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Quality measures: measuring patient safety indicators across the Medicare, Medicaid, and commercially insured populations

Clarify Health is a certified national Qualified Entity (QE), which enables us to receive Medicare Fee-for-Service (FFS) claims data. The Center for Medicare and Medicaid Services QE program requires us to use these data to evaluate and publicly report on provider performance. The QE data, referred to as the Medicare FFS data set in this document, includes 100 percent of Medicare Parts A and B claims data and Part D prescription drug event data. Additionally, Clarify has a proprietary data set with Other-Payer data, including Commercial, Medicare Advantage, and Managed Medicaid claims for 200 million patient-years across all 50 states, Puerto Rico, and the District of Columbia. This data set offers an additional breadth and depth of information with which to gain insights into the quality of care in the United States. In this report, we have chosen to measure provider performance at the hospital level using a combined Medicare FFS and Other-Payer data set, as well as the individual Medicare FFS and the individual Other-Payer component data sets (i.e., Commercial and Medicaid Managed Care claims).

This public report evaluates a hospital-level, composite patient safety indicator (PSI), aggregated from ten standard quality measures for inpatient patient safety using claims data in 2021. Patient safety is a long-term concern of the US health system, with medical errors a [major problem](link). The composite PSI measure (known as PSI-90) was developed by the Agency for Healthcare Research and Quality (AHRQ). It provides an overview of hospital-level quality as it relates to a set of potentially preventable hospital-related safety events associated with harmful outcomes for patients. The specific [AHRQ-validated](link) safety measures incorporated into PSI-90 include:

- PSI 03: Pressure Ulcer Rate
- PSI 06: Iatrogenic Pneumothorax Rate
- PSI 08: In-Hospital Fall with Hip Fracture Rate
- PSI 09: Postoperative Hemorrhage or Hematoma Rate
- PSI 10: Postoperative Acute Kidney Injury Requiring Dialysis Rate
- PSI 11: Postoperative Respiratory Failure Rate
- PSI 12: Perioperative Pulmonary Embolism (PE) or Deep Vein Thrombosis (DVT) Rate
- PSI 13: Postoperative Sepsis Rate
- PSI 14: Postoperative Wound Dehiscence Rate
- PSI 15: Abdominopelvic Accidental Puncture or Laceration Rate

Overall, we document substantial variation in hospital-level rates of patient safety events measured by the PSI-90 composite across payers, states, and patient characteristics. Within hospitals, the patient safety events considered by the composite are more likely to occur among the Medicaid-insured, and less likely to occur among the Medicare-insured, on a risk-adjusted basis. Geographic variation exists with differences in average hospital-level PSI-90 scores observed across states. Finally, we observe that Blacks, Latinos, and patients of other races are more likely to experience adverse safety events during an inpatient admission compared with Asian/Pacific Islander and White patients.

Please keep the following caveats in mind as you review this report:

- These measures were calculated using claims data, which reflects services billed to an insurer. Variations in billing practices mean that not all services appear consistently in claims data when compared to other information sources like electronic health records or survey data.
- While all specifications were followed, the values in this report may diverge from other publicly reported measures that use different types or samples of data.
- All measures are reported as hospital-level estimates, with estimates risk-adjusted to account for differences in hospital case mix relative to national reference data and smoothed to adjust for hospitals with low sample size.
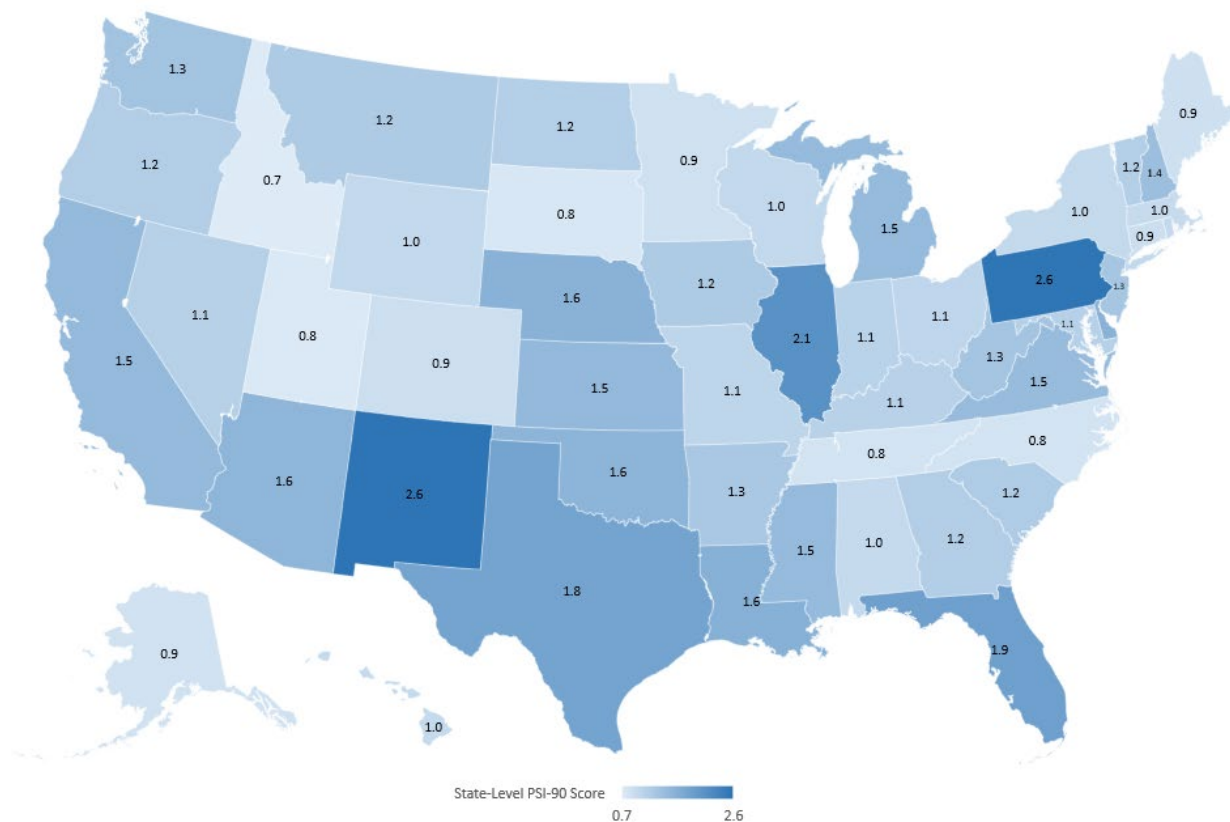
PSI-90 Results

The PSI-90 metric is calibrated by AHRQ around one, with scores above one reflecting lower rates of patient safety and scores lower than one reflecting better rates of patient safety. Considering estimates from over 4,291 US hospitals, we estimate higher hospital-level average PSI-90 scores among Medicaid and commercial discharges compared to discharges in FFS Medicare.

Payer Category	Average PSI-90 Score (N=4,291)	Confidence Interval
All Payers	**1.20**	**(0.57, 1.84)**
Medicare	0.98	(0.34, 1.62)
Medicaid	1.70	(0.91, 2.48)
Commercial	1.30	(0.52, 2.08)

Review of state-level PSI-scores highlights substantial variation in patient safety across the US. In particular, higher rates of patient safety events occurred in Pennsylvania, New Mexico, Illinois, Florida, and Texas in 2021.

State-Level PSI-90 Score
0.7   2.6

In addition to variation across types of insurance and geographic areas, substantial disparities in patient safety events are observed across race/ethnicity categories. Blacks, Latinos, and patients of other races (including unknown race) are observed to experience higher rates of safety events during an inpatient admission compared with Asian/Pacific Islander and White patients.

Race/Ethnicity Category	Average PSI-90 Score (N=4,291)	Confidence Interval
All	**1.20**	**(0.57, 1.84)**
Asian or Pacific Islander	1.01	(0.43, 1.61)
Black	1.15	(0.51, 1.74)
Latino	1.09	(0.45, 1.91)
Other Race	1.29	(0.83, 2.05)
White	1.07	(0.88, 1.81)

Component PSI Results

The PSI-90 composite is a quality measure made up of individual metrics, with variation in the composite metric determined by variation in individual metrics. Risk-adjusted, smoothed, hospital-level estimates of each of the component PSIs demonstrate continued variation in patient safety across hospitals. For most of the ten PSIs included in PSI-90, component indicator rates are estimated to be higher among patients with Medicaid and Commercial insurance compared to patients with Medicare FFS, consistent with overall estimates for the PSI-90 composite.

PSI Metric by Payer Type	Average Hospital-Level PSI Rate per 1,000 Discharges (N=4,291)	Confidence Interval
All Payers		
PSI 03: Pressure Ulcer Rate	1.39	(0.0, 3.2)
PSI 06: Iatrogenic Pneumothorax	0.17	(0.0, 0.3)
PSI 08: In-Hospital Fall with Hip Fracture	0.09	(0.0, 0.2)
PSI 09: Postoperative Hemorrhage or Hematoma	2.24	(0.7, 3.8)
PSI 10: Postoperative Acute Kidney Injury Requiring Dialysis	0.87	(0.0, 2.0)
PSI 11: Postoperative Respiratory Failure	6.03	(0.0, 13.1)
PSI 12: Perioperative Pulmonary Embolism (PE) or Deep Vein Thrombosis (DVT)	3.26	(1.0, 5.6)
PSI 13: Postoperative Sepsis	3.86	(0.9, 6.8)
PSI 14: Postoperative Wound Dehiscence	1.57	(0.0, 3.1)
PSI 15: Abdominopelvic Accidental Puncture or Laceration	0.96	(0.0, 2.1)
Medicare		
PSI 03: Pressure Ulcer Rate	0.59	(0.0, 2.4)
PSI 06: Iatrogenic Pneumothorax	0.17	(0.0, 0.3)
PSI 08: In-Hospital Fall with Hip Fracture	0.08	(0.0, 0.2)
PSI 09: Postoperative Hemorrhage or Hematoma	2.23	(0.6, 3.8)

PSI 10: Postoperative Acute Kidney Injury Requiring Dialysis	0.87	(0.0, 2.0)
PSI 11: Postoperative Respiratory Failure	5.96	(0.0, 13.1)
PSI 12: Perioperative Pulmonary Embolism (PE) or Deep Vein Thrombosis (DVT)	3.16	(0.8, 5.5)
PSI 13: Postoperative Sepsis	3.80	(0.9, 6.7)
PSI 14: Postoperative Wound Dehiscence	1.58	(0.0, 3.1)
PSI 15: Abdominopelvic Accidental Puncture or Laceration	0.98	(0.0, 2.2)
Medicaid		
PSI 03: Pressure Ulcer Rate	4.03	(1.7, 6.4)
PSI 06: Iatrogenic Pneumothorax	0.17	(0.0, 0.3)
PSI 08: In-Hospital Fall with Hip Fracture	0.08	(0.0, 0.2)
PSI 09: Postoperative Hemorrhage or Hematoma	2.26	(0.6, 3.9)
PSI 10: Postoperative Acute Kidney Injury Requiring Dialysis	0.90	(0.0, 2.0)
PSI 11: Postoperative Respiratory Failure	6.38	(0.0, 14.7)
PSI 12: Perioperative Pulmonary Embolism (PE) or Deep Vein Thrombosis (DVT)	3.37	(0.9, 5.9)
PSI 13: Postoperative Sepsis	4.00	(0.9, 7.1)
PSI 14: Postoperative Wound Dehiscence	1.57	(0.0, 3.1)
PSI 15: Abdominopelvic Accidental Puncture or Laceration	0.96	(0.0, 2.2)
Commercial		
PSI 03: Pressure Ulcer Rate	1.98	(0.0, 4.3)
PSI 06: Iatrogenic Pneumothorax	0.17	(0.0, 0.3)
PSI 08: In-Hospital Fall with Hip Fracture	0.08	(0.0, 0.2)
PSI 09: Postoperative Hemorrhage or Hematoma	2.26	(0.6, 3.9)
PSI 10: Postoperative Acute Kidney Injury Requiring Dialysis	0.90	(0.0, 2.0)

PSI 11: Postoperative Respiratory Failure	6.34	(0.0, 14.6)
PSI 12: Perioperative Pulmonary Embolism (PE) or Deep Vein Thrombosis (DVT)	3.35	(0.9, 5.8)
PSI 13: Postoperative Sepsis	3.97	(0.9, 7.0)
PSI 14: Postoperative Wound Dehiscence	1.57	(0.0, 3.1)
PSI 15: Abdominopelvic Accidental Puncture or Laceration	0.95	(0.0, 2.2)

Conclusions

PSIs were developed by AHRQ and adopted by CMS with the goal of helping provider organizations benchmark their performance, reduce safety events and preventable complications, and ultimately improve patient outcomes. Patient safety events continue to occur, and this public report documents widespread variation in patient safety across US hospitals. Furthermore, external evidence suggests that patient safety has worsened during the recent COVID-19 pandemic. While there are many ways to assess quality and safety, PSI-90 has been identified by CMS as a key metric for ongoing inclusion in public reporting and hospital value-based purchasing. Healthcare leaders should proactively assess this composite measure and the underlying component PSIs to promote patient safety across their inpatient populations.

About PSI-90

PSI 90 (National Quality Forum-endorsed measure 0531) is a composite complication measure composed from 10 separate Patient Safety Indicators (PSIs). The measure is intended to provide an overview of hospital-level quality as it relates to a set of potentially preventable hospital-related events associated with harmful outcomes for patients. To make meaningful comparisons about quality of care, the AHRQ PSIs take into account underlying differences across hospitals related to patient mix and other characteristics that are unrelated to quality. The PSI-90 composite is composed from smoothed, risk-adjusted rates of ten underlying patient safety events combining a weighted average of the reference population rate and the locally observed (hospital-level) rate; the weighting depends on whether an individual hospital includes many observations and thus provides numerically stable rate estimates. The PSI-90 composite is then calculated from the smoothed, component rates for each component PSI using a validated, AHRQ-defined weighted average formula. This formula to construct the PSI-90 composite reflects both the relative volume of patients impacted by a specific type of event and the specific clinical harm related to such an event.

About Component PSIs

The ten component PSIs included in the PSI-90 composite capture a wide range of specific patient harms among patients ages 18 years and older and were selected by AHRQ for inclusion in the composite based on literature review and expert opinions. Descriptions of each component indicator are provided below, with exact technical specifications available from AHRQ.

PSI Metric	Description
PSI 03: Pressure Ulcer Rate	Occurrence of Stage 3 or 4 (or unstageable) pressure ulcers (secondary diagnosis not present on admission) per 1,000 hospital discharges of surgical or medical patients.
PSI 06: Iatrogenic Pneumothorax	Hospital discharges with iatrogenic pneumothorax (secondary diagnosis) per 1,000 surgical and medical discharges.
PSI 08: In-Hospital Fall with Hip Fracture	In-hospital fall with hip fracture (secondary diagnosis) per 1,000 discharges.
PSI 09: Postoperative Hemorrhage or Hematoma	Discharges with postoperative hemorrhage or hematoma (secondary diagnosis) associated with a procedure to treat the hemorrhage or hematoma following surgery, per 1,000 surgical discharges.
PSI 10: Postoperative Acute Kidney Injury Requiring Dialysis	Hospital discharges with postoperative acute kidney failure (secondary diagnosis) requiring dialysis per 1,000 elective surgical discharges.

PSI 11: Postoperative Respiratory Failure	Hospital discharges with postoperative respiratory failure (secondary diagnosis), prolonged mechanical ventilation, or intubation cases per 1,000 elective surgical discharges.
PSI 12: Perioperative Pulmonary Embolism (PE) or Deep Vein Thrombosis (DVT)	Hospital discharges with perioperative pulmonary embolism or proximal deep vein thrombosis (secondary diagnosis) per 1,000 surgical discharges.
PSI 13: Postoperative Sepsis	Hospital discharges with postoperative sepsis (secondary diagnosis) per 1,000 elective surgical discharges.
PSI 14: Postoperative Wound Dehiscence	Hospital discharges with postoperative reclosure procedures involving the abdominal wall with a diagnosis of disruption of internal operation (surgical) wound per 1,000 abdominopelvic surgery discharges.
PSI 15: Abdominopelvic Accidental Puncture or Laceration	Hospital discharges with accidental punctures or lacerations (secondary diagnosis) per 1,000 discharges for patients who have undergone an abdominopelvic procedure in which a second abdominopelvic procedure occurs one or more days after the index abdominopelvic procedure.

About Clarify Health

Clarify Health is an enterprise analytics and value-based payments platform company that turns healthcare data into actionable insights for health plans, health systems, ACOs, and life sciences companies. Its healthcare analytics software products enable customers to manage referrals, optimize networks, improve care delivery, manage population risk, maximize value-based care performance, and commercialize pharmaceutical and biotechnology products – all of which depend on a superior understanding and trending of individual patient journeys and cohorts. The analytics and insights surfaced in its software solutions are drawn from the Clarify Platform, which elevates the usability of healthcare data to a standard suitable for machine learning, at a scale heretofore unseen in healthcare analytics. Its proprietary, patient-level data sets are comprehensive and longitudinal, and span over 300 million patient journeys utilizing government and commercial claims, lab, prescription, and social determinants data.

Learn more at https://clarifyhealth.com/.