



Measure Information

This document contains the information submitted by measure developers/stewards, but is organized according to NQF's measure evaluation criteria and process. The item numbers refer to those in the submission form but may be in a slightly different order here. In general, the item numbers also reference the related criteria (e.g., item 1b.1 relates to subcriterion 1b).

Brief Measure Information

NQF #: 0351

Corresponding Measures:

De.2. Measure Title: Death Rate among Surgical Inpatients with Serious Treatable Complications (PSI 04)

Co.1.1. Measure Steward: Agency for Healthcare Research and Quality

De.3. Brief Description of Measure: In-hospital deaths per 1,000 surgical discharges, among patients ages 18 through 89 years or obstetric patients, with serious treatable complications (shock/cardiac arrest, sepsis, pneumonia, deep vein thrombosis/ pulmonary embolism or gastrointestinal hemorrhage/acute ulcer). Includes metrics for the number of discharges for each type of complication. Excludes cases transferred to an acute care facility. A risk-adjusted rate is available. The risk-adjusted rate of PSI 04 relies on stratum-specific risk models. The stratum-specific models are combined to calculate an overall risk-adjusted rate.

1b.1. Developer Rationale: This indicator targets patients who are admitted for surgery who die following the development of a serious but treatable complication of care. Examples of such complications include: 1) shock or cardiac arrest, 2) sepsis, 3) pneumonia, 4) deep vein thrombosis or pulmonary embolism, and 5) gastrointestinal hemorrhage or acute ulcer. This indicator is fundamentally different than other PSIs, as it reflects the effectiveness of the hospital in rescuing a patient from complications versus preventing the underlying complications.

S.4. Numerator Statement: Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.

S.7. Denominator Statement: Surgical discharges, for patients ages 18 through 89 years or MDC 14 (pregnancy, childbirth, and puerperium), with all of the following:

- any-listed ICD-9-CM or ICD-10-PCS procedure codes for an operating room procedure; and
- the principal procedure occurring within 2 days of admission or an admission type of elective (ATYPE=3); and
- meet the inclusion and exclusion criteria for STRATUM_SHOCK (shock or cardiac arrest), STRATUM_SEPSIS (sepsis), STRATUM_PNEUMONIA (pneumonia), STRATUM_DVT (deep vein thrombosis or pulmonary embolism), or STRATUM_GI_HEM (gastrointestinal hemorrhage or acute ulcer)

STRATUM_SHOCK (shock or cardiac arrest)

- any secondary ICD-9-CM or ICD-10-CM diagnosis codes or any-listed ICD-9-CM or ICD-10-PCS procedure codes for shock or cardiac arrest

STRATUM_SEPSIS (sepsis)

- any secondary ICD-9-CM or ICD-10-CM diagnosis codes for sepsis.

STRATUM_PNEUMONIA (pneumonia)

- any secondary ICD-9-CM or ICD-10-CM diagnosis codes for pneumonia or pneumonitis.

STRATUM_DVT (deep vein thrombosis or pulmonary embolism)

- any secondary ICD-9-CM or ICD-10-CM diagnosis codes for deep vein thrombosis or pulmonary embolism.

STRATUM_GI_HEM (gastrointestinal hemorrhage or acute ulcer)

- any secondary ICD-9-CM or ICD-10-CM diagnosis codes for gastrointestinal hemorrhage or acute ulcer.

Surgical discharges are defined by specific MS-DRG codes and ICD-9-CM/ICD-10-PCS codes indicating "major operating room

procedures.”

S.10. Denominator Exclusions: Exclude cases:

- transferred to an acute care facility (DISP = 2)
- with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing), or principal diagnosis (DX1=missing)

De.1. Measure Type: Outcome

S.23. Data Source: Claims

S.26. Level of Analysis: Facility

IF Endorsement Maintenance – Original Endorsement Date: May 15, 2008 **Most Recent Endorsement Date:** Jan 31, 2012

IF this measure is included in a composite, NQF Composite#/title:

IF this measure is paired/grouped, NQF#/title:

De.4. IF PAIRED/GROUPED, what is the reason this measure must be reported with other measures to appropriately interpret results? Not applicable

1. Evidence, Performance Gap, Priority – Importance to Measure and Report

Extent to which the specific measure focus is evidence-based, important to making significant gains in healthcare quality, and improving health outcomes for a specific high-priority (high-impact) aspect of healthcare where there is variation in or overall less-than-optimal performance. **Measures must be judged to meet all subcriteria to pass this criterion and be evaluated against the remaining criteria.**

1a. Evidence to Support the Measure Focus – See attached Evidence Submission Form

[PSI04_Measure_Evidence_Form_160531_v2.docx](#)

1b. Performance Gap

Demonstration of quality problems and opportunity for improvement, i.e., data demonstrating:

- considerable variation, or overall less-than-optimal performance, in the quality of care across providers; and/or
- disparities in care across population groups.

1b.1. Briefly explain the rationale for this measure (e.g., the benefits or improvements in quality envisioned by use of this measure)

This indicator targets patients who are admitted for surgery who die following the development of a serious but treatable complication of care. Examples of such complications include: 1) shock or cardiac arrest, 2) sepsis, 3) pneumonia, 4) deep vein thrombosis or pulmonary embolism, and 5) gastrointestinal hemorrhage or acute ulcer. This indicator is fundamentally different than other PSIs, as it reflects the effectiveness of the hospital in rescuing a patient from complications versus preventing the underlying complications.

1b.2. Provide performance scores on the measure as specified (current and over time) at the specified level of analysis. (This is required for endorsement maintenance. Include mean, std dev, min, max, interquartile range, scores by decile. Describe the data source including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included). This information also will be used to address the subcriterion on improvement (4b.1) under Usability and Use.

These tables (1a. and 1b.) are also included in the supplemental files.

Table 1a. Reference Population Observed Rate for Death Rate among Surgical Inpatients with Serious Treatable Complications (PSI 04), 2011-2013

Overall Reference Population Rate

Year2 Number of Hospitals Outcome of Interest

(Numerator)1 Population at Risk

(Denominator)1 Observed Rate

Per 1000 Surgical Discharges1

2013 2,783 21,242 182,512 116.3869

2012 2,860 21,897 185,872 117.8069

2011 2,748 21,403 181,317 118.0419

Source: HCUP State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). 2011 - 2013. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov (AHRQ QI Software Version 6.0)

1The observed rate refers to the total rate for all observations included in the reference population data (numerator) divided by the total combined eligible population of all hospitals included in the reference population data (denominator).

2Reference population is limited to states with present on admission data (POA). Since many states did not report POA data prior to 2011 we have not included testing prior to 2011.

Table 1b. Distribution of Hospital Performance for Death Rate among Surgical Inpatients with Serious Treatable Complications (PSI 04) in 2-year Pooled Data (2011-2012, 2012-2013)¹

Distribution of Hospital-level Observed Rates in Reference Population

Year3 Number of

Hospitals	Rates per 1000 Surgical Discharges (p=percentile) ²							
	Mean	SD2	p5	p25	Median	p75	p95	
2011-2012	3,212	103.83	85.55	0.00	58.06	102.61	140.35	217.39
2012-2013	3,398	100.76	88.28	0.00	51.28	99.92	137.25	212.12

Source: HCUP State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). 2011 - 2013. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov (AHRQ QI Software Version 6.0)

1Consistent with the recommended minimum reporting time period, results are presented for data combining 2 years of data: 2011 and 2012, 2012 and 2013. Data from 2012 are included in both time periods reported. Limitations in present on admission data (POA) data availability (see below) do not allow for use of earlier years.

2The distribution of hospital rates reports the mean and standard deviation (SD) of the observed rates for all hospitals in the dataset with at least one case in the denominator, as well as the observed rate for hospitals in the 5th, 25th, 50th (median), 75th, and 95th percentile. Standard deviation refers to the spread in observed values in relation to the mean.

3Reference population is limited to states with present on admission data (POA). Since many states did not report POA data prior to 2011 we have not included testing prior to 2011.

1b.3. If no or limited performance data on the measure as specified is reported in 1b2, then provide a summary of data from the literature that indicates opportunity for improvement or overall less than optimal performance on the specific focus of measurement.

Not applicable

1b.4. Provide disparities data from the measure as specified (current and over time) by population group, e.g., by race/ethnicity, gender, age, insurance status, socioeconomic status, and/or disability. (This is required for endorsement maintenance. Describe the data source including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities include.) This information also will be used to address the subcriterion on improvement (4b.1) under Usability and Use.

Table 2 shows that the risk of death for surgical inpatients with serious treatable complications varies by age, sex, community-level income, expected payer, and region. In 2013, among 182,512 surgical patients with serious treatable conditions, older patients, men, those from lower income communities, those with Medicare, Medicaid or uninsured, and those treated in the Northeast were at greater risk of death (after controlling for a variety of clinical risk factors) than younger patients, women, those from higher income communities, those with private insurance and those treated in the Midwest or West. These findings are based on 182,512 discharges from 2,783 hospitals in the 34 states in 2013 and reflect national population estimates. The findings may be different at an individual hospital-level.

Please note: Table 2, as shown below, is unformatted and may be difficult to read. A formatted Table 2 is provided in the supplemental files.

Table 2. Risk-Adjusted Death Rate among Surgical Inpatients with Serious Treatable Complications (PSI 04) per 1,000 surgical discharges, by patient and hospital characteristics, 2013

Patient/hospital characteristic	Risk-adjusted Estimate ¹	Std Error	p-value	(Ref Grp = *)	Lower
95% CL Upper					
95% CL					
Total U.S.	116.387	0.675			115.063 117.711
Patient Characteristics					
Age Groups:					

18-392	74.420	2.443	*	69.631	79.209
40-64	100.445	1.105	<.001	98.280	102.611
65 and over	133.431	0.923	<.001	131.621	135.241
Gender:					
Male2	120.100	0.909	*	118.319	121.882
Female	111.841	1.010	<.001	109.860	113.821
Patient Zip Code Median Income					
First quartile (lowest income)	121.085	2.383	<.001	116.415	125.755
Second quartile	118.659	1.532	<.001	115.656	121.661
Third quartile	120.176	1.393	<.001	117.445	122.907
Fourth quartile (highest income)2	112.644	0.969	*	110.746	114.543
Location of patient residence (NCHS)3:					
Rural	121.536	5.067	0.148	111.605	131.468
Urban2	116.192	0.683	*	114.854	117.531

Expected payment source:

Private insurance2	109.914	1.534	*	106.906	112.921
Medicare	116.361	0.838	<.001	114.718	118.004
Medicaid	120.407	2.300	<.001	115.899	124.915
Uninsured / self-pay / no charge	136.964	3.203	<.001	130.687	143.241
Other insurance	116.814	4.217	0.062	108.549	125.078

Location of Care:

Northeast2	122.821	1.769	*	119.355	126.288
Midwest	110.965	1.440	<.001	108.143	113.788
South	118.210	1.097	0.013	116.061	120.359
West	115.587	1.375	<.001	112.893	118.282

Source: HCUP State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). 2013. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov (AHRQ QI Software Version 6.0)

1Rates are adjusted using the AHRQ QI PSI POA Reference Population for 2013 as the standard population. Age and gender are removed from models for the relevant strata.

2Reference group

3NCHS - National Center for Health Statistics designation for urban-rural locations. Metropolitan areas are considered urban and micropolitan or non-core areas are considered rural.

1b.5. If no or limited data on disparities from the measure as specified is reported in 1b4, then provide a summary of data from the literature that addresses disparities in care on the specific focus of measurement. Include citations.

Not applicable

1c. High Priority (previously referred to as High Impact)

The measure addresses:

- a specific national health goal/priority identified by DHHS or the National Priorities Partnership convened by NQF; OR
- a demonstrated high-priority (high-impact) aspect of healthcare (e.g., affects large numbers of patients and/or has a substantial impact for a smaller population; leading cause of morbidity/mortality; high resource use (current and/or future); severity of illness; and severity of patient/societal consequences of poor quality).

1c.1. Demonstrated high priority aspect of healthcare

Patient/societal consequences of poor quality

1c.2. If Other:

1c.3. Provide epidemiologic or resource use data that demonstrates the measure addresses a high priority aspect of healthcare.

List citations in 1c.4.

This indicator was originally proposed by Silber et al. as a more powerful tool than the risk-adjusted mortality rate to detect true differences in patient outcomes across hospitals.¹ The underlying premise was that better hospitals are distinguished not by having fewer adverse occurrences but by more successfully averting death among (i.e., rescuing) patients who experience such complications. Silber et al's original definition was based on key clinical findings abstracted from the medical records of 2,831

cholecystectomy patients and 3,141 transurethral prostatectomy patients admitted to 531 hospitals in 1985.¹ The key postoperative diagnoses that defined the denominator at risk of “failure to rescue” (FTR) included cardiac arrhythmias, congestive heart failure, cardiac arrest, pneumonia, pulmonary embolus, pneumothorax, renal dysfunction, stroke, wound infection, and unplanned return to surgery.¹ More recently, Needleman and Buerhaus adapted failure to rescue to administrative data sets, with a specific focus on optimizing the sensitivity of the indicator to nurse staffing and skill mix. Their denominator definition included the ICD-9-CM codes for sepsis, pneumonia (including aspiration), acute upper gastrointestinal bleeding, shock, cardiac/respiratory arrest, deep vein thrombosis (DVT), and pulmonary embolus (PE).² Both specifications have been linked to factors such as board-certified anesthesiologists, board certified surgeons, registered nurse staffing ratios, nursing skill mix, and other structural and processes measures of high-quality care. 1-18 Due to improvements in care, between 1998 and 2007, FTR decreased by 6.05% per year ($p < 0.0001$).¹⁹ However, Table 1 above shows that PSI 04 still captures approximately 43,000 deaths each year in the 34 states in the all-payer reference population.

1c.4. Citations for data demonstrating high priority provided in 1a.3

1. Silber JH, Williams SV, Krakauer H, Schwartz JS. Hospital and patient characteristics associated with death after surgery. A study of adverse occurrence and failure to rescue. *Med Care*. 1992;30(7):615-629.
2. Needleman J, Buerhaus P, Mattke S, Stewart M, Zelevinsky K. Nurse-staffing levels and the quality of care in hospitals. *N Engl J Med*. 2002;346(22):1715-1722.
3. Navathe AS, Silber JH, Small DS, et al. Teaching hospital financial status and patient outcomes following ACGME duty hour reform. *Health Serv Res*. 2013;48(2 Pt 1):476-498.
4. Needleman J, Buerhaus PI, Mattke S, Stewart M, Zelevinsky K. Nurse Staffing and Patient Outcomes in Hospitals. Boston, MA: Health Resources Services Administration; February 28, 2001. 230-99-0021.
5. Manojlovich M, Talsma A. Identifying nursing processes to reduce failure to rescue. *J Nurs Adm*. 2007;37(11):504-509.
6. Schmid A, Hoffman L, Happ MB, Wolf GA, DeVita M. Failure to rescue: a literature review. *J Nurs Adm* 2007;37(4):188-198.
7. Silber JH, Rosenbaum PR, Ross RN. Comparing the contributions of groups of predictors: Which outcomes vary with hospital rather than patient characteristics? . *Journal of the American Statistical Association*. 1995;90(429):7-18.
8. Aiken LH, Clarke SP, Sloane DM, Sochalski J, Silber JH. Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. *Jama-J Am Med Assoc*. 2002;288(16):1987-1993.
9. Aiken LH, Clarke SP, Cheung RB, Sloane DM, Silber JH. Educational levels of hospital nurses and surgical patient mortality. *JAMA*. 2003;290(12):1617-1623.
10. Kendall-Gallagher D, Aiken LH, Sloane DM, Cimiotti JP. Nurse Specialty Certification, Inpatient Mortality, and Failure to Rescue. *J Nurs Scholarship*. 2011;43(2):188-194.
11. Friese CR, Aiken LH. Failure to rescue in the surgical oncology population: Implications for nursing and quality improvement. *Oncol Nurs Forum*. 2008;35(5):779-785.
12. Ghaferi AA, Osborne NH, Birkmeyer JD, Dimick JB. Hospital Characteristics Associated with Failure to Rescue from Complications after Pancreatectomy. *J Am Coll Surgeons*. 2010;211(3):325-330.
13. Needleman J, Buerhaus PI, Vanderboom C, Harris M. Using present-on-admission coding to improve exclusion rules for quality metrics: the case of failure-to-rescue. *Med Care*. 2013;51(8):722-730.
14. Seago JA, Williamson A, Atwood C. Longitudinal analyses of nurse staffing and patient outcomes - More about failure to rescue. *J Nurs Admin*. 2006;36(1):13-21.
15. Boyle SM. Nursing unit characteristics and patient outcomes. *Nurs Econ*. 2004;22(3):111-+.
16. Clarke SP, Aiken LH. Failure to rescue. *Am J Nurs*. 2003;103(1):42-47.
17. Silber JH, Kennedy SK, Even-Shoshan O, et al. Anesthesiologist direction and patient outcomes. *Anesthesiology*. 2000;93(1):152-163.
18. Johnston MJ, Arora S, King D, et al. A systematic review to identify the factors that affect failure to rescue and escalation of care in surgery. *Surgery*. 2015;157(4):752-763.
19. Downey JR, Hernandez-Boussard T, Banka G, Morton JM. Is patient safety improving? National trends in patient safety indicators: 1998-2007. *Health Serv Res*. 2012;47(1 Pt 2):414-430.

1c.5. If a PRO-PM (e.g. HRQoL/functional status, symptom/burden, experience with care, health-related behaviors), provide evidence that the target population values the measured PRO and finds it meaningful. (Describe how and from whom their input was obtained.)

Not applicable

2. Reliability and Validity—Scientific Acceptability of Measure Properties

Extent to which the measure, as specified, produces consistent (reliable) and credible (valid) results about the quality of care when implemented. **Measures must be judged to meet the subcriteria for both reliability and validity to pass this criterion and be evaluated against the remaining criteria.**

2a.1. Specifications The measure is well defined and precisely specified so it can be implemented consistently within and across organizations and allows for comparability. eMeasures should be specified in the Health Quality Measures Format (HQMF) and the Quality Data Model (QDM).

De.5. Subject/Topic Area (check all the areas that apply):

[Surgery](#)

De.6. Non-Condition Specific (check all the areas that apply):

[Safety, Safety : Complications](#)

S.1. Measure-specific Web Page (Provide a URL link to a web page specific for this measure that contains current detailed specifications including code lists, risk model details, and supplemental materials. Do not enter a URL linking to a home page or to general information.)

<http://1.usa.gov/1TksC2k> Note: The URL link will be updated for version 6.0 public release found via the module page:

http://qualityindicators.ahrq.gov/Modules/psi_resources.aspx

S.2a. If this is an eMeasure, HQMF specifications must be attached. Attach the zipped output from the eMeasure authoring tool (MAT) - if the MAT was not used, contact staff. (Use the specification fields in this online form for the plain-language description of the specifications)

[This is not an eMeasure](#) **Attachment:**

S.2b. Data Dictionary, Code Table, or Value Sets (and risk model codes and coefficients when applicable) must be attached. (Excel or csv file in the suggested format preferred - if not, contact staff)

Attachment Attachment: [PSI04_Technical_Specifications_v6.0_160527.xlsx](#)

S.3. For endorsement maintenance, please briefly describe any changes to the measure specifications since last endorsement date and explain the reasons.

As standard protocol, the AHRQ QI program annually updates all measures with Fiscal Year coding changes, refinements based on stakeholder input, refinements to improve specificity and sensitivity based on additional analyses, and necessary software changes. In addition, approximately every two years, AHRQ updates the risk-adjustment parameter estimates based on the most recent year of data (i.e., the most current reference population possible). The refined measures are tested and confirmed to be valid and reliable prior to release of the updated software.

Since the last update, the following changes have been made to the indicator:

This revised version will be implemented in forthcoming version 6.0 specifications in 2016. This version (v6.0) includes the following changes from the previously-endorsed version (v4.4):

- An ICD-10-CM/PCS version has been created.
- STRATUM_SHOCK (previously Stratum D):
 - o Abortion-related shock diagnosis codes added to Denominator
 - 63450 - SPON ABORT W SHOCK-UNSP
 - 63451 - SPON ABORT W SHOCK-INC
 - 63452 - SPON ABORT W SHOCK-COMP
 - 63550 - LEGAL ABORT W SHOCK-UNSO
 - 63551 - LEGAL ABORT W SHOCK-INC
 - 63552 - LEGAL ABORT W SHOCK-COMP
 - 63650 - ILLEG AB W SHOCK-UNSO
 - 63651 - ILLEG ABORT W SHOCK-INC
 - 63652 - ILLEG ABORT W SHOCK-COMP
 - 63750 - ABORT NOS W SHOCK-UNSO
 - 63751 - ABORT NOS W SHOCK-INC
 - 63752 - ABORT NOS W SHOCK-COMP
 - 6385 - ATTEM ABORTION W SHOCK

- o Codes removed from denominator (eliminating overlap with STRATUM_SEPSIS):
 - 78552 – SEPTIC SHOCK
 - 99802 – POSTOP SHOCK, SEPTIC
- o Code added to Denominator principal diagnosis exclusion: 53021 (ULCER OF ESOPHAGUS WITH BLEEDING)
- STRATUM_SEPSIS (previously Stratum C):
- o Codes removed from Denominator (eliminating overlap with STRATUM_SHOCK):
 - 78559 (SHOCK W/O TRAUMA NEC)
 - 99800 (POSTOPERATIVE SHOCK, NOS)
- o Codes added to the Denominator Exclusion:
 - 70700 PRESSURE ULCER, SITE NOS
 - 70701 PRESSURE ULCER, ELBOW
 - 70702 PRESSURE ULCER, UPR BACK
 - 70703 PRESSURE ULCER, LOW BACK
 - 70704 PRESSURE ULCER, HIP
 - 70705 PRESSURE ULCER, BUTTOCK
 - 70706 PRESSURE ULCER, ANKLE
 - 70707 PRESSURE ULCER, HEEL
 - 70709 PRESSURE ULCER, SITE NEC
- STRATUM_PNEUMONIA (previously Stratum B):
- o Codes added to Denominator: 481 – PNEUMOCOCCAL PNEUMONIA [STREPTOCOCCUS PNEUMONIAE PNEUMONIA
- o Codes added to Denominator exclusions: ICD-9-CM Lung cancer procedure codes for thoroscopic surgery (3230, 3241, 3250)
- STRATUM_DVT (previously Stratum A):
- o Codes removed from Denominator: 45342 (AC DVT/EMB DISTL LOW EXT),
- STRATUM_GI_HEM (previously Stratum E)

S.4. Numerator Statement (Brief, narrative description of the measure focus or what is being measured about the target population, i.e., cases from the target population with the target process, condition, event, or outcome)
IF an OUTCOME MEASURE, state the outcome being measured. Calculation of the risk-adjusted outcome should be described in the calculation algorithm.

Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.

S.5. Time Period for Data (What is the time period in which data will be aggregated for the measure, e.g., 12 mo, 3 years, look back to August for flu vaccination? Note if there are different time periods for the numerator and denominator.)
 For users with a complete all-payer sample of hospital discharge, the recommended time period is two years for measurement of hospital rates. This recommendation is based on testing of reliability of the measure; this reliability testing is specific to all-payer hospital populations. Reliability estimates often vary when the measure is applied to other hospital populations, such as Medicare-only populations. Reliability is sensitive to numerator and denominator size as well as the distribution of hospital rates. For populations other than all-payer hospital populations fewer or more than 2 years of data may be recommended, depending on changes in reliability estimates. Note that the signal variance parameters embedded in the AHRQ QI software assume at least a one-year time period. Users may use longer time periods if desired.

S.6. Numerator Details (All information required to identify and calculate the cases from the target population with the target process, condition, event, or outcome such as definitions, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format at S.2b)
IF an OUTCOME MEASURE, describe how the observed outcome is identified/counted. Calculation of the risk-adjusted outcome should be described in the calculation algorithm.
 Please see attached excel file in S.2b. for version 6.0 specifications.

S.7. Denominator Statement (Brief, narrative description of the target population being measured)
 Surgical discharges, for patients ages 18 through 89 years or MDC 14 (pregnancy, childbirth, and puerperium), with all of the following:

- any-listed ICD-9-CM or ICD-10-PCS procedure codes for an operating room procedure; and
- the principal procedure occurring within 2 days of admission or an admission type of elective (ATYPE=3); and
- meet the inclusion and exclusion criteria for STRATUM_SHOCK (shock or cardiac arrest), STRATUM_SEPSIS (sepsis),

STRATUM_PNEUMONIA (pneumonia), STRATUM_DVT (deep vein thrombosis or pulmonary embolism), or STRATUM_GI_HEM (gastrointestinal hemorrhage or acute ulcer)

STRATUM_SHOCK (shock or cardiac arrest)

- any secondary ICD-9-CM or ICD-10-CM diagnosis codes or any-listed ICD-9-CM or ICD-10-PCS procedure codes for shock or cardiac arrest

STRATUM_SEPSIS (sepsis)

- any secondary ICD-9-CM or ICD-10-CM diagnosis codes for sepsis.

STRATUM_PNEUMONIA (pneumonia)

- any secondary ICD-9-CM or ICD-10-CM diagnosis codes for pneumonia or pneumonitis.

STRATUM_DVT (deep vein thrombosis or pulmonary embolism)

- any secondary ICD-9-CM or ICD-10-CM diagnosis codes for deep vein thrombosis or pulmonary embolism.

STRATUM_GI_HEM (gastrointestinal hemorrhage or acute ulcer)

- any secondary ICD-9-CM or ICD-10-CM diagnosis codes for gastrointestinal hemorrhage or acute ulcer.

Surgical discharges are defined by specific MS-DRG codes and ICD-9-CM/ICD-10-PCS codes indicating “major operating room procedures.”

S.8. Target Population Category (Check all the populations for which the measure is specified and tested if any):

Populations at Risk

S.9. Denominator Details (All information required to identify and calculate the target population/denominator such as definitions, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format at S.2b)

Please see attached excel file in S.2b. for v6.0 specifications.

S.10. Denominator Exclusions (Brief narrative description of exclusions from the target population)

Exclude cases:

- transferred to an acute care facility (DISP = 2)
- with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing), or principal diagnosis (DX1=missing)

S.11. Denominator Exclusion Details (All information required to identify and calculate exclusions from the denominator such as definitions, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format at S.2b)

Please see attached excel file in S.2b. for v6.0 specifications.

S.12. Stratification Details/Variables (All information required to stratify the measure results including the stratification variables, definitions, specific data collection items/responses, code/value sets – Note: lists of individual codes with descriptors that exceed 1 page should be provided in an Excel or csv file in required format with at S.2b)

Please see attached excel file in S.2b. for v6.0 specifications.

S.13. Risk Adjustment Type (Select type. Provide specifications for risk stratification in S.12 and for statistical model in S.14-15)

Statistical risk model

If other:

S.14. Identify the statistical risk model method and variables (Name the statistical method - e.g., logistic regression and list all the risk factor variables. Note - risk model development and testing should be addressed with measure testing under Scientific Acceptability)

The predicted value for each case is computed using a hierarchical model (logistic regression with hospital random effect) and covariates for gender, age (in 5-year age groups, except for the youngest age range), Modified Diagnosis Related Groups (ie. MS-

DRGs without any distinction for “comorbidity and complications” (CC/MCC), Elixhauser Comorbidity Index (<https://www.hcup-us.ahrq.gov/toolssoftware/comorbidity/comorbidity.jsp>), Major Diagnosis Categories (MDC) based on the principal diagnosis, and transfer in from another acute care hospital. A parsimonious model was identified using a backward stepwise selection procedure with bootstrapping. The expected rate is computed as the sum of the predicted value for each case divided by the number of cases for the unit of analysis of interest (i.e., hospital). The risk-adjusted rate for the overall PSI 04 is calculated as the observed to expected ratio multiplied by the reference population rate, where the observed and expected values are summed across five strata (categories) of PSI 04 risk. This approach differs from other AHRQ Patient Safety Indicators without strata, in that each discharge-record’s expected value is computed using one of five distinct stratum-specific risk adjustment models that correspond to an assigned PSI 04 stratum. The five PSI 04 strata group records together based on secondary diagnoses that represent complications of care, and place the patient at risk of death (which is the numerator of PSI 04).

Additional information on methodology can be found in the Empirical Methods document on the AHRQ Quality Indicator website (www.qualityindicators.ahrq.gov). The Empirical Methods are also attached in the supplemental materials.

The specific covariates for this measure are provided for each Stratum as part of the Technical Specifications attached to section S.2b.

Source: http://www.qualityindicators.ahrq.gov/Modules/psi_resources.aspx

S.15. Detailed risk model specifications *(must be in attached data dictionary/code list Excel or csv file. Also indicate if available at measure-specific URL identified in S.1.)*

Note: Risk model details (including coefficients, equations, codes with descriptors, definitions), should be provided on a separate worksheet in the suggested format in the Excel or csv file with data dictionary/code lists at S.2b.

Available in attached Excel or csv file at S.2b

S.15a. Detailed risk model specifications *(if not provided in excel or csv file at S.2b)*

Not applicable.

S.16. Type of score:

Rate/proportion

If other:

S.17. Interpretation of Score *(Classifies interpretation of score according to whether better quality is associated with a higher score, a lower score, a score falling within a defined interval, or a passing score)*

Better quality = Lower score

S.18. Calculation Algorithm/Measure Logic *(Describe the calculation of the measure score as an ordered sequence of steps including identifying the target population; exclusions; cases meeting the target process, condition, event, or outcome; aggregating data; risk adjustment; etc.)*

The observed rate is the number of discharge records where the patient experienced the PSI adverse event divided by the number of discharge records at risk for the event. The expected rate is a comparative rate that incorporates information about a reference population that is not part of the user’s input dataset – what rate would be observed if the expected level of care observed in the reference population and estimated with risk adjustment regression models, were applied to the mix of patients with demographic and comorbidity distributions observed in the user’s dataset. The expected rate is calculated only for risk-adjusted indicators.

The following descriptions are for the expected rate and risk-adjusted rate. These rates are calculated using models for each individual stratum.

The expected rate is estimated using the stratum specific model for each record using a generalized estimating equations (GEE) approach to account for correlation at the hospital or provider level. Records are assigned to the stratum for which they qualify with the highest observed mortality rate.

The risk-adjusted rate is a comparative rate that also incorporates information about a reference population that is not part of the input dataset – what rate would be observed if the level of care observed in the user’s dataset were applied to a mix of patients with demographics and comorbidities distributed like the reference population? The risk-adjusted rate for the overall PSI 04 is calculated as the observed to expected ratio multiplied by the reference population rate, where the observed and expected values are

summed across five strata (categories) of PSI 04 risk. This approach differs from other AHRQ Patient Safety Indicators without strata, in that each discharge-record's expected value is computed using one of five distinct stratum-specific risk adjustment models that correspond to an assigned PSI 04 stratum. The five PSI 04 strata group records together based on secondary diagnoses that represent complications of care, and place the patient at risk of death (which is the numerator of PSI 04).

The smoothed rate is the weighted average of the risk-adjusted rate from the user's input dataset and the rate observed in the reference population; the smoothed rate is calculated with a shrinkage estimator to result in a rate near that from the user's dataset if the provider's rate is estimated in a stable fashion with minimal noise, or to result in a rate near that of the reference population if the variance of the estimated rate from the input dataset is large compared with the hospital-to-hospital variance estimated from the reference population. Thus, the smoothed rate is a weighted average of the risk-adjusted rate and the reference population rate, where the weight is the signal-to-noise ratio. In practice, the smoothed rate brings rates toward the mean, and tends to do this more so for outliers (such as rural hospitals).

For additional information, please see the supplemental materials for the AHRQ QI Empirical Methods.

S.19. Calculation Algorithm/Measure Logic Diagram URL or Attachment (You also may provide a diagram of the Calculation Algorithm/Measure Logic described above at measure-specific Web page URL identified in S.1 OR in attached appendix at A.1)
No diagram provided

S.20. Sampling (If measure is based on a sample, provide instructions for obtaining the sample and guidance on minimum sample size.)

IF a PRO-PM, identify whether (and how) proxy responses are allowed.

Not applicable

S.21. Survey/Patient-reported data (If measure is based on a survey, provide instructions for conducting the survey and guidance on minimum response rate.)

IF a PRO-PM, specify calculation of response rates to be reported with performance measure results.

Not applicable

S.22. Missing data (specify how missing data are handled, e.g., imputation, delete case.)

Required for Composites and PRO-PMs.

Exclude cases with missing gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing), or principal diagnosis (DX1=missing). Missingness on these variables, in aggregate, almost never exceeds 1% of eligible records.

S.23. Data Source (Check ONLY the sources for which the measure is SPECIFIED AND TESTED).

If other, please describe in S.24.

Claims

S.24. Data Source or Collection Instrument (Identify the specific data source/data collection instrument e.g. name of database, clinical registry, collection instrument, etc.)

IF a PRO-PM, identify the specific PROM(s); and standard methods, modes, and languages of administration.

While the measure is tested and specified using data from the Healthcare Cost and Utilization Project (HCUP) (see section 1.1 and 1.2 of the measure testing form), the measure specifications for numerators, denominators and observed rates and software are specified to be used with any ICD-9-CM- or ICD-10-CM/PCS coded administrative billing/claims/discharge dataset. Software to calculate risk-adjusted and smoothed rates is available for ICD-9-CM only. One year of ICD-10-CM/PCS coded data is necessary before risk adjustment will be available for ICD-10-CM/PCS versions of the software.

S.25. Data Source or Collection Instrument (available at measure-specific Web page URL identified in S.1 OR in attached appendix at A.1)

Available at measure-specific web page URL identified in S.1

S.26. Level of Analysis (Check ONLY the levels of analysis for which the measure is SPECIFIED AND TESTED)

Facility

S.27. Care Setting (Check ONLY the settings for which the measure is SPECIFIED AND TESTED)

<p>Inpatient/Hospital If other:</p>
<p>S.28. <u>COMPOSITE Performance Measure</u> - Additional Specifications (<i>Use this section as needed for aggregation and weighting rules, or calculation of individual performance measures if not individually endorsed.</i>) Not applicable</p>
<p>2a. Reliability – See attached Measure Testing Submission Form 2b. Validity – See attached Measure Testing Submission Form PSI04_Measure_Testing_Form_160615.docx</p>

<p>3. Feasibility</p>
<p>Extent to which the specifications including measure logic, require data that are readily available or could be captured without undue burden and can be implemented for performance measurement.</p>
<p>3a. Byproduct of Care Processes For clinical measures, the required data elements are routinely generated and used during care delivery (e.g., blood pressure, lab test, diagnosis, medication order).</p> <p>3a.1. Data Elements Generated as Byproduct of Care Processes. Coded by someone other than person obtaining original information (e.g., DRG, ICD-9 codes on claims) If other:</p>
<p>3b. Electronic Sources The required data elements are available in electronic health records or other electronic sources. If the required data are not in electronic health records or existing electronic sources, a credible, near-term path to electronic collection is specified.</p> <p>3b.1. To what extent are the specified data elements available electronically in defined fields? (<i>i.e., data elements that are needed to compute the performance measure score are in defined, computer-readable fields</i>) ALL data elements are in defined fields in electronic claims</p> <p>3b.2. If ALL the data elements needed to compute the performance measure score are not from electronic sources, specify a credible, near-term path to electronic capture, OR provide a rationale for using other than electronic sources.</p> <p>3b.3. If this is an eMeasure, provide a summary of the feasibility assessment in an attached file or make available at a measure-specific URL. Attachment:</p>
<p>3c. Data Collection Strategy Demonstration that the data collection strategy (e.g., source, timing, frequency, sampling, patient confidentiality, costs associated with fees/licensing of proprietary measures) can be implemented (e.g., already in operational use, or testing demonstrates that it is ready to put into operational use). For eMeasures, a feasibility assessment addresses the data elements and measure logic and demonstrates the eMeasure can be implemented or feasibility concerns can be adequately addressed.</p> <p>3c.1. Describe what you have learned/modified as a result of testing and/or operational use of the measure regarding data collection, availability of data, missing data, timing and frequency of data collection, sampling, patient confidentiality, time and cost of data collection, other feasibility/implementation issues. <u>IF a PRO-PM, consider implications for both individuals providing PROM data (patients, service recipients, respondents) and those whose performance is being measured.</u> Because the indicator is based on readily available administrative billing and claims data and U.S. Census data, feasibility is not an issue. The AHRQ QI software has been publicly available at no cost since 2001; Users have over ten years of experience using the AHRQ QI software in SAS and Windows.</p> <p>3c.2. Describe any fees, licensing, or other requirements to use any aspect of the measure as specified (<i>e.g., value/code set, risk</i></p>

model, programming code, algorithm).

There are no fees. Software is freely available from the AHRQ Quality Indicators website (<http://www.qualityindicators.ahrq.gov/>).

4. Usability and Use

Extent to which potential audiences (e.g., consumers, purchasers, providers, policy makers) are using or could use performance results for both accountability and performance improvement to achieve the goal of high-quality, efficient healthcare for individuals or populations.

4a. Accountability and Transparency

Performance results are used in at least one accountability application within three years after initial endorsement and are publicly reported within six years after initial endorsement (or the data on performance results are available). If not in use at the time of initial endorsement, then a credible plan for implementation within the specified timeframes is provided.

4.1. Current and Planned Use

NQF-endorsed measures are expected to be used in at least one accountability application within 3 years and publicly reported within 6 years of initial endorsement in addition to performance improvement.

Planned	Current Use (for current use provide URL)
	<p>Public Reporting</p> <p>Arizona Department of Health Services, AZ Hospital Compare, MONAHRQ website http://pub.azdhs.gov/hospital-discharge-stats/2012/AboutQualityRatings.html</p> <p>CareChex (Division of Quantros) http://www.carechex.com/QualityIndicators.aspx</p> <p>CMS Medicare Hospital Compare Program https://www.medicare.gov/hospitalcompare/Data/Measures-Displayed.html#</p> <p>Commonwealth Fund, Why Not the Best http://whynotthebest.org/methodology</p> <p>Connecticut Department of Health Services, CT Hospital Compare, MONAHRQ website http://ctmonahrq.ct.gov/2012/index.html#/resources/AboutQualityRatings</p> <p>Connecticut Hospital Association http://www.cthosp.org/advocacy/quality-and-patient-safety/hospital-quality-reporting-website/</p> <p>Consumer Reports http://www.consumerreports.org/health/resources/pdf/how-we-rate-hospitals/How%20We%20Rate%20Hospitals.pdf</p> <p>HealthGrades https://d2dcgio3q2u5fb.cloudfront.net/54/98/f79cdfd84640a03792ea092f20a8/2014-patient-safety-methodology.pdf</p> <p>Hospital Safety Score http://www.hospitalsafetyscore.org/media/file/HospitalSafetyScore_ScoringMethodology_Spring2015_Final.pdf</p> <p>Iowa Healthcare Collaborative https://iowareport.ihconline.org/Public/Reports.aspx?FID=778&F1ID=0&F2ID=0&F3ID=0&CID=2&PID=4</p> <p>Kentucky Cabinet for Health and Family services https://prd.chfs.ky.gov/MONAHRQ/2012/MONAHRQ/AboutQualityRatings.html</p> <p>Kentucky Hospital Association Quality Data http://info.kyha.com/qualitydata/psisite/SelectPSIReport.asp?IndID=PSI4&TimePeriod=5&GroupOpt=none&SortOrder=hospital&SortDir=ASC</p> <p>Louisiana Hospital Inform http://lahospitalinform.org/index.html</p> <p>Maryland Health Care Commission, MONAHRQ Website http://www.hsrcr.state.md.us/documents/md-maphs/wg-meet/di/2014-03-</p>

	<p>04/MHCC%20Inpatient%20Measures%20Inventory%20QBR%20highlights.pdf Maine Health Data Organization (MHDO), MONAHRQ Website https://mhdo.maine.gov/monahrq/#/resources/AboutQualityRatings Minnesota Community Measurement http://mncm.org/wp-content/uploads/2014/02/2013-HCQR-Final-2.4.2014.pdf Nevada Compare Care, MONAHRQ website http://nevadacomparecare.net/MQ2014/index.html#/professional/resources/AboutQualityRatings Niagara Health Quality Coalition, New York State Hospital Report Card http://www.myhealthfinder.com/newyork15/main_byproc.php Norton Healthcare http://www.nortonhealthcare.com/QualityReport Oklahoma State Department of Health, MONAHRQ https://www.phin.state.ok.us/ahrq/MONAHRQ%202010/Methodology.html South Dakota Association of Healthcare Organizations http://www.sdhospitalquality.org/search.php http://healthdata.dshs.texas.gov/Hospital/PatientSafetyQualityIndicators Texas Department of State Health Services Texas Health Resources https://www.texashealth.org/Documents/System/Quality_Patient_Safety/Reports/03-02-2016_Surgery.pdf U.S. News and World Report http://www.usnews.com/pubfiles/BH2015-16MethodologyReport.pdf Utah Department of Health, MONAHRQ website https://health.utah.gov/myhealthcare/monahrq/ Virginia Health Information http://www.vhi.org/MONAHRQ/default.asp?yr=2013 Washington State, MONAHRQ website http://www.wamonahrq.net/MONAHRQ_5p0_WA_2012/index.html#/resources/AboutQualityRatings WHA Information Center (Wisconsin Hospital Association) http://www.whainfocenter.com/uploads/PDFs/Publications/QualityIndicators/2012_WI_IQIRReport.pdf CMS Hospital Quality Initiative: Outcome Measures http://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/OutcomeMeasures.html Quality Improvement (Internal to the specific organization) BayCare https://baycare.org/quality-report-card/surgical-complications-0715 Blue Cross Blue Shield of North Carolina http://www.bcbsnc.com/content/providers/hqp/index.htm Greenville Health System, Quality and Safety Report http://www.ghs.org/upload/docs/Reports/2013-April-Quality-Report.pdf Northwestern Memorial Hospital, Patient Safety Indicator Monitoring Plan https://www.nm.org/location/northwestern-memorial-hospital/quality-nmh/view-our-quality-ratings-nmh/surgery-nmh/general-surgery-nmh Upstate University Hospital http://qoc.upstate.edu/QualityOfCare.cfm?quality_measure_group_id=7</p>
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4a.1. For each CURRENT use, checked above, provide:

- Name of program and sponsor
- Purpose
- Geographic area and number and percentage of accountable entities and patients included

Public Reporting:

Arizona Department of Health Services, AZ Hospital Compare, MONAHRQ website

Hospital quality ratings from all hospitals in Arizona

<http://pub.azdhs.gov/hospital-discharge-stats/2012/AboutQualityRatings.html>

CareChex (Division of Quantros)

Provides comprehensive reports of hospitals to consumers, providers and purchasers

<http://www.carechex.com/QualityIndicators.aspx>

CMS Medicare Hospital Compare Program

Publicly available database containing information about the quality of care at over 4,000 Medicare-certified hospitals across the U.S.

<https://www.medicare.gov/hospitalcompare/Data/Measures-Displayed.html#>

CMS Hospital Quality Initiative: Outcome Measures

Produces a chartbook of hospital outcome measures

<http://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/OutcomeMeasures.html>

Commonwealth Fund, Why Not the Best

Provides performance and quality ratings for most US hospitals

<http://whynotthebest.org/methodology>

Connecticut Department of Health Services, CT Hospital Compare, MONAHRQ website

Hospital quality ratings from all hospitals in Connecticut

<http://ctmonahrq.ct.gov/2012/index.html#/resources/AboutQualityRatings>

Connecticut Hospital Association

Provide quality of care for hospitals in Connecticut

<http://www.cthosp.org/advocacy/quality-and-patient-safety/hospital-quality-reporting-website/>

Consumer Reports

Hospital measure performance compared to external hospitals

<http://www.consumerreports.org/health/resources/pdf/how-we-rate-hospitals/How%20We%20Rate%20Hospitals.pdf>

HealthGrades

Healthgrades measures 40 million patient records from 4,500 hospitals nationwide for the most recent three-year period.

Consumer-targeted hospital and provider ratings

<https://d2dcgio3q2u5fb.cloudfront.net/54/98/f79cdfd84640a03792ea092f20a8/2014-patient-safety-methodology.pdf>

Hospital Safety Score

PSI 04 is one component of a single composite score that represents a hospital's overall performance in patient safety

http://www.hospitalsafetyscore.org/media/file/HospitalSafetyScore_ScoringMethodology_Spring2015_Final.pdf

Iowa Healthcare Collaborative

Hospital quality ratings from hospitals in Iowa

<https://iowareport.ihconline.org/Public/Reports.aspx?FID=778&F1ID=0&F2ID=0&F3ID=0&CID=2&PID=4>

Kentucky Cabinet for Health and Family services

Hospital quality ratings from hospitals in Kentucky

<https://prd.chfs.ky.gov/MONAHRQ/2012/MONAHRQ/AboutQualityRatings.html>

Kentucky Hospital Association Quality Data

Hospital quality ratings from most hospitals in Kentucky

<http://info.kyha.com/qualitydata/psisite/SelectPSIReport.asp?IndID=PSI4&TimePeriod=5&GroupOpt=none&SortOrder=hospital&SortDir=ASC>

Louisiana Hospital Inform

Hospital quality ratings from hospitals in Louisiana

<http://lahospitalinform.org/index.html>

Maryland Health Care Commission, MONAHRQ Website

Collects and provides quality ratings on hospitals across Maryland

<http://www.hscrc.state.md.us/documents/md-maphs/wg-meet/di/2014-03-04/MHCC%20Inpatient%20Measures%20Inventory%20QBR%20highlights.pdf>

Maine Health Data Organization (MHDO), MONAHRQ Website

Hospital quality ratings from all hospitals in Maine

<https://mhdo.maine.gov/monahrq/#/resources/AboutQualityRatings>

Minnesota Community Measurement

Minnesota Community Measurement is a nonprofit healthcare data reporting organization. Provides quality ratings on hospitals across Minnesota.

<http://mncm.org/wp-content/uploads/2014/02/2013-HCQR-Final-2.4.2014.pdf>

Nevada Compare Care, MONAHRQ website

Hospital quality ratings from most hospitals in Nevada

<http://nevadacomparecare.net/MQ2014/index.html#/professional/resources/AboutQualityRatings>

Niagara Health Quality Coalition, New York State Hospital Report Card

Consumer focused public report of quality indicator performance for NY hospitals.

http://www.myhealthfinder.com/newyork15/main_byproc.php

Norton Healthcare

Report patient satisfaction scores in Norton Healthcare hospitals and their performance on nationally recognized quality indicators and practices <http://www.nortonhealthcare.com/QualityReport>

Oklahoma State Department of Health, MONAHRQ

Compares quality ratings on hospitals across Oklahoma

<https://www.phin.state.ok.us/ahrq/MONAHRQ%202010/Methodology.html>

South Dakota Association of Healthcare Organizations

Use PSI 04 in a composite of serious complications in report of South Dakota hospital quality.

<http://www.sdhospitalquality.org/search.php>

Texas Department of State Health Services

Texas Health Care Information Collection

<http://healthdata.dshs.texas.gov/Hospital/PatientSafetyQualityIndicators>

Texas Health Resources

Provides quality and safety reports for all Texas Health Resources

https://www.texashealth.org/Documents/System/Quality_Patient_Safety/Reports/03-02-2016_Surgery.pdf

U.S. News and World Report

National publication that lists ratings of U.S. medical centers based on performance

<http://www.usnews.com/pubfiles/BH2015-16MethodologyReport.pdf>

Utah Department of Health, MONAHRQ website

Report hospital quality for all hospitals in Utah

<https://health.utah.gov/myhealthcare/monahrq/>

Virginia Health Information

Compares quality ratings on hospitals across Virginia

<http://www.vhi.org/MONAHQR/default.asp?yr=2013>

Washington State, MONAHQR website

Information system of inpatient care utilization, quality, and potentially avoidable stays in Washington State's community hospitals

http://www.wamonahrq.net/MONAHQR_5p0_WA_2012/index.html#/resources/AboutQualityRatings

WHA Information Center (Wisconsin Hospital Association)

Wisconsin Inpatient Hospital Quality Indicators Report

http://www.whainfocenter.com/uploads/PDFs/Publications/QualityIndicators/2012_WI_IQIReport.pdf

Quality Improvement (external benchmarking to multiple organizations):

CMS Hospital Compare

Publicly available performance measures for hospitals

<http://www.medicare.gov/hospitalcompare/Data/Measures-Displayed.html>

University HealthSystem Consortium/Vizient

Internal quality improvement efforts, documentation, and evaluation of AHRQ PSIs for quality improvement by its members

<https://www.vizientinc.com/clinical-analytics-and-benchmarking.htm>

Quality Improvement (internal to the specific organization):

BayCare

Provide information on quality of hospital care within the BayCare health system

<https://baycare.org/quality-report-card/surgical-complications-0715>

Blue Cross Blue Shield of North Carolina

Stimulate improvements in quality and safety within hospitals

<http://www.bcbsnc.com/content/providers/hqp/index.htm>

Greenville Health System, Quality and Safety Report

All data was collected from four hospitals in the Greenville Health system and compared with internal rates

<http://www.ghs.org/upload/docs/Reports/2013-April-Quality-Report.pdf>

Northwestern Memorial Hospital, Patient Safety Indicator Monitoring Plan

Quality improvement initiative at 894-bed academic hospital

<https://www.nm.org/location/northwestern-memorial-hospital/quality-nmh/view-our-quality-ratings-nmh/surgery-nmh/general-surgery-nmh>

Upstate University Hospital

Report of hospital rates against national benchmark (published online)

http://qoc.upstate.edu/QualityOfCare.cfm?quality_measure_group_id=7

4a.2. If not currently publicly reported OR used in at least one other accountability application (e.g., payment program, certification, licensing) what are the reasons? (e.g., Do policies or actions of the developer/steward or accountable entities restrict access to performance results or impede implementation?)

n/a

4a.3. If not currently publicly reported OR used in at least one other accountability application, provide a credible plan for implementation within the expected timeframes -- any accountability application within 3 years and publicly reported within 6 years of initial endorsement. (Credible plan includes the specific program, purpose, intended audience, and timeline for

implementing the measure within the specified timeframes. A plan for accountability applications addresses mechanisms for data aggregation and reporting.)

n/a

4b. Improvement

Progress toward achieving the goal of high-quality, efficient healthcare for individuals or populations is demonstrated. If not in use for performance improvement at the time of initial endorsement, then a credible rationale describes how the performance results could be used to further the goal of high-quality, efficient healthcare for individuals or populations.

4b.1. Progress on Improvement. (Not required for initial endorsement unless available.)

Performance results on this measure (current and over time) should be provided in 1b.2 and 1b.4. Discuss:

- Progress (trends in performance results, number and percentage of people receiving high-quality healthcare)
- Geographic area and number and percentage of accountable entities and patients included

See Table 1 in response to question 1b.2 (also included in supplemental materials)

We observe that PSI 04 rates have been relatively stable from 2011-2013 in the AHRQ QI POA Reference Population data (116-118 deaths per 1000 patients with perioperative or postoperative complications). An earlier study of administrative data showed a decrease by 6.05% per year ($p < 0.0001$) (Downey et al., 2012).

Downey, J. R., et al. (2012). "Is patient safety improving? National trends in patient safety indicators: 1998-2007." *Health Serv Res* 47(1 Pt 2): 414-430.

4b.2. If no improvement was demonstrated, what are the reasons? If not in use for performance improvement at the time of initial endorsement, provide a credible rationale that describes how the performance results could be used to further the goal of high-quality, efficient healthcare for individuals or populations.

n/a

4c. Unintended Consequences

The benefits of the performance measure in facilitating progress toward achieving high-quality, efficient healthcare for individuals or populations outweigh evidence of unintended negative consequences to individuals or populations (if such evidence exists).

4c.1. Were any unintended negative consequences to individuals or populations identified during testing; OR has evidence of unintended negative consequences to individuals or populations been reported since implementation? If so, identify the negative unintended consequences and describe how benefits outweigh them or actions taken to mitigate them.

No evidence has been identified suggesting unintended consequences for this measure.

Coding professionals follow detail guidelines, are subject to training and credentialing requirements, peer review and audit.

5. Comparison to Related or Competing Measures

If a measure meets the above criteria and there are endorsed or new related measures (either the same measure focus or the same target population) or competing measures (both the same measure focus and the same target population), the measures are compared to address harmonization and/or selection of the best measure.

5. Relation to Other NQF-endorsed Measures

Are there related measures (conceptually, either same measure focus or target population) or competing measures (conceptually both the same measure focus and same target population)? If yes, list the NQF # and title of all related and/or competing measures.

Yes

5.1a. List of related or competing measures (selected from NQF-endorsed measures)

0352 : Failure to Rescue In-Hospital Mortality (risk adjusted)

0353 : Failure to Rescue 30-Day Mortality (risk adjusted)

5.1b. If related or competing measures are not NQF endorsed please indicate measure title and steward.

n/a

5a. Harmonization

The measure specifications are harmonized with related measures;

OR

The differences in specifications are justified

5a.1. If this measure conceptually addresses EITHER the same measure focus OR the same target population as NQF-endorsed measure(s):

Are the measure specifications completely harmonized?

No

5a.2. If the measure specifications are not completely harmonized, identify the differences, rationale, and impact on interpretability and data collection burden.

NQF 0353 uses 30-day mortality (dated from the date of the surgical admission), regardless of location, for the numerator. This is a different outcome from in-hospital mortality, and is only available in a very limited number of data sets, so NQF 0353 is a related (not competing) measure. NQF 0352 is a measure of in-hospital mortality, similar to PSI 04 (NQF 0351), but it has a different target population, so NQF 0352 is a related (not competing) measure. Specifically, the denominator for NQF 0352 and NQF 0353 is limited to surgical MS-DRGs in MDC 6 (Digestive System), MDC 7 (Hepatobiliary), MDC 9 (Skin, subcutaneous tissue, breast), MDC 10 (Endocrine, nutritional, metabolic), MDC 8 (Musculoskeletal and connective tissue), and MDC 5 (Circulatory system). By contrast, the denominator for PSI 04 (NQF 0351) also includes patients undergoing transplantation, neurosurgical, ophthalmologic, otolaryngologic (ENT), pulmonary/respiratory, urologic, gynecologic, hematologic, infection-related, trauma-related, and burn-related major procedures (if they otherwise qualify for the denominator). Therefore, the clinical/specialty breadth of the current measure is substantially greater than that of NQF 0352. Although all three of these measures are focused on “surgical patients between ages 18 and 90 admitted to an acute care hospital,” the available risk-adjustment for NQF 0352 and NQF 0353 is based on Medicare fee-for-service claims data, which greatly limits the usefulness of these two measures for users with all-payer data sets (i.e., hospitals and hospital systems/associations, state and regional health data agencies, regional quality collaboratives and other “report card” sponsors, and researchers using HCUP or similar data). By contrast, the publicly available risk-adjustment for PSI 04 (NQF 0351) is based on all-payer data from 34 US states. The target population for PSI 04 (NQF 0351) is substantially broader than the target population for NQF 0352 and NQF 0353, as described above. Another key difference in denominator specifications is that PSI 04 (NQF 0351) only includes patients who experienced one or more of five broad categories of perioperative or postoperative complications, as defined by the strata. By contrast, the denominators of NQF 0352 and NQF 0353 include patients with a much wider set of 38 perioperative or postoperative complications. More importantly, in-hospital death after surgery automatically qualifies a patient for the denominator of NQF 0352, regardless whether the patient had any reported complication. As a result, the numerator of NQF 0352 includes ALL in-hospital deaths after eligible operations, whereas the numerator of PSI 04 (NQF 0351) only includes in-hospital deaths that follow one or more of the stratum-defining complications. Previous studies suggest that PSI 04 (NQF 0351) captures about 42-49% of all in-hospital deaths after qualifying operations, whereas NQF 0352 captures 100% of these deaths. The clinical rationale for this difference is that focusing on a narrower subset of deaths provides an easier target for quality improvement efforts and makes the indicator more sensitive to nursing-related quality of care (i.e., nurses are presumably less likely to be able to “rescue” patients from sudden unexpected deaths or “planned” deaths, in which physicians’ orders and/or advance directives do not allow cardiopulmonary resuscitation or similar efforts). Specifically, a 2007 analysis cited in the Testing Form showed that the omega ratio summarizing the contribution of patient characteristics at the discharge-level versus hospital-level variables for explaining PSI04 (NQF 0351) was 57, compared with omega ratios of 189 for the overall risk-adjusted surgical mortality rate and 128 for NQF 0352. In other words, NQF 0352 is more heavily influenced by patient characteristics, whereas PSI 04 (NQF 0351) better isolates the hospital quality effect (albeit at the price of lower reliability, given that it only captures 42-49% of all in-hospital deaths after qualifying operations).

5b. Competing Measures

The measure is superior to competing measures (e.g., is a more valid or efficient way to measure);

OR

Multiple measures are justified.

5b.1. If this measure conceptually addresses both the same measure focus and the same target population as NQF-endorsed measure(s):

Describe why this measure is superior to competing measures (e.g., a more valid or efficient way to measure quality); OR provide a rationale for the additive value of endorsing an additional measure. (Provide analyses when possible.)

n/a

Appendix

A.1 Supplemental materials may be provided in an appendix. All supplemental materials (such as data collection instrument or methodology reports) should be organized in one file with a table of contents or bookmarks. If material pertains to a specific submission form number, that should be indicated. Requested information should be provided in the submission form and required attachments. There is no guarantee that supplemental materials will be reviewed.

Attachment [Attachment: PSI04_Supplemental_file_160531.pdf](#)

Contact Information

Co.1 Measure Steward (Intellectual Property Owner): [Agency for Healthcare Research and Quality](#)

Co.2 Point of Contact: [Pamela, Owens, Pam.Owens@ahrq.hhs.gov, 301-427-1412-](#)

Co.3 Measure Developer if different from Measure Steward: [Agency for Healthcare Research and Quality](#)

Co.4 Point of Contact: [Mamatha, Pancholi, Mamatha.Pancholi@ahrq.hhs.gov, 301-427-1470-](#)

Additional Information

Ad.1 Workgroup/Expert Panel involved in measure development

Provide a list of sponsoring organizations and workgroup/panel members' names and organizations. Describe the members' role in measure development.

In 2002, a workgroup convened and provided feedback on key indicator development decisions and methodology, including the usefulness of the Death Rate among Surgical Inpatients with Serious Treatable Complications (PSI04), formerly known as Failure to Rescue (PSI04). The active members of the panel were:

Michael Barrett, MD, Internist and Cardiologist
Blue Bell, PA
Medical College of Pennsylvania Hospital
Nominated by the American College of Physicians

William Golden, MD, Professor of medicine, Internist
Little Rock, AR
University of Arkansas for Medical Sciences
Nominated by the American College of Physicians

Constantine Manthous, MD, Critical care physician
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Yale University
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Evans, CO
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Mark Williams, MD, Hospitalist
Atlanta, GA
Emory University of Medicine
Nominated by the National Association of Inpatient Physicians

Charles Yowler, MD, Surgeon, Critical Care - Burn Surgery
Cleveland, OH

Case Western Reserve University
Nominated by the American College of Surgeons

In 2013, ten panels of experts were convened to support the process of converting the AHRQ QIs from ICD-9-CM to ICD-10-CM/PCS in an accurate and transparent manner, to improve the validity and usefulness of the QIs. Four of these panels –focused on Cancer, Infection, Medicine, and Surgery - advised AHRQ on the ICD-10-CM/PCS specifications for PSI 04. The active members of these panels were:

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Office of Quality & Patient Safety, New York State Dept of Health

Measure Developer/Steward Updates and Ongoing Maintenance

Ad.2 Year the measure was first released: 2002

Ad.3 Month and Year of most recent revision: 06, 2016

Ad.4 What is your frequency for review/update of this measure? Annually

Ad.5 When is the next scheduled review/update for this measure? 06, 2016

Ad.6 Copyright statement: The AHRQ QI software is publicly available. We have no copyright disclaimers.

Ad.7 Disclaimers: None

Ad.8 Additional Information/Comments: None