036, 0371-2, 0379, 0393, 0394, 0397-9
		029	See MS-DRG 028
		030	See MS-DRG 028
S	Combined anterior/posterior spinal fusion	453	Include all
		454	Include all
		455	Include all
S	Spinal fus exc cerv w spinal curv/malig/infec or 9+ fus	456	Include all
		457	Include all
		458	Include all
S	Spinal fusion except cervical	459	Include all
		460	Include all

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
S	Bilateral or multiple major joint procs of lower extremity	461	Include all
		462	Include all
S	Wound Debridement and Skin Graft Except Hand, for Musculo-Connective Tissue Disease	463	Include procedures: 8005, 8006
		464	Include procedures: 8005, 8006
		465	Include procedures: 8005, 8006
S	Revision of hip or knee replacement	466	Include all
		467	Include all
		468	Include all
S	Major joint replacement or reattachment of lower extremity	469	Include all
S	Cervical spinal fusion	471	Include all
		472	Include all
		473	Include all
S	Hip & femur procedures except major joint	480	Include all
		481	Include all
		482	Include all
S	Major joint & limb reattachment proc of upper extremity	483	Include all
S	Knee procedures w pdx of infection	485	Include all
		486	Include all
		487	Include all
S	Lower extrem & humer proc except hip,foot,femur	492	Include all
		493	Include all
		494	Include all
S	Local excision & removal int fix devices exc hip & femur	495	Include all
		496	Include all
		497	Include all
S	Local excision & removal int fix devices of hip & femur	498	Include all
		499	Include all
S	Soft tissue procedures	500	Include all
		501	Include all
S	Foot procedures	503	Include all
		504	Include all
		505	Include all
S	Major thumb or joint procedures	506	Include all
S	Major shoulder or elbow joint procedures	507	Include all
		508	Include all
S	Other musculoskelet sys & conn tiss O.R. proc	515	Include procedures: 7601, 7631, 7639, 764, 7641-6, 765-6, 7661-70, 7672, 7674, 7676-7, 7679, 7691-2, 7694, 7699, 7700-1, 7709, 7720-1, 7729-31, 7739, 7780-1, 7789-91, 7799-7801, 7809-7811, 7819-20, 7829-30, 7839-41, 7849-51, 7859, 7870-1, 7879, 7890-1, 7899, 7910, 7919-20, 7929-30, 7939-40, 7949-50, 7959-60, 7969, 7980, 7989-90, 7999, 8010, 8019, 8040, 8049, 8090, 8118, 8120, 8129, 8159, 8165-6, 8196-7, 8199, 8429, 8440, 8493, 8499
		516	See MS-DRG 515
		517	See MS-DRG 515
S	Back & Neck Procedures Except Spinal Fusion	518	Include all
		519	Include all
		520	Include all

Medical/Surgical	DRG Title	MS-DRG	ICD-9-CM
M	Fractures of femur	533	Include all
		534	Include all
M	Fractures of hip & pelvis	535	Include all
		536	Include all
M	Osteomyelitis	539	Include all
		540	Include all
		541	Include all
M	Pathological fractures & musculoskelet & conn tiss malig	542	Include diagnoses: 7331, 73310-6, 73319, 73393-5
		543	See MS-DRG 542
		544	See MS-DRG 542
S	Limb reattachment, hip & femur proc for multiple significant trauma	956	Include all

Pulmonology & Lung Surgery

Medical/Surgical	DRG Title	MS-DRG	ICD-9-CM
S	ECMO or trach w MV 96+ hrs or PDX exc face, mouth & neck w maj O.R.	003	Include all
S	Trach w MV 96+ hrs or PDX exc face, mouth & neck w/o maj O.R.	004	Include all
S	Lung transplant	007	Include all
S	Major chest procedures	163	Include procedures: 3173, 3175, 3179, 3209, 321, 3221-2, 3229, 323-6, 329-31, 3325, 3328, 3334, 3339, 334, 3341-3, 3348-9, 3392, 3398-9, 3402, 3427, 345, 3451, 3459, 346, 3473-4, 348, 3481-5, 3489, 3493
		164	See MS-DRG 163
		165	See MS-DRG 163
S	Other resp system O.R. procedures	166	Include all
		167	Include all
		168	Include all
M	Pulmonary embolism	175	Include all
		176	Include all
M	Respiratory infections & inflammations	177	Exclude diagnoses: 7955, V712, 79551, 75952
		178	See MS-DRG 177
		179	See MS-DRG 177
M	Respiratory neoplasms	180	Exclude diagnoses: 2122-5, 2128-9, 2133
		181	See MS-DRG 181
		182	See MS-DRG 181
M	Major chest trauma	183	Include all
		184	Include all
		185	Include all
M	Pleural effusion	186	Include all
		187	Include all
M	Pulmonary edema & respiratory failure	189	Include all
M	Chronic obstructive pulmonary disease	190	Include all
		191	Include all
		192	Include all

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
M	Simple pneumonia & pleurisy	193	Include all
		194	Include all
M	Interstitial lung disease	196	Include all
		197	Include all
		198	Include all
M	Pneumothorax	199	Exclude diagnoses: 5121
		200	See MS-DRG 199
M	Bronchitis & asthma	202	Include all
M	Respiratory system diagnosis w ventilator support	207	Include all
		208	Include all
M	Septicemia or severe sepsis w MV 96+ hours	870	Include all
		871	Include all
		872	Include all

Urology

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
S	Major bladder procedures	653	Include all
		654	Include all
		655	Include all
S	Kidney & ureter procedures for neoplasm	656	Include procedures: 561-2, 5640-2, 5651-2, 5661-2, 5671-5, 5679, 5681-6, 5689, 5692-5, 5699, 5900, 5902-3, 5909
		657	See MS-DRG 656
		658	See MS-DRG 656
S	Kidney & ureter procedures for non-neoplasm	659	See MS-DRG 656
		660	See MS-DRG 656
		661	See MS-DRG 656
S	Minor bladder procedures	662	Include all
		663	Include all
		664	Include all
S	Prostatectomy	665	Include all
		666	Include all
S	Transurethral procedures	668	Include all
		669	Include all
S	Urethral procedures w CC/MCC	671	Include all
S	Other kidney & urinary tract procedures	673	Include procedures: 1756, 3806-7, 3816, 3836-7, 3846-7, 3866-7, 387, 3886-7, 3927, 3942-3, 3949-50, 3952, 3956-9, 3971
		674	See MS-DRG 673
		675	See MS-DRG 673
M	Kidney & urinary tract neoplasms	686	Exclude diagnoses: 1890-1, 1980-1, 2230-1
		687	See MS-DRG 686
		688	See MS-DRG 686
M	Urinary stones w esw lithotripsy	691	Include all
		692	Include all
M	Urethral stricture	697	Include all

Medical/ Surgical	DRG Title	MS- DRG	ICD-9-CM
M	Other kidney & urinary tract diagnoses	698	Exclude diagnoses: 580-3, 587, 589, 866, 4401, 4421, 4473, 4533, 5800, 5804, 5808-13, 5818-22, 5824, 5828-32, 5834, 5836-9, 5890-1, 5899, 5930-2, 5936, 8660, 86600-3, 8661, 86610-3, 27410, 27419, 44323, 44581, 58081, 58089, 58181, 58189, 58281, 58289, 58381, 58389, V420, V594
		699	See MS-DRG 698
		700	See MS-DRG 698
S	Major male pelvic procedures	707	Include all
		708	Include all
S	Penis procedures	709	Include all
		710	Include all
S	Testes procedures	711	Include all
		712	Include all
S	Transurethral prostatectomy w CC/MCC	713	Include all
S	Other male reproductive system O.R. proc for malignancy	715	Include all
		716	Include all
S	Other male reproductive system O.R. proc exc malignancy	717	Include all
		718	Include all
M	Malignancy, male reproductive system	722	Include all
		723	Include all
		724	Include all
M	Inflammation of the male reproductive system	727	Include all
		728	Include all
M	Other male reproductive system diagnoses	729	Exclude diagnoses: V252
		730	See MS-DRG 729
S	Prostatic O.R. procedure unrelated to principal diagnosis	984	Include all
		985	Include all
		986	Include all

Appendix D

Year-by Year History of Methodology Changes

RTI began working with *U.S. News* on the Best Hospitals rankings in 2005. This section details the changes to the previous Best Hospitals methodology used between 2005-2018. These brief descriptions are provided for context to allow consumers of the rankings to review year-over-year changes implemented to the rankings.

Summary of 2018-19 Changes

- **Removal of the transfer adjustment for mortality.** Since 2010, the rankings have adjusted mortality ratios for the influence of particularly high or low transfer rates to control for potential bias in the evaluation of hospital outcomes. This was done to address issues with coding of transfers in the datasets used which had been shown to be problematic at times. With the move to the SAF data, the project is now able to use both identified transfers on the record along with calculated implicit transfers which effectively overcomes the previous issues, removing the need for the adjustment.
- **Backwards mapping of ICD-10 to ICD-9.** Since two of the three years of SAF data used in the rankings for 2018-19 appear in ICD-9 format, the project chose to recode the ICD-10 data from FY2016 into ICD-9 format for the volume and mortality analyses. Due to the increased granularity of the ICD-10 codes, it is possible to backwards map ICD-10 codes to ICD-9 codes. The project team utilized the IBM Watson Health mapping of ICD-10 to ICD-9 codes to recode data, so that the same DRGs could be used for all three years. The project anticipates using the same approach for the 2019-20 rankings before moving completely to ICD-10 in 2020. (See page 26-27.)
- **Updated Survival Score calculation.** To improve the clarity of the survival scores used in the data-driven specialties, the project team updated the method of calculating these display-only scores (this change does not affect points assigned in the rankings). The scores are now calculated based on the adjusted mortality ratio (rather than the unadjusted ratio) and are based on quintiles above and below a mortality ratio of 1.0; ratios above 1.0 will receive a score of 1-5, while those below a ratio of 1.0 will receive a score of 6-10. (See pages 31-32.)

Summary of 2017-18 Changes

- **Move to SAF data.** The project implemented a change from the MedPAR to the SAF inpatient limited datasets for all volume, mortality, and patient safety calculations; the exception is that the HSCRC all-payer database continues to be used for the Patient Safety Score calculations for hospitals located in Maryland. Only patients receiving care under traditional Medicare (fee-for-service) are included in the SAF data used for analyses; as a result, all hospital volumes will be reduced due to the lack of CMS managed care patients in the SAF data.
- **Volume adjustment for loss of Medicare Advantage.** Volumes were estimated for hospitals in each specialty using an adjustment to account for the loss of

Medicare Advantage patients from the analyses. The numerator for the volume calculation was the number of fee-for-service discharges meeting the criteria for inclusion in the specialty. The denominator was the proportion of Medicare beneficiaries enrolled in fee-for-service (as opposed to Medicare Advantage) in the county in which the hospital is located. The denominator was calculated by subtracting from 1.0 the CMS Medicare Advantage penetration estimates, expressed as a decimal less than 1.0, for June 2013. As a result, the volumes reported represent estimates rather than observed volumes of care at each hospital.

- **Socioeconomic status (SES) adjustment to the survival score.** The rankings now incorporate a new adjustment at the patient level for dual-eligibility for Medicare and Medicaid. The dual eligible flag is set to either 0 (not present) or 1 (present) for each case entering the risk-adjusted mortality equation. This was done to address known differences in morbidity and mortality with hospital patients associated with lower SES; dual-eligibility, or more specifically eligibility for Medicaid, is being used in this case to represent lower SES. The overall impact of the change is very small, but will result in scores that better represent patient survival in hospitals evaluated.
- **Intensivists.** Hospitals now receive 1 point for having at least one intensivist FTE reported as being available in any adult-focused intensive care unit within the hospital. This change now provides somewhat broader credit to hospitals for having intensivists available than in previous years.
- **Nurse Magnet.** The Nurse Magnet measure was updated to better reflect program coverage for hospitals that are part of a multi-campus system or an arrangement with another hospital outside the system. Hospitals received 1 point for being recognized as a Nurse Magnet hospital. For hospitals that are part of a special merger or a multiplex healthcare system, the primary hospital is required to have Magnet Recognition status for the combination hospital to receive 1 point. If there is no defined primary hospital, then if either hospital in the special merger has Magnet Recognition status then both receive credit. Partial credit was not offered in the 2017-2018 rankings.
- **Patient safety score.** Two of the PSIs used in the patient safety score—PSI 06 (Iatrogenic Pneumothorax) and PSI 14 (Postoperative Wound Dehiscence)—were dropped due to concerns that low base rates could lead to unreliable measurement. The scoring for the remaining individual PSIs was also revised to a three-point scale with the middle category defined as the mean +/- 2 standard deviations. The individual PSI scores were combined to form a 1-9-point Patient Safety Score with higher numbers indicating better performance (i.e., lower rates of patient safety events).
- **Nurse staffing score adjustments.** The project implemented three changes to the nurse staffing score for the 2017-18 rankings. First, the calculation now includes a correction for hospitals that provide onsite skilled nursing and report their nursing inclusive of both the inpatient and skilled nursing. The nursing FTEs associated with the skilled nursing are removed from the numerator and a corrected adjusted average daily census is used for the denominator. The corrected adjusted average daily census

values for hospitals affected by this change are calculated and provided directly to the project by the AHA. Second, to address problems with missing data—in particular the primary nursing FTEs variable (FTEN)—the rankings impute missing FTEN values. For the imputation, hospitals that do not have extreme nurse staffing ratios are selected and the calculation incorporates data from current values for FTEN (Full time equivalent registered nurses reported), FTERN (Full time equivalent registered nurses estimated), ADJADC (Adjusted Average Daily Census) and BDTOT (total hospital beds set up and staffed). Third, to address volatility in the nurse staffing measure for hospitals with relatively low numbers of patients, we adjust the nurse staffing values for hospitals in the lowest quartile of adjusted average daily census by blending their rate with that of the average adjusted nurse staffing rate for hospitals eligible for the rankings.

- **Surgical Minimums for Eligibility in Neurology and Neurosurgery.** To be eligible for evaluation in the neurology and neurosurgery specialty hospitals are now required to be at the 25th percentile or higher in terms of the ratio of surgical to total discharges within the DRGs evaluated for the specialty. This change was made to address excessive bias in mortality rates for hospitals with a very low ratio of surgical-to-total discharges.

Summary of 2016-17 Changes

- **MedPAR data.** Only patients receiving care under Medicare (fee-for-service and, if available, managed-care) and who were 65 years of age or older were included in the MedPAR file used for analyses. In previous years, all ages were used which resulted in somewhat inflated volume rates.
- **Component weight.** The overall weight for the patient safety index was lowered from 10% in 2015-16 to 5% in 2016-17. The overall weight for outcomes was correspondingly increased from 32.5% last year to 37.5%.
- **Intensivists.** Hospitals now receive 1 point for having at least one intensivist whether on staff or through another privileged arrangement. Previously, intensivists were required to be on staff.
- **Nurse Magnet.** The Nurse Magnet measure was updated to better reflect program coverage for hospitals that are part of a multicampus system or an arrangement with another hospital outside the system. These combined entities only received full credit in 2016-17 (1 point) if all hospitals in the combination had Nurse Magnet recognition as of April 1, 2016. If the primary hospital had Nurse Magnet recognition but the specialty or secondary hospital(s) did not, the combined entity received half credit (0.5 point).
- **Public transparency.** In Cardiology & Heart Surgery only, a new measure was added rewarding hospitals for participation in transparency in public reporting of heart outcomes with the ACC and STS.

- **Use of SAF data for patient safety.** In previous years, the data source for the patient safety score was the same 3-year sample from the MedPAR dataset that was used for the volume and mortality analyses. For 2016-17, the rankings used data from the CMS SAF data instead of MedPAR. This change was motivated by the need to have more accurate procedure data for a number of the PSI calculations.
- **Patient safety score.** PSI 03, decubitus ulcer, was dropped due to concerns that the measure was overly sensitive to missing POA data in the record, which could confound comparisons.
- **Data for Maryland hospitals.** For Maryland hospitals, data from the state's HSCRC all-payer database were used for patient safety. This change was made to address incomplete coding of POA indicators in the CMS datasets for some of the years of analyses under consideration for the rankings.
- **Honor Roll.** Moved to a new format that incorporated results from the 12 data-driven specialty rankings, the 4 expert opinion-based specialty rankings, and the 9 procedures and conditions ratings. Hospitals received points for being ranked in each of the Best Hospitals data-driven and expert opinion only specialties if they appeared in the top 50, and additional points if they achieved a rating of high performing in the procedures and conditions ratings. The Honor Roll now recognizes the 20 hospitals that earned the most points out of the possible total.

Summary of 2015-16 Changes

- **Technology and Patient Services.** Due to changes to the AHA annual survey, there are now three categories instead of four categories for receiving credit for providing technology and patient services to patients. These services can be provided (1) by the hospital or its subsidiaries, (2) by the hospital's health system (in local network), or (3) by another institution outside of the health system, but in the local network, through a formal contractual arrangement or joint venture.
- **Patient Safety Score.** PSI08 was removed from the patient safety score due to low prevalence. A risk-adjusted rather than a smoothed rate is used, to address concerns that the smoothed rate might over-adjust for differences between hospitals.

Summary of 2014-15 Changes

- **Component weighting.** The weight for the process component was reduced from 32.5% to 27.5% and the weight for the patient safety score was increased from 5% to 10%. This was done in recognition of the increased importance of patient safety to the quality of care provided by hospitals.
- **Technology.** Cardiac ICU was removed in Cardiology & Heart Surgery, as it already served as a requirement for hospitals to be eligible for ranking in this specialty.

IMRT was added as a new technology to the Cancer and Urology specialties, recognizing the importance of this treatment modality to care in both specialties.

- **Patient Safety Score.** Two patient safety indicators were added to the patient safety score due to the availability of the POA indicator in the MedPAR dataset. Additionally, for display purposes, PSIs were converted from a 3-point scale to a 5-point scale to provide more nuanced information to consumers on the differences in patient safety performance between hospitals. For scoring, we now use a continuous value for PSI rather than a discrete value shown in the ranking tables.
- **MS-DRG deletions.** MS-DRG 689 (Kidney and Urinary Tract Infections with MCC) was removed from the Urology specialty because it does not reflect the quality of care of a urology service. A review of hospital data showed that the code is frequently used by other specialties within the institution to identify significant medical comorbidities rather than for identifying performance by the institution's urology service.
- **Eligibility for expert opinion-based specialties.** In previous years, a hospital was eligible if it received one or more physician nominations in the past 3 years. In 2014-15, a hospital was eligible for a expert opinion-based specialty only if it had an expert opinion score of 1% or greater, which equates to about three nominations in the past 3 years. This change was made to restrict eligibility to hospitals that are more consistently nominated.

Summary of 2013-14 Changes

- **“Present on admission” data included in patient safety calculations.** Starting with the 2013-14 rankings, patient safety data were analyzed using the AHRQ PSI grouper software version 4.3. This version of the software incorporates POA data found in Medicare claims. This allows the software to remove cases where POA is indicated so that they do not count against a hospital in the assessment of patient safety events.
- **Neurology & Neurosurgery MS-DRG deletions.** Several procedures involving spinal fusion (MS-DRGs 028, 029, 030, 453, 453, 455, 456, 457, 458, 459, 460, 471, 472, 473, 490, and 491) were removed from the Neurology & Neurosurgery but retained in the Orthopedic specialty. The change was made to reflect the specialty that patients typically turn to when seeking spinal fusion procedures. This change also eliminated a redundancy in the coverage of these procedures in the rankings. As a result, these procedures are covered in the orthopedic specialty regardless of whether the surgery was performed by an orthopedic surgeon or neurosurgeon.

Summary of 2012-13 Changes

- **Surgical volume discharge minimums.** If the minimum total discharge value for a specialty was lower than 25, then 25 was set as the minimum for that specialty to ensure a sufficient number of discharges.

- **Normalization.** Normalization is the process of transforming index values into a distribution between 0 and 1 based on the range of possible values for a given measure. Individual measures were normalized before incorporating into the overall score. In previous years, standardization was used instead of normalization.
- **New weighting procedures for structural measures.** In previous years, factor analysis determined the relative weights of the structural measures. Starting in 2012-13, weights are based on the relative significance of each measure.
- **Expert Opinion.** In previous years, the hospital with the highest expert opinion score received the full point total (i.e., 32.5 points) for the expert opinion component. Starting in 2012-13, hospitals received a normalized expert opinion score. For example, if the highest expert opinion score in a given specialty is 80%, the hospital receives a normalized score of 0.80. Since expert opinion is worth 32.5% of the overall score, the hospital receives 0.80×32.5 , or 26 points, for expert opinion instead of the full 32.5 points possible.
- **Survey response weighting.** Beginning in 2012-13, we calculated expert opinion values for each year of the survey independently and averaged the 3 years rather than pooling nominations across years. This was done to reduce the year-to-year fluctuation of expert opinion scores within specialties.
- **Honor Roll.** The methodology for assigning Honor Roll points was revised. For data-driven specialties, hospitals received 2 points for ranking among the top 10 hospitals and 1 point for ranking in the next 10 (i.e., 11–20). For expert opinion-based specialties, hospitals received 2 points for ranking in among the top 5 and 1 point for ranking in the next 5 (i.e., 6–10).

Summary of 2011-12 Changes

- **Ties allowed.** For 2011-12, we instituted a new rule that allows for ranking ties for hospitals with the same score. Previously, ties were not allowed and were broken by examining the scores out to 3 decimal points.
- **Cut-offs for expert opinion-based specialties.** In previous years, hospitals representing 3% or more of the total nominations in a specialty were published in print for the expert opinion-based specialties. For the 2011-12 rankings, this was revised to 5% to be more discerning.
- **Mortality displayed as survival scores.** The values displayed in the rankings tables for mortality were changed from mortality ratios to decile-based survival scores. The top 10% of hospitals—with the lowest relative mortality and highest 30-day survival—received a survival score value of 10; the next 10% of hospitals received a value of 9, and so on. The method for using the mortality scores to calculate the score did not change from that used in 2010.

- **Updated scoring for the Patient Safety Index.** The Patient Safety Index was revised to include 6 rather than 7 indicators (PSI 02: Death in low-mortality DRGs is no longer included). The approach to weighting individual PSIs also changed from the population at risk to equal weighting. The index scoring was also updated from the quintile scoring used in 2009-10 to a new 3-point scale that represents $\geq 75^{\text{th}}$ percentile, $25^{\text{th}}-74^{\text{th}}$ percentile and $< 25^{\text{th}}$ percentile.

Summary of 2010-11 Changes

- **Expert opinion scores transformed.** Implemented a new log transformation of the expert opinion survey data prior to standardization. This change will allow expert opinion scores to cluster more, reducing the overall impact of this component on the final hospital ranking.
- **MS-DRGs incorporated.** The 3M Health Information Systems MS Grouper software was run on all 3 years of data included in the analyses, and we revised the assignment of cases to specialties using the MS-DRGs.
- **Change in structural volume measure.** The criteria used to determine volume for the structural variable have now changed to include only those cases meeting the minimum severity of illness thresholds set by the project using APR-DRGs and includes transfers; previously, this measure focused on all discharges for DRGs used by the project and excluded transfers. This change will allow the volume measure to more accurately reflect the actual volume of cases according to the specialty definitions.
- **Codes identifying transfers for mortality calculation revised.** As in previous years, transfers were identified using the claim source of inpatient admission variable on the MedPAR files. In past years, transfers were identified based on the value “4” for transfer from an acute hospital. This year the variable value “A” for transfer from critical access hospital was also used.
- **Low-discharge hospitals adjustment changed.** We revised the method for adjusting the scores for hospitals with low discharges on both volume and mortality. In previous years, we used an inverse-logit transformation. Starting in 2010, for hospitals with a discharge volume below the 25^{th} percentile, we adjusted the observed volume score and transfer-free mortality rate by creating an average weight based on the hospital’s observed score and the score for all hospitals at or above the 25th percentile in volume.
- **“Outlier” transfer data adjusted.** We adjusted the observed transfer-free mortality rate for hospitals in the top and bottom quartiles of transfer-in rates to account for the fact that some hospitals may have had too many or too few cases included in the mortality calculations due to poor or inaccurate coding of administrative data.

Summary of 2009 Changes

- **Eligibility criteria updated.** Hospitals with a minimum number of hospital beds may now be eligible for the rankings.
- **Key technologies updated.** The elements in this index were updated for a few specialties to remain consistent with the key technologies expected from a best hospital.
- **Intensivist on staff added.** Hospitals now receive credit in all data-driven specialties for having intensivists on staff.
- **Patient Safety Index added.** A Best Hospitals Patient Safety Index was created and applied to all data-driven specialties.
- **DRG groupings updated.** DRG groupings were updated for all data-driven specialties, consistent with typical year-to-year changes.
- **Physician survey.** The following instruction was removed from the physician survey: “Please do not list any hospital where you currently practice.” Physicians likely choose to work at a certain hospital because it is a best hospital. Therefore, it was deemed acceptable for them to vote for the hospital where they work.

Summary of 2008 Changes

- **Advanced technologies updated.** The elements in this index were updated for a few specialties to remain consistent with the advanced technologies expected from a best hospital.
- **Patient services updated.** The elements in these services were updated for a few specialties to remain consistent with the patient services expected from a best hospital.
- **Trauma center certification dropped.** Trauma center certification was dropped from the Gynecology specialty.
- **Alzheimer’s disease center added.** This element was added to the Neurology & Neurosurgery specialty.
- **30-day mortality rates added for Cancer.** Thirty-days-from-admission mortality rates were introduced in all data-driven specialties except Cancer in 2007. For 2010-11, 30-day mortality was used in Cancer as well.

Summary of 2007 Changes

Changes for 2007 were more substantial but still in keeping with the goal of maintaining consistency and continuity. Many of the changes were discussed at length at a day-long meeting

convened by U.S. News in fall 2006 to solicit the views of a Best Hospitals advisory panel of approximately 40 invitees. The panelists represented top hospitals and brought expertise in areas such as clinical care, healthcare data analyses and quality research. Several representatives from key trade/industry organizations also participated.

- **External organizations added.** Hospitals in the Cancer specialty now receive points for accreditation by FACT as a Cellular Therapy Facility. Hospitals in Geriatrics now receive points if they are recognized by NIA for having an Alzheimer's center.
- **DRG groupings updated.** DRG groupings were updated for all specialties, consistent with typical year-to-year changes.
- **Transfers excluded.** Patients transferred into a hospital from another hospital are excluded from mortality and volume calculations to reduce the likelihood of either benefiting or suffering from "dumping" of patients.
- **30-day mortality introduced.** Thirty-days-from-admission mortality rates were introduced in all data-driven specialties (except Cancer) instead of death-at-discharge mortality rates.
- **Mortality data weighted.** Weights were applied to the MedPAR data based on the relative over- or underrepresentation of the cases' DRGs among all patients, as identified in the HCUP data.
- **Neonatologists moved.** Neonatologists were removed from the Gynecology sample and included in the Pediatrics sample instead.
- **Physician survey.** An additional instruction was added to the physician survey: "Please do not list any hospital where you currently practice."

Summary of 2005 and 2006 Changes

To maintain consistency in the previous ranking process, RTI replicated the preexisting methodology in the 2005 rankings and implemented only minor operational improvements in 2006.

