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Progress Report

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EXECUTIVE SUMMARY

The Partnership for Patients (PfP) campaign was launched in April 2011 with the ambitious goals of reducing preventable hospital-acquired conditions (HACs) by 40 percent and 30-day hospital readmissions by 20 percent. To reduce harm at this level of magnitude, the campaign implemented a strategy to align all health care stakeholders, including federal and other public and private health care payors, providers, and patients, to focus on this issue concurrently. By influencing everyone to move in the same direction at the same time, the program strove to overcome the inherently limited reach of any single initiative operating in a complex environment. The three major components of the campaign, conceptualized as “engines,” are the Centers for Medicare & Medicaid Innovation (CMMI) investment engine, the federal partner alignment engine, and the outside partner engine. The program is national in scope, due to its level of implementation. For example, over 70 percent of general acute care hospitals in the United States (U.S.), representing over 80 percent of admissions, worked with PfP-funded Hospital Engagement Networks (HENs) during 2012-2013.

Purpose of the Report

The goal of the evaluation is to assess the harm reduction during the period when all three engines (CMMI, federal partners, and private partners) were engaged simultaneously in an extraordinary effort to meet the common goals. This report provides an interim assessment of the PfP campaign’s progress towards reducing hospital-acquired harms, based on the synthesis of evidence across multiple data sources and using multiple analytic techniques. The national scale of PfP makes it challenging to assess its overall impacts, as there is little opportunity to identify the progress that would be made in its absence. However, it is important to assess PfP’s overall progress towards its goals, even if more rigorous analyses examining specific features or components of PfP must wait for more complete data to become available.

Findings

The PfP campaign focuses on 11 areas of patient harm. To date, the evaluation has found clear evidence for decreased rates of harms in five of the eleven areas, meaning the decreases are statistically significant, and/or meet statistical process control criteria for a special cause decrease, and/or (in cases where only aggregated data are available) are large in magnitude. These areas include obstetrical early elective deliveries (OB-EED), readmissions, adverse drug events (ADE), ventilator-associated pneumonia (VAP), and central line-associated bloodstream infection (CLABSI). In the other six areas, to date, the evaluation has found mixed evidence, meaning some datasets show decreases, while others show no change, or even worsening, including venous thromboembolism (VTE), catheter-associated urinary tract infection (CAUTI), other OB adverse events (OB-Other), pressure ulcers, surgical site infections (SSI), and falls.

The cost estimates available to date suggest cumulative savings of between \$3.1 to \$4 billion as a result of the decreases in harms since the baseline of 2010. Additionally, AHRQ has estimated

15,500 deaths averted since 2010, based on mortality rate estimates associated with targeted harms.¹ Tables 1 and 2 synthesize the evidence available to date for improvement in the rate of adverse events in each of the 11 areas, and Table 3 provides cost reduction estimates from the two available sources of estimates to date. Since hospital payment policies and other U.S. Department of Health & Human Services (HHS) programs that played an important role as part of the PfP campaign were in place and making changes over time, it is not possible at this time for the evaluation to identify the portion of these harm reductions and savings attributable to the PfP campaign's direct work with hospitals versus alignment of forces for harm reduction versus other harm reduction work that would have continued with or without PfP. An analysis by the largest HEN in PfP (using data available only to the HEN) found a significant relationship between the number of the 11 PfP focus areas that its aligned hospitals focused on and the amount of data hospitals submitted (measures of engagement with PfP), and the hospital's performance as measured by a composite score representing overall level of outcomes improvement on the outcomes the HEN reported (see Appendix D). This analysis does not prove but is consistent with the hypothesis that hospitals that were more engaged with PfP were able to more effectively reduce harm.

Discussion and Next Steps

While this report demonstrates the progress towards achieving PfP goals, understanding which features or components of PfP were effective in reducing harms is critical for understanding how best to address patient safety in the future; additional analysis is underway for this purpose. Concurrent with the implementation of PfP, there have been significant national improvements in patient safety and readmissions. Additional planned analyses include updated national trend analysis, dose-response analysis, and mixed methods (qualitative and quantitative) analysis of the campaign's strategy as it relates to achieving national results.

In particular, several analyses by the Evaluation Contractor will provide additional insight on the relationship between PfP participation and harm reduction. These will include comparison of outcome trends in PfP-aligned and non-aligned hospitals, as well as using results from two rounds of a national survey of hospitals to examine whether hospitals that self-reported more engagement with PfP demonstrated greater 2-year improvement in implementing best practices in patient safety and experiencing larger reduction in harms.

Finally, improving patients' and families' engagement with their care has been a major PfP strategy to reduce harm and an important part of the CMMI investment. Additional analyses will describe the accomplishments of PfP in this area.

¹ Estimate of deaths averted in 2012 are from Noel Eldridge, "PfP's 'AHRQ National Scorecard' or National HAC Rate: Updated with Final 2012 Data." Updated June 2, 2014. Center for Quality Improvement and Patient Safety, AHRQ, and total 12,300. Estimate of deaths averted in 2011 are from a spreadsheet provided to the Evaluation Contractor by Noel Eldridge in March 2014, "2012 prelim sum PfP measures HACs", and total 3,200.

Executive Summary Tables 1-3

Table 1—Summary of Clear Evidence for Changes in Rates of Harms, by Adverse Event Area		
Clear Evidence for Improvement	Mixed Evidence	Clear Evidence for Worsening
<ul style="list-style-type: none"> ◆ OB-EED ◆ Readmissions ◆ ADE ◆ VAP ◆ CLABSI 	<ul style="list-style-type: none"> ◆ VTE ◆ CAUTI ◆ OB-Other ◆ Pressure Ulcers ◆ SSI ◆ Falls 	

Note: Clear Evidence for Improvement: A meaningful decrease in the rate of harms, where “meaningful” means that the decrease is statistically significant, and/or meets statistical process control criteria for a special cause decrease, and/or (in cases where only aggregated data are available) is large in magnitude. Although the Evaluation Contractor also examined alterations in the speed with which rates were changing (that is, the steepness of decline or growth in rates), and comparisons between HEN-aligned and non-HEN-aligned hospitals (see Table 2), this table focuses only on changes in rates .

Mixed Evidence: While some data sources show that rates are decreasing, other data sources show that rates are either unchanged, or even worsening.

Clear Evidence for Worsening: A meaningful increase in the rate of harms, where “meaningful” means that the increase is statistically significant, and/or meets statistical process control criteria for a special cause increase, and/or (in cases where only aggregated data are available) is large in magnitude.

The table summarizes evidence on changes in rates of adverse events and readmissions. It does not speak to the causes driving the changes.

Table 2—Additional Details on Evidence for Adverse Event Areas—Baseline Rates, Further Details on Changes in Rates, Speed with Which Rates Are Changing, Comparison Group Results, and Numbers of Events Averted			
Area of Focus	Data Suggesting Improvement	Data Suggesting or Consistent With No Change	Data Suggesting Worsening
<p>Obstetrical (OB)-Early Elective Deliveries (OB-EED) Most recent estimate of national EED rate is 4.3%</p>	<p>Change in Rate: A HEN-reported measure (the only measure available) shows 44.8 percent improvement between HEN-defined baseline periods (predominantly Q1 2012 or earlier) and follow-up periods (predominantly Q2 or Q3 2013).</p> <p>Events Averted: An estimated 16,088 EEDs have been averted, from calculations using HEN-reported data²</p>		

² All of the adverse event areas listed in this table have a range of estimates of numbers of events averted. These estimates are derived from a variety of data sources (e.g., the AHRQ National Scorecard, Medicare claims data, NHSN, NDNQI, and HEN-reported data). Appendix Table A-7, and Appendices B and C provide further information on these estimates.

Table 2—Additional Details on Evidence for Adverse Event Areas—Baseline Rates, Further Details on Changes in Rates, Speed with Which Rates Are Changing, Comparison Group Results, and Numbers of Events Averted

Area of Focus	Data Suggesting Improvement	Data Suggesting or Consistent With No Change	Data Suggesting Worsening
<p>Readmissions</p> <p>Most recent readmissions rate for Medicare FFS patients nationally is 17.7%</p>	<p>Change in Rate: Analysis of the Medicare claims-based measure suggests 7.4 percent improvement between 2010 and follow-up periods through October 2013.</p> <p>The HEN-reported all-payer measure points to 7.7 percent improvement between HEN-defined baseline periods (predominantly 2010 and 2011) and HEN-defined follow up periods (predominantly Q2 or Q3 2013).</p> <p>A second readmission measure calculated by the QIOs with Medicare claims data, which is seasonally adjusted and allows for each readmission to be counted as an index admission, improved 20 percent from January 2011 to April 2013.</p> <p>Change in Speed with which Rate Is Changing: Trends in improvement (reduction of readmissions) in the follow up period (March 2011 through September 2013) are significantly more rapid than in the 2009-2010 baseline period.</p>		
<p>Adverse Drug Events (ADE)</p> <p>Most recent national estimate of rate from the AHRQ National Scorecard is 41.9 per 1,000 discharges</p>	<p>Change in Rate: The only available measure, from the AHRQ National Scorecard, shows 15.4 percent improvement between 2010 and 2012.</p>		

Table 2—Additional Details on Evidence for Adverse Event Areas—Baseline Rates, Further Details on Changes in Rates, Speed with Which Rates Are Changing, Comparison Group Results, and Numbers of Events Averted

Area of Focus	Data Suggesting Improvement	Data Suggesting or Consistent With No Change	Data Suggesting Worsening
<p>Venous Thromboembolism (VTE) Most recent national estimate of rate from the AHRQ National Scorecard is 0.67 per 1,000 discharges</p>	<p>Change in Rate: The analyses of the national Medicare claims-based measure (p ' chart and pre/post comparison of rates) indicate 13.5 percent improvement between 2011 and the follow up period extending through Q3 2013.</p> <p>The all-payer, HEN-reported measure of PSI-12 per 1,000 surgical discharges indicates 15.5 percent improvement between HEN-defined baseline periods (predominantly 2010) and HEN-defined follow up periods (predominantly Q2 or Q3 2013).</p> <p>Change in Speed with which Rate Is Changing: Trends in improvement (reduction of harms) in the follow up period for the Medicare claims-based measure (through Q3 2013) are significantly more rapid than in the 2011 baseline period.</p>	<p>Comparison Group: The comparative change of HEN-aligned and non-HEN-aligned groups in the Medicare claims-based measure are not qualitatively different between the 2009-2011 baseline and follow-up period through Q1 2013.</p>	<p>Change in Rate: The AHRQ National Scorecard suggests 36.7 percent worsening between 2010 and 2012, although there may be a data issue.³</p>

³ AHRQ staff believes pulmonary embolisms may not have all been counted in 2010 as they were in 2012.

Table 2—Additional Details on Evidence for Adverse Event Areas—Baseline Rates, Further Details on Changes in Rates, Speed with Which Rates Are Changing, Comparison Group Results, and Numbers of Events Averted

Area of Focus	Data Suggesting Improvement	Data Suggesting or Consistent With No Change	Data Suggesting Worsening
<p>Ventilator-Associated Pneumonia (VAP)</p> <p>Most recent national estimate of rate from the AHRQ National Scorecard is 1.0 per 1,000 discharges</p>	<p>Change in Rate: The p' control chart for the NDNQI^{®4} measure of VAP per 1,000 ventilator days and the pre/post comparison of rates in this measure indicates 47.1 percent improvement between the baseline (2011) and follow up periods through Q3 2013.</p> <p>The AHRQ National Scorecard measure indicates 16.7 percent improvement between 2010 and 2012.</p>	<p>Change in Speed with which Rate is Changing:</p> <p>Trends in improvement (reduction of harms) in the follow up period (2012 through Q3 2013) are not different than the baseline period (2011).</p>	

⁴ NDNQI[®] is a registered trademark of the American Nurses Association (ANA).

Table 2—Additional Details on Evidence for Adverse Event Areas—Baseline Rates, Further Details on Changes in Rates, Speed with Which Rates Are Changing, Comparison Group Results, and Numbers of Events Averted

Area of Focus	Data Suggesting Improvement	Data Suggesting or Consistent With No Change	Data Suggesting Worsening
<p>Catheter-Associated Urinary Tract Infection (CAUTI)</p> <p>Most recent national estimate of rate from the AHRQ National Scorecard equals 10.6 per 1,000 discharges</p>	<p>Change in Rate: A measure with less complete reporting, CAUTI/1,000 catheter days-National Database of Nursing Quality Indicators® (NDNQI), shows significant improvement from 2011 to Q3 2013 (6.9 percent improvement). However, most improvement in this measure occurred in late 2011, prior to the Hospital Engagement Network (HEN) work period.</p> <p>The AHRQ National Scorecard data shows improvement of 13.1 percent between 2010 and 2012.</p>	<p>Change in Rate: A measure with less complete reporting, National Healthcare Safety Network (NHSN) SIR non-ICU, shows no signal for improvement in the control chart.</p> <p>QIO data indicate the CAUTI standardized infection ratio (SIR) remained steady from 2011 to 2013 in 667 facilities that worked with QIOs on the issue,</p>	<p>Change in Rate: The more NHSN SIR Intensive Care Unit (ICU) measure shows 14.2 percent worsening between Q1 2012 and Q2 2013.⁵ A measure with less complete reporting, NHSN SIR non-ICU, shows no signal for improvement in the control chart.</p> <p>Change in Speed with which Rate Is Changing: Trends in improvement (reduction of harms) in CAUTI/1,000 catheter days-NDNQI in the follow up period (Q1 2012 to Q3 2013) are significantly slower than in the baseline period (2011), although most of this occurs in 2011 before HEN work began.</p> <p>Comparison Group: Larger increases in the NHSN ICU SIR occurred among HEN-aligned hospitals than among the comparison group, between 2011 and the period Q1 2012 – Q2 2013.</p>

⁵ Q1 2012 was the first quarter of data available to the Evaluation Contractor from the NHSN; that was the first quarter that CMS required reporting of this measure by Medicare-participating hospitals. Data submitted prior to this was submitted voluntarily by many fewer hospitals, so it is not comparable to the 2102 and later data.

Table 2—Additional Details on Evidence for Adverse Event Areas—Baseline Rates, Further Details on Changes in Rates, Speed with Which Rates Are Changing, Comparison Group Results, and Numbers of Events Averted

Area of Focus	Data Suggesting Improvement	Data Suggesting or Consistent With No Change	Data Suggesting Worsening
<p>Central Line-Associated Bloodstream Infection (CLABSI) Most recent national estimate of rate from the AHRQ National Scorecard is 0.51 per 1,000 discharges</p>	<p>Change in Rate: Four measures indicate improvement:</p> <p>(a) 10.3 percent improvement between 2011 baselines and follow-up period through Q2 2013 for the NHSN-ICU CLABSI SIR measure,</p> <p>(b) 13.9 percent improvement for the NHSN-non-ICU CLABSI SIR measure for the same period,</p> <p>(c) 10.5 percent improvement for NDNQI's CLABSI/1,000 central line days measure between 2011 and Q3 2013, and</p> <p>(d) 46.0 percent improvement for Medicare claims-based measure for Central line-related bloodstream infection (PSI-07) per 1,000 discharges, between the Q2-Q4 2011 baseline period and Q3 2013.</p> <p>AHRQ National Scorecard data show improvement of 7.3 percent between 2010 and 2012.</p> <p>QIO data indicate the CLABSI SIR rate improved from 1.2 to .6 per 1,000 central line days between 2011 and 2013 for 148 hospitals that participated in QIO initiatives.</p>	<p>Change in Speed with which Rate Is Changing: The trend in improvement (reduction of harms) in the follow up periods are not different from the trend in the 2011 baseline periods for three measures (NHSN CLABSI SIR ICU, NDNQI CLABSI/1,000 central line days, and AHRQ PSI-07 CR-BSI per 1,000 discharges). (The follow-up periods run through Q2 2013 for the NHSN measure, and Q3 2013 for the other two measures.)</p>	

Table 2—Additional Details on Evidence for Adverse Event Areas—Baseline Rates, Further Details on Changes in Rates, Speed with Which Rates Are Changing, Comparison Group Results, and Numbers of Events Averted

Area of Focus	Data Suggesting Improvement	Data Suggesting or Consistent With No Change	Data Suggesting Worsening
<p>CLABSI cont.</p>	<p>Comparison Group: On average the change in the HEN-aligned hospitals’ NHSN SIR between the baseline (2011) and follow-up period (Q1 2012 – Q2 2013) was greater than for the comparison group.</p>		
<p>Falls Most recent national estimate of rate from the AHRQ National Scorecard is 7.2 per 1,000 discharges</p>	<p>Change in Rate: The two NDNQI measures, which are more sensitive and accurate than claims-based measures, but which include fewer hospitals, show improvement between 2011 and follow-up period through Q3 2013. The measure of all falls shows 7.9 percent improvement from baseline, and falls with injury shows 11.3 percent improvement.</p> <p>The AHRQ National Scorecard data show 8.9 percent improvement between 2010 and 2012.</p> <p>Change in Speed with which Rate Is Changing: The trends in the narrow post-operative hip fracture per 1,000 discharges (AHRQ PSI-08) show evidence of acceleration in the 12 months after Q2 2012, but not in the 12 months after Q3 2012.</p>	<p>Change in Speed with which Rate Is Changing: In two measures (falls per 1,000 patient days-NDNQI, falls with injury per 1,000 patient days-NDNQI), trends in improvement (reduction of harms) in the follow up period through Q3 2013 are either not different from the 2011 baseline period, or slower.</p> <p>Comparison Group: No differences between the HEN-aligned hospitals and the comparison group in change in PSI-08 rates between the 2009-2011 baseline and follow up period 2012 through Q1 2013.</p>	

Table 2—Additional Details on Evidence for Adverse Event Areas—Baseline Rates, Further Details on Changes in Rates, Speed with Which Rates Are Changing, Comparison Group Results, and Numbers of Events Averted

Area of Focus	Data Suggesting Improvement	Data Suggesting or Consistent With No Change	Data Suggesting Worsening
<p>Other OB Adverse Events (OB-Other)</p> <p>Most recent national estimate of Obstetric Trauma rate from the AHRQ National Scorecard is 2.2 per 1,000 discharges</p>	<p>Change in Rate: Two of the three HEN-reported measures, Obstetric Trauma (3rd and 4th degree lacerations) with and without instrumented delivery (PSI-18 and PSI-19, respectively), show improvement between HEN-defined baselines (predominantly 2010), and HEN-defined follow-up periods (predominantly Q2 or Q3 2013): 11.1 percent improvement for PSI-18, and 14.1 percent improvement for PSI-19.</p> <p>AHRQ National Scorecard data for the period 2010 to 2012 show 12.0 percent improvement for obstetric adverse events, based on PSIs 18 and 19 (taken together) from a sample of 29 states' all-payer data.</p>		<p>Change in Rate: One of the three HEN-reported measures, Birth Trauma—Injury to Neonate (PSI-17), shows 1.2 percent worsening between HEN-defined baselines (predominantly 2010) and HEN-defined follow-up periods (predominantly Q2 or Q3 2013).</p>

Table 2—Additional Details on Evidence for Adverse Event Areas—Baseline Rates, Further Details on Changes in Rates, Speed with Which Rates Are Changing, Comparison Group Results, and Numbers of Events Averted

Area of Focus	Data Suggesting Improvement	Data Suggesting or Consistent With No Change	Data Suggesting Worsening
<p>Pressure Ulcers</p> <p>Most recent national estimate of rate from the AHRQ National Scorecard is 39.4 per 1,000 discharges</p>	<p>Change in Rate: The voluntarily reported NDNQI measure of stage 2+ pressure ulcers shows 26.3 percent improvement between 2011 and follow up period through Q3 2013. The HEN-reported measure of stages 3+ pressure ulcers also shows 29.1 percent improvement, between HEN-defined baselines (predominantly 2010 or 2011) and HEN-defined follow-up periods (predominantly Q2 or Q3 2013).</p>	<p>Change in Rate: The measure focused on more severe pressure ulcers in the Medicare claims data shows 2.0 percent improvement (not significant) between the 2011 baseline period and follow-up period through Q3 2013.</p> <p>The AHRQ National Scorecard measure shows 2.2 percent improvement from 2010 to 2012 (not able to be tested, considered likely not significant).</p> <p>Comparison Group: No greater improvement in rates among HEN-aligned hospitals than among comparison group hospitals for the Medicare measure of more severe pressure ulcers between the 2009-2011 baseline and 2012 through Q1 2013 follow-up period.</p> <p>Change in Speed with which Rate Is Changing: Trends in improvement (reduction of harms) in the follow up period are either not different than the baseline period, decelerating, or even turning the wrong way (increased harms).</p>	

Table 2—Additional Details on Evidence for Adverse Event Areas—Baseline Rates, Further Details on Changes in Rates, Speed with Which Rates Are Changing, Comparison Group Results, and Numbers of Events Averted			
Area of Focus	Data Suggesting Improvement	Data Suggesting or Consistent With No Change	Data Suggesting Worsening
Surgical Site Infections (SSI) Most recent national estimate of rate from the AHRQ National Scorecard is 2.5 rate per 1,000 discharges	Change in Rate: The AHRQ National Scorecard measure—which covers SSIs across many surgeries but whose denominator may have limitations—suggests 13.8 percent improvement between 2010 and 2012. ⁶	Change in Rate: One NHSN measure focused on abdominal hysterectomy SSIs shows no change (0.2 percent worsening) between Q1 2012 and Q2 2013. ⁷ Comparison Group: Comparative analysis does not show a difference between HEN-aligned hospitals’ change and the comparison group’s on either of these measures between 2012 (baseline) and Q2 2013.	Change in Rate: The NHSN measure for SSI after colon surgery indicates 14.9 percent worsening over the same period.

Note: The previous table summarized evidence on changes in adverse event rates, whereas this table provides not only further details on the evidence on changes in adverse event rates, but also information on changes in the speed with which rates are changing, comparison group results, and on baseline event rates and numbers of events averted.

Table 3 provides estimates of cost reductions associated with the reductions in adverse events described above. Appendix A describes the two methods for estimation.

- ◆ AHRQ has estimated cost reductions for each HAC using the AHRQ National Scorecard estimates of the difference in number of adverse events in the U.S. in 2010 and 2012, multiplied by the cost-per-event estimate developed prior to PfP by an HHS team including representatives from CMS, AHRQ, CDC, and other agencies (see Appendix A).
- ◆ The second column provides estimates of cost reductions for each HAC using the various data sources and trends described in the report below, and using cost-per-event estimates from the literature and new analysis as described in Appendix A. As noted in the table, some of the estimates are only partial estimates, because the data available do not cover the entire U.S. population, and/or the data do not include the full time period since 2010.

⁶ The denominator for the National Scorecard measure is all discharges, rather than surgical discharges, so that if fewer surgeries are done in the hospital (e.g., due to increasing prevalence of outpatient surgery centers), the rate of SSIs will appear to drop.

⁷ Q1 2012 was the first quarter of data available to the Evaluation Contractor from the NHSN for SSI measures; that was the first quarter that CMS required reporting of this measure by Medicare-participating hospitals. Data submitted prior to this was submitted voluntarily by many fewer hospitals, so it is not comparable to the 2012 and later data.

Table 3—Changes in Cost Associated with Changes in Adverse Events—Estimates to Date

Area of Focus	AHRQ Estimate of Cost Reductions Due to Reductions in Adverse Events from the AHRQ National Scorecard (Rounded)	Estimate of Cost Reductions Due to Reductions in Adverse Events from Other Data Sources* (Rounded)
OB-EED	Not estimated	\$12,620,000
Readmissions	Not estimated	\$2,821,420,000
Adverse Drug Events	\$1,380,000,000	Not estimated
VTE	-\$24,000,000	\$40,630,000
VAP	\$147,000,000	\$23,910,000
CAUTI	\$80,000,000	-\$710,000
CLABSI	\$34,000,000	\$166,290,000
Falls	\$217,020,000	\$4,240,000
OB-Other	\$15,000,000	\$900,000
Pressure Ulcers	\$340,000,000	\$2,600,000
SSI	\$588,000,000	\$37,970,000
All Other Hospital-Acquired Conditions	\$1,190,000,000	Not estimated
Total	\$3,967,020,000	\$3,109,870,000

Note: All estimates have been rounded. The total differs from the sum of the estimates because the total was derived using the sum of unrounded data.

*All estimates in this column except the estimate for readmissions are partial estimates limited to available data and cost estimates from the literature or new analysis as follows: OB-EED estimates reduced costs due to estimated reduced use of the NICU only, and cover only hospitals reporting to their HEN; VAP, Falls, and OB-Other estimates cover only hospitals reporting to their HEN or NDNQI, depending on the measure (no extrapolation); SSI covers SSI for only two of many relevant surgical conditions; CAUTI and CLABSI measures cover hospital units reporting to NHSN only; pressure ulcers covers only high-stage pressure ulcers; and VTE baseline data are for Q2-Q4 2011 rather than 2010, due to data issues in earlier data.

1. INTRODUCTION

This report is a February 2014 assessment for the Partnership for Patients (PfP) campaign, based on synthesis of evidence across multiple data sources and using multiple analytic techniques. The most recent data in the analyses cover Q1, Q2, or Q3 2013, depending on the measure.

Overview of The Partnership for Patients

The PfP model is a test of whether it is possible to achieve national spread of proven practices to reduce hospital inpatient harms and readmissions across all U.S. acute care hospitals. The specific goals of PfP are to reduce preventable inpatient harms by 40 percent and readmissions by 20 percent by the end of 2014; these ambitious goals were chosen to propel aggressive action. To achieve these ambitious goals, CMS established a campaign that was designed to align both new and existing programs across United States (US) Department of Health and Human Services (HHS) and the country to focus on making care safer in America's hospitals. Specifically, PfP is designed to prevent readmissions and inpatient harms in nine focus areas: adverse drug events (ADE), falls, pressure ulcers (PrU), catheter-associated urinary tract infections (CAUTI), central line-associated blood stream infections (CLABSI), surgical site infections (SSI), ventilator-associated events (VAE), venous thromboembolism (VTE), and obstetric (OB) events.

An important element of the evaluation will be to assess the extent to which the ambitious aims of a 40 percent reduction in preventable harm and a 20 percent reduction in 30 day readmissions were met. However, it will be even more important to assess whether improvements in quality and/or concurrent reductions in cost beyond the total CMS Innovation Center investment were achieved. This aspect of the evaluation will be key to determining whether the test is determined to be successful in the context of the Affordable Care Act (ACA) 3021 Statute.

PfP was launched to the general public in April 2011, and the first major initiative was a webinar series, focused on prevention of inpatient harms and available to all hospitals nationally, conducted by the National Quality Forum (NQF). Concurrently, hospitals and health care professionals were encouraged to sign a pledge to reduce preventable patient harms. PfP implementation intensified during 2012, after CMS awarded contracts to Hospital Engagement Networks (HENs) and support contractors in late 2011.

How PfP Intends to Achieve its Goals

PfP intends to achieve its goals of preventing inpatient harm and reducing readmissions by aligning three "engines" of change: HHS agencies and programs, HENs and support contractors funded under PfP, and non-federal public and private-sector organizations. The Partnership is different from other more specific quality improvement initiatives in that it both includes these initiatives as one of the drivers for achieving results -- such as Quality Improvement Organization (QIO) work on the 10th Scope of Work, but also extends beyond quality improvement and technical assistance to incorporate other drivers of national spread. Other drivers and contributors to the national test of spread include payment programs, reporting programs, proactive engagement of key networks like rural hospitals supported by Health Resources and Services Administration

(HRSA) programs, alignment of incentives by other payors such as the US Office of Personnel Management Federal Employees Health Benefit plans, and alignment with powerful and influential partners like the American College of Obstetricians and Gynecologists (ACOG) and their work to reduce maternal harm, including early elective deliveries. The aligned forces of federal programs, the programs and platforms of private partners, and the CMS Innovation Center are all aimed at supporting progress towards the aims in the national test of spread. Some of the many examples of these activities include:

- ◆ HHS agencies and programs, including the following, are actively coordinated through a weekly “federal partners” meeting:
 - Medicare payment policy under the Hospital Readmissions Reductions Program, which downward-adjusts payment to hospitals with high readmissions rates for certain conditions; and Section 3008 of the ACA, which provides for payment penalty based on high rates of hospital-acquired conditions, beginning in fiscal year (FY) 2015.
 - QIOs, which work with hospitals under the Medicare-funded 10th Scope of Work to reduce hospital-acquired infections (HAIs), and work with communities to reduce hospital readmission.
 - The Agency for Healthcare Research & Quality (AHRQ), which funds large-scale assistance to hospitals to implement the Comprehensive Unit-based Safety Programs (CUSP) for CLABSI and CAUTI, two of PfP’s focus areas, and funds TeamSTEPPS training centers to improve communication and teamwork skills among health care professionals, considered a foundation of hospital safety.
 - The Centers for Disease Control and Prevention (CDC), which operates the National Healthcare Safety Network (NHSN) and funds personnel in state departments of health to track and reduce healthcare-acquired infections.
 - The Community-based Care Transition Program (CCTP), which works to improve patient care transitions from the inpatient hospital to other care settings and prevent readmissions for high-risk beneficiaries.¹⁻¹
 - The Administration for Community Living (ACL) (formerly Agency on Aging [AoA]), which has mobilized the nation’s agency services network including Area Agencies on Aging, to reduce 30-day readmissions via participation in the Community Based Care Transitions Program and through other activities.
 - US Office of Personnel Management, which has aligned guidance for the approximately 100 Federal Employees Health Benefit plans with the two aims of the Partnership, including a special focus on reduction of early elective deliveries.
- ◆ The Centers for Medicare & Medicaid Services CMS PfP staff manage HENs and support contractors that were funded under PfP:
 - In December 2011, HHS awarded 2-year contracts to 26 HENs to facilitate hospitals’ adoption of evidence-based practices to achieve PfP goals. All 26 HENs were later awarded an option year which extended their work to December 2014.¹⁻²

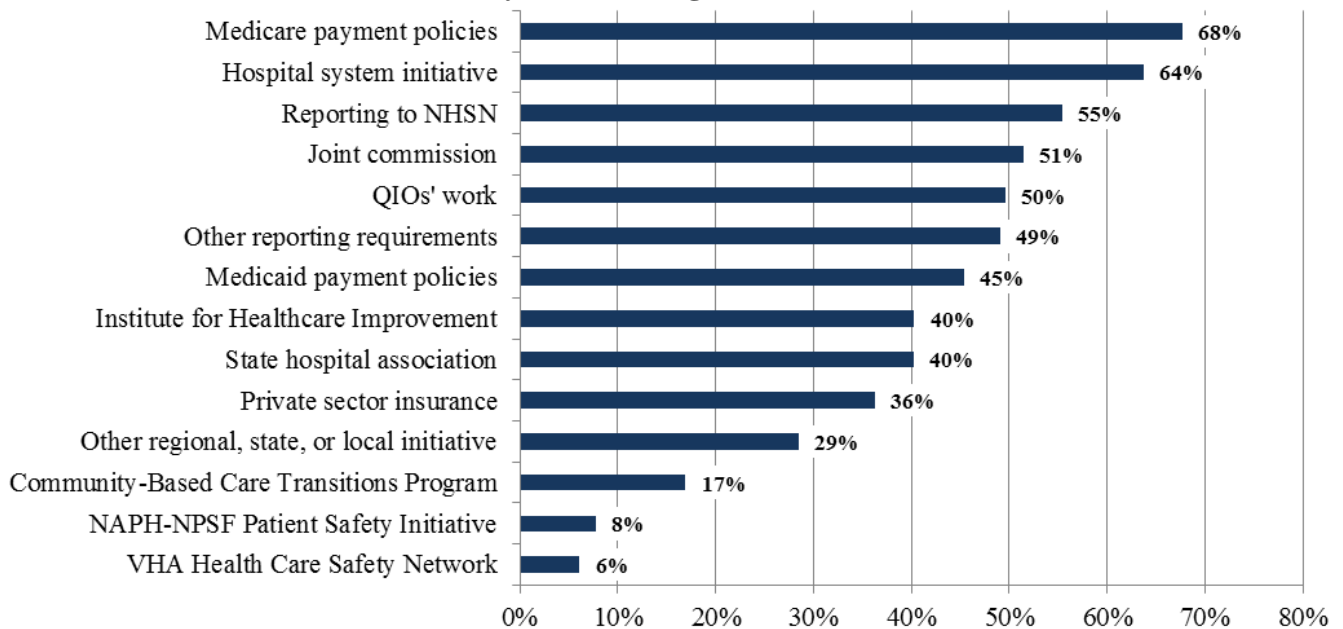
¹⁻¹ The CCTP is a care transitions model test under Section 3026 that is an important element of the PfP that has its own independent evaluation, so it is named separately here.

¹⁻² The Indian Health Services (IHS) joined the Partnership as the 27th HEN through an interagency agreement more than a year after other HENs had begun their work.

- The National Content Developer (NCD) established and manages a learning community of the HENs, which has included well-attended weekly virtual learning sessions (“pacing events”), and an online “Community of Practice” Web site where resources are shared.
- The Evaluation Contractor provides monthly formative evaluation reports that feedback summary and HEN-specific information to CMS and HENs on progress toward campaign objectives, assists HENs with their measurement strategies, and works with the NCD to support learning sessions.
- The Patient and Family Engagement Contractor (PFEC) has built a network of patients who tell their stories of harm to help motivate hospitals to act, links HENs to appropriate patient speakers, develops case stories of hospitals successfully involving patients and families in patient safety, and provides relevant resources to promote patient-centered care.
- ◆ Non-federal public and private-sector organizations work toward PfP goals:
 - The NQF serves as the PfP’s primary means to reach and influence private-sector organizations. For example, with PfP funding, NQF convened a series of patient safety improvement meetings during 2012 bringing together representatives from the National Priorities Partnership (NPP), including payer and purchaser representatives, and more recently convened relevant associations of health care professionals to focus on mobilizing the workforce to prevent inpatient harm.
 - Public and private organizations working intensively to reduce early elective deliveries include state Medicaid agencies, some of which have stopped paying for such deliveries, the March of Dimes, and ACOG.

Consistent with the broad approach of PfP, a national survey of hospitals in May to July 2012, conducted by the PfP program, summarized some of the many factors in addition to HENs that were influencing hospitals’ action on the PfP focus areas (Figure 1-1). The survey asked what other federal and private partner actions were influencing hospital actions. The survey also suggested that many hospitals believed they would need HENs to accomplish their harm reduction goals—for example, 69 percent of the hospitals that said they were somewhat or very likely to reduce readmissions by 20 percent by the end of 2013 said they would need HEN assistance to do so.

Figure 1-1—Many Factors Influence Hospital Action on PfP Adverse Event Areas, Beyond Working with HENs



Source: Hospital Survey on Prevention of Adverse Events and Reduction of Readmissions, conducted by Mathematica Policy Research, May-July 2012 (n=1,655 hospitals).

HENs and HEN-Aligned Hospitals

As noted above, HENs are the major technical technical assistance arm of PfP, and are directly funded by the campaign. HENs include large and small organizations of different types, all of which had existing relationships with hospitals on which to build. The largest HEN is the American Hospital Association/Hospital Research and Education Trust (AHA/HRET) HEN, which includes over 1,700 hospitals, and which works closely with 31 state hospital associations (SHA) to achieve the campaign goals. Other HENs include hospital systems (e.g., Ascension Health), SHAs (e.g., New Jersey Hospital Association), and other organizations connected with hospitals in multiple states (e.g., VHA, Premier Inc., and the University Health Consortium [UHC]).

Together, HENs recruited over 70 percent of U.S. short stay acute care hospitals (over 3,700 hospitals) to participate with them in the campaign, which account for about 80 percent of U.S. acute care admissions. A second round of hospital recruitment, underway in early 2014 by HENs, promises to further increase the scale of the campaign.

The activities undertaken by HENs to support harm reduction in their hospitals vary by HEN, but include establishing learning communities with frequent educational events and Listservs; collaboratives that meet regularly with a topical focus; sharing of best practices through in-person and virtual meetings; recognition or celebrations of hospital successes; data feedback and publishing of hospital-specific data within the group to stimulate friendly competition; hospital harm reduction workplans developed with HEN support; individual follow up to hospitals with higher rates of harm; and involvement of patient and family representatives as speakers to tell their stories to help motivate commitment and encourage patient and family engagement. HEN strategies and hospital interventions for OB-EED, readmissions, pressure ulcers, falls, and CAUTI have been described in briefs submitted to CMS by the Evaluation Contractor.

Research Questions and Analyses

This Preliminary Evaluation Progress Report uses multiple data sources and evaluation methodologies to summarize current evidence for improvement, evidence for no improvement or evidence for worsening on each of the priority areas of focus on the PfP.

The report takes an approach of summarizing the preponderance of evidence for change at this stage of overall initiative. Subsequent versions of this report are anticipated to make more definitive conclusions of progress, after more time has elapsed and in consultation with the CMS Office of the Actuary. Additionally, subsequent versions of this report will also contain more detailed and extensive analyses, such as examination of the extent to which Pfp worked better for some subgroups of hospitals than for others, with hospital subgroups to include variation in urban/rural, size, type of HEN, teaching status, and system ownership status .

Many of the results presented in this report are cross-cutting rather than focused on the impact of a specific component of Pfp. That is, they focus on whether rates of targeted outcomes have improved across all hospitals nationally since the Pfp campaign began, and particularly on the period since the HENs began work. For example, were rates of pressure ulcers lower in later years and quarters than in earlier ones? That is an examination of change in rate. The Evaluation Contractor uses statistical control charts as the primary method of detecting change in rate, although t-tests were also performed to detect differences in the speed with which the rate is changing over time, as well. See Appendix A for a description of the construction of the control charts, the rules used to detect “special cause” variation, and the conduct of t-tests.

In order to aid interpretation of the data on how rates have changed (or not changed) over time, where possible the Evaluation Contractor also examines:

- ◆ How trajectories of outcomes have changed, and
- ◆ How improvement in outcomes among hospitals that have been working with HENs compare to improvement among hospitals not working with HENs.

For many adverse events, rates were changing before the Pfp campaign started or the HENs began their work. If rates had been on an improving trajectory, the Evaluation Contractor might expect at least some continued improvement even in the absence of new intervention. The “Change in Speed with which Rate is Changing” test examines whether the outcome’s trajectory has been “bent.” Typically, this is tested by measuring change in a particular measure for the earliest 12-month period for which data are available, and compare that to change during more recent 12-month periods since HENs’ work began. For example, if the data for a given outcome run from 2011 Q1 through 2013 Q3, the baseline change would be measured from Q1 2011 to Q1 2012. That change would be compared to change occurring during each of the following three 12-month followup periods: Q1 2012 to Q1 2013, Q2 2012 to Q2 2013, and Q3 2012 to Q3 2013.¹⁻³ Although the Evaluation Contractor might reasonably expect some carryover in trend from earlier to later

¹⁻³ Year periods were chosen in order to avoid concern about seasonality affecting change. Further analyses of changes in trend will be conducted in a regression framework what will permit comparisons of trend across the follow-up period as a whole (vis-à-vis the baseline trend), rather than in yearly sub-sections.

periods, it is not possible to know with confidence how much change to have expected to occur in the absence of the intervention based on preexisting trends alone.

One important policy change that occurred prior to PfP, and continued throughout PfP's implementation, is the reduction in payment for hospitals that do not meet standards for reporting quality measures, and later, outcome standards. Under CMS's Inpatient Prospective Payment System (IPPS), hospital payments can be reduced if a hospital does not meet CMS's requirements as measured in an earlier period. On the figures, the Evaluation Contractor has indicated when new measures began affecting payment during the measurement period displayed. Note that since the payment changes were based on performance data measured well before the actual payment changes were implemented, it is difficult to know if, and when, hospitals responded to the incentives associated with such changes; indeed, it is reasonable to argue that many hospitals responded to these incentives well before the actual payment changes occurred. Nevertheless, the Evaluation Contractor indicates these payment incentives on the figures at the times they became effective, as they are an important component of the overall system.¹⁻⁴

Because of the investment in HENs as a major component of PfP, some analyses focus on change in HEN-aligned hospitals. In order to obtain a "counterfactual" estimate of what change might have been expected among these hospitals if they did not work with a HEN, where possible the Evaluation Contractor examines changes in outcomes among a comparison group of hospitals that are similar on observable characteristics to hospitals that did work with a HEN and then compare those "non-aligned" hospitals' outcomes to the outcomes of HEN-aligned hospitals. The Evaluation Contractor created the comparison groups using a propensity score reweighting approach, which gives greater weight to non-aligned hospitals that are more similar to HEN-aligned hospitals and less weight to those that are not. The weights were based on a wide range of hospital characteristics, such as pre-intervention level and trajectory of outcomes of interest, case mix, physician type mix, size, location (urbanicity, region), ownership type, and teaching status. See Appendix A for further detail on the matching approach and characteristics included in the matching model.

To further increase the likelihood that any observed differences between the groups are due to the PfP HEN component, rather than other potential causes, the comparison group analyses used a hospital fixed effects approach to net out effects of any time-invariant (stable) differences between hospitals, whether observed or unobserved.

There are two caveats to the comparison group analysis. First, as discussed above, the HENs' work is only one of the elements used to achieve PfP goals; thus the comparison group analyses only address the effectiveness of the HEN activities. Second, because non-aligned as well as HEN-aligned hospitals received benefits from PfP, the comparison method may underestimate the true impact of PfP. Subsequent iterations of this evaluation will work to assess, document and address the impacts of PfP experienced by non-aligned hospitals.

While this analysis between HEN-aligned and non-HEN-aligned hospitals provides the most rigorous and reliable information as to whether participation in the campaign is related to

¹⁻⁴ The payment incentives were added to graphs presenting evidence for VTE, SSI, CAUTI, Pressure Ulcers, and CLABSI.

outcomes, one of the HENs, AHA/HRET, also gathered evidence regarding the relationship between intensity of participation and levels of improvement. Because of data limitations, the analysis could not distinguish between whether a higher degree of hospital engagement resulted in better outcomes, or, conversely, whether hospitals with better management and outcomes were more likely to engage more intensively in the PFP program. However, it does show positive correlation between degree of participation and outcomes, even if it does not show causation. These results produced by AHA/HRET are included in Appendix D.

The evaluation is also conducting a qualitative evaluation, which is examining a number of different factors, including the role of the various influences on hospitals’ patient safety actions listed in Figure 1-1. Qualitative study results are not presented below, but will be presented in future reports.

Major Data Sources

Table 1-1 lists the major data sources used for this report and notes key strengths and weaknesses as the data sources pertain to the measures used in this analysis. See Appendices B and C for more detail on data sources and strengths and weaknesses of the measures, respectively.

Table 1-1—Data Sources—Strengths and Weaknesses

Data Source	Strengths	Weaknesses
<p>AHRQ National Scorecard Data Estimates of the incidence of adverse events for 2010, 2011, and preliminary 2012; mostly drawn from a representative nationwide sample of inpatient charts, along with estimates of healthcare-acquired infections (HAI) from the Centers for Disease Control and Prevention (CDC) surveillance data, and of obstetrical events from all-payer claims data.^{a, b, c}</p> <p>The specific source used in this report is: “Annual Partnership for Patients Hospital-Acquired Conditions (HACs) Data,” Draft for Presentation January 15, 2014, Noel Eldridge, AHRQ Center for Quality Improvement and Safety.</p>	<p><u>Representative</u>: Generalizable to the full U.S. population.</p> <p><u>Measure sensitivity</u>: Relies heavily on inpatient medical charts, considered the “gold standard” of accuracy for identifying patient safety events.</p>	<p><u>Timing</u>: Data are only available annually, and 2012 results are still preliminary.</p> <p><u>Denominators for SSI and Obstetric harm</u>: Because of their intended use, all indicator denominators are the same--all discharges (rather than a narrower group of patients relevant to the measures). This may not be the best denominator for the purpose of analyzing area-specific improvement for SSI and Obstetrics. In the case of SSI, this type of rate could go down if the number of surgeries in the hospital decreased; similarly for Obstetric harm the rate could go down if the number of births in hospitals decreased.</p>

Table 1-1—Data Sources—Strengths and Weaknesses

Data Source	Strengths	Weaknesses
<p>CDC’s NHSN Data on HAIs are provided by hospitals to the CDC. The CDC provides to PfP, in aggregate form, measures of CAUTI, CLABSI, and SSIs that are most complete and most relevant to the campaign.</p>	<p><u>Measure sensitivity</u>: Due to the surveillance methodology, measures have a strong ability to identify the infections that exist in the reporting hospitals.</p> <p><u>Risk-adjusted</u>: Data are risk-adjusted.^d</p> <p><u>Hospital representativeness (for most measures)</u>: Data for CAUTI and CLABSI in ICU units, as well as the two SSI measures, are nationally representative of hospitals in Medicare’s inpatient prospective payment system (IPPS), since reporting is required.</p>	<p><u>Hospital representativeness (for some measures)</u>: CAUTI and CLABSI data outside the ICU were reported only by a voluntary subset of hospitals and thus may not accurately reflect rates for all hospitals.</p> <p><u>Limited scope (for SSI measures)</u>: SSI data only cover two common procedure types.</p>
<p>Medicare claims data Claims data for the Medicare fee-for-service (FFS) population are used to calculate readmissions and AHRQ-defined PSIs for pressure ulcers, CR-BSI, falls, and VTE.</p>	<p><u>Complete for Medicare</u>: Available for the entire Medicare FFS population.</p>	<p><u>Measure sensitivity</u>: Measures based on claims data typically undercount the actual number events.</p> <p><u>Vulnerability to coding changes</u>: Changes in hospitals’ coding on the claims over time can affect trends, particularly where payment policies have changed that may cause coding changes.</p>
<p>NDNQI Data The NDNQI maintained by the ANA provides data for rates of falls, pressure ulcers, CAUTI and CLABSI, and VAP.</p>	<p><u>Sensitive</u>: Falls and pressure ulcer measures from this source are more sensitive and accurate than claims-based measures for these areas, due to their use of a surveillance method.</p> <p><u>Only source</u>: Only existing, available source on VAP and of <i>observed</i> rates on CAUTI and CLABSI, which are a useful complement to observed/expected rates.</p>	<p><u>Hospital representativeness</u>: NDNQI is a voluntary database that hospitals pay to participate in. Therefore, it is likely that hospitals that value participation and improvement on these measures more and have more resources are disproportionately represented in the database.</p>
<p>HEN Data Data self-reported by HENs for their aligned hospitals.</p>	<p><u>Only source</u>: Only available source for trends in OB-EED and OB-Other harms.</p> <p><u>Only all-payer source</u>: Only all-payer data source for VTE, pressure ulcers, and readmissions.</p>	<p><u>Varied time periods complicate analysis</u>: HENs vary in the periods over which they report data, which limits ability to measure trends.</p> <p><u>Measurement inconsistency</u>: Slight variation across HENs in how their readmissions and EED rates are calculated.</p>

Table 1-1—Data Sources—Strengths and Weaknesses

Data Source	Strengths	Weaknesses
<p>QIO Program Data Data reported by the QIO program for communities engaged in reducing readmissions, and for hospitals in which QIOs provided intensive assistance in the reduction of HAIs (data are from Medicare claims and CDC/NHSN)</p>	<p><u>Different method of measuring readmissions, which includes adjusting for seasonality</u> and allows for each hospital readmission to be counted as an index admission, giving more weight to those that have frequent admissions.</p>	<p><u>Hospital representativeness:</u> Limited number of hospitals voluntarily receiving intensive assistance from their QIOs in reducing HAIs, making them non-representative of all hospitals in general.</p>

^aCollected as part of AHRQ’s Medicare Patient Safety Monitoring System (MPSMS).

^bThe CDC’s NHSN.

^cThe AHRQ-led Hospital Cost and Utilization Project (HCUP).

^dThe CDC reports results as “standardized infection ratios” (SIRs), which are observed-to-expected rates of infection.

Why Does the Partnership Depend on a Synthesis Approach for Assessing Results?

The very characteristics that were designed to make PfP effective also complicate measurement of results and hamper the evaluation’s ability to attribute changes in outcomes to the campaign. Table 1-2 contrasts characteristics of a traditional intervention and evaluation cycle with PfP. Given these characteristics, a synthesis of evidence across sources and measures is necessary.

Table 1-2—Comparison of the Characteristics of Traditional Intervention and Evaluation Cycles with PfP

Characteristic	Traditional Intervention and Evaluation Cycle	PfP
Scale	<ul style="list-style-type: none"> ◆ Limited (focused on particular sub-populations or locations) 	<ul style="list-style-type: none"> ◆ All patients within acute care hospital inpatient settings nationally
Scope	<ul style="list-style-type: none"> ◆ Often narrow 	<ul style="list-style-type: none"> ◆ Broad (11 areas of focus)
Goals	<ul style="list-style-type: none"> ◆ Incremental 	<ul style="list-style-type: none"> ◆ Bold
Definition of intervention	<ul style="list-style-type: none"> ◆ Single definition 	<ul style="list-style-type: none"> ◆ Locally defined
Change to intervention during funded period	<ul style="list-style-type: none"> ◆ Static - refinement disallowed or discouraged 	<ul style="list-style-type: none"> ◆ Dynamic - refinement encouraged

Table 1-2—Comparison of the Characteristics of Traditional Intervention and Evaluation Cycles with PfP

Characteristic	Traditional Intervention and Evaluation Cycle	PfP
Management approach	<ul style="list-style-type: none"> ◆ Control, oversight, faithful implementation 	<ul style="list-style-type: none"> ◆ Motivation, alignment, support, “all-teach, all-learn”
Measurement philosophy	<ul style="list-style-type: none"> ◆ Impose measures as condition of participation, define baselines and reporting periods 	<ul style="list-style-type: none"> ◆ Allow local choice in measures and flexibility in baselines and reporting periods to encourage widespread participation
Data sources required for evaluation	<ul style="list-style-type: none"> ◆ Often just one or two 	<ul style="list-style-type: none"> ◆ Five, to date (see Table 1-1)
Ability to attribute changes in outcomes over time to the intervention model	<ul style="list-style-type: none"> ◆ Straightforward analysis 	<ul style="list-style-type: none"> ◆ Hampered by characteristics described above
Importance of qualitative evaluation	<ul style="list-style-type: none"> ◆ Of varying importance, depending on the intervention and the design of the evaluation 	<ul style="list-style-type: none"> ◆ Particularly important in the PfP Evaluation given the characteristics of the initiative and its evaluation described above.

The following sections of this report present the available evidence of change by focus area.

2. OB-EED EVIDENCE

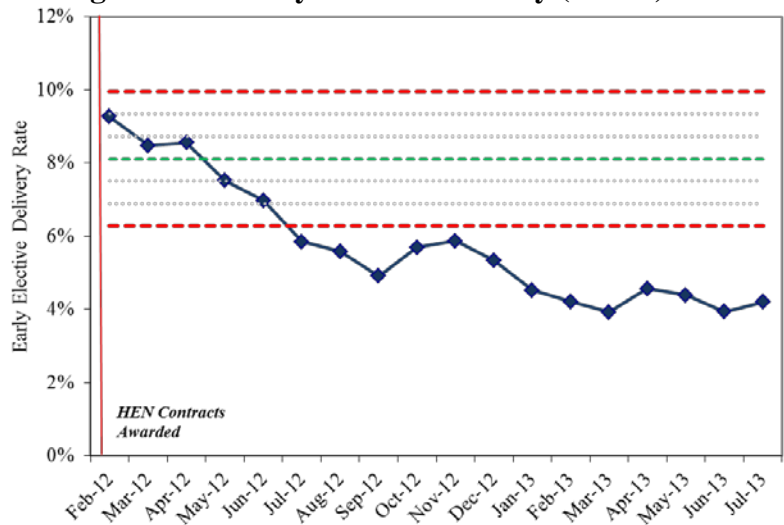
A HEN-reported measure (the only measure available) shows improvement.

Table 2-1—Evidence for OB-EED				
Measure	Source	Improvement	No Change	Worsening
Early Elective Delivery Rate (TJC PC-01)	HENs Less complete reporting (Voluntary)	✓ p ' control chart (Figure 2-1) t-test of rates (Figure 2-2)		

The following figures give more detail on the measure listed above in Table 2-1.

Early Elective Delivery (PC-01) (HENs—Early Baseline Cohort)

Figure 2-1—Early Elective Delivery (PC-01)



- ◆ Evidence for improvement from the p ' chart.
 - Multiple points that are below the lower control limit.²⁻¹
 - 45.5 percent reduction from baseline (Feb – July 2012) to July 2013.

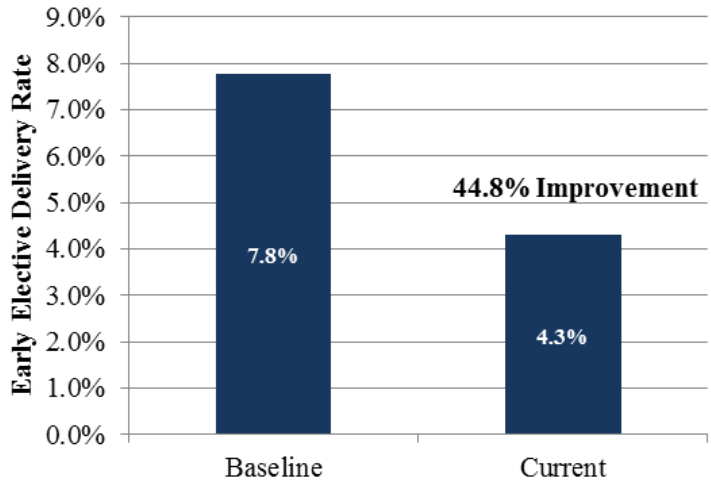
Note: Data are between 313 and 386 hospitals per month. Control limits (p ') constructed using monthly data from February 2012 to June 2013. The dashed green line is the center line; dashed red lines are the control limits; the closest dotted lines above and below the center line are the one-sigma limits; and the dotted lines just inside the control limits are the two-sigma limits.

²⁻¹ Three limitations should be noted, however: (1) these data are only for 313 to 386 hospitals, (2) there are no data prior to the awarding of HEN contracts to determine whether the process was in control, and (3) improvement appears greatest in early 2012 before HEN efforts on EEDs began in earnest.

Early Elective Delivery (PC-01) (HENs)

- ◆ Evidence for improvement.
 - The most recent EED rate is 44.8 percent lower than baseline (or 3.5 fewer EEDs per 100 early deliveries).

Figure 2-2—Early Elective Delivery (PC-01)



Note: Data include 1,540 hospitals in the current period. HEN baseline periods varied, but most were Q1 2012 or earlier. Current periods also varied, but are predominantly one quarter in length during Q2 or Q3 2013, and were always in 2012 or later.

Table 2-2 lists key actions by the “three engines” of the Partnership, as discussed above: the CMMI investment engine, federal partners, and the private sector, that may have contributed to the reduction in EEDs described above. This type of analysis is planned for each adverse event area to show potentially contributing factors working toward the PfP harm reduction goals during the period of the trends displayed.

Table 2-2—OB-EED Key Actions

National Decrease in Harm	Strategies: CMMI Investment Engine	Strategies: Federal Partner Engine	Strategies: Private Partner Engine
<p>A nationally-defined measure reported by PfP-funded HENs available for over 1,500 hospitals shows 44.8 percent improvement between HEN-defined baseline periods (predominantly Q1 2012 or earlier) and follow-up periods (predominantly Q2 or Q3 2013); this reduction is associated with an estimated 16,088 fewer EEDs.</p>	<p>HENs sought commitments from hospital CEOs for “hard-stop” policies, show-cased strategies of successful hospitals, celebrated their success, and provided hospitals with tools and information in partnership with private and federal partners.</p> <p>PfP asked all HENs to request EED rates from their hospitals and began comparative feedback.</p> <p>CMMI with PfP support contractors facilitated sharing of best practices among HENs; actively recognized HENs and hospitals with large, early decreases; and mapped progress, highlighting areas of success and those needing improvement.</p> <p>CMMI funded NQF to convene “maternal action team,” currently completing a “Playbook” to assist late adopters in reducing EED.</p>	<p>Medicaid programs in many states stopped paying for EEDs or gave financial incentives for low rates.</p> <p>Strong Start public communications campaign, federally funded in partnership with ACOG, the March of Dimes and other partners.</p> <p>CMS announced EED rate would be required public reporting for Hospital Compare beginning 2013 with payment implications for 2015.</p>	<p>March of Dimes developed “Less than 39 Weeks Toolkit” including information for patients and hospitals to assist in reducing EEDs.</p> <p>Joint Commission included EED rate (PC-01) as a core measure for hospital accreditation beginning 2013.</p> <p>Association of Women’s Health, Obstetric, and Neonatal Nurses (AWHONN) conducted “Don’t Rush Me!” Reducing Early Elective Deliveries campaign, giving women 40 reasons to “go the full 40 weeks.”</p> <p>Leapfrog included hospital reporting of EED rates in its annual hospital safety survey, beginning 2010, and reports results to the press.</p> <p>Public-private collaborations including goal of reduced EED were identified in at least 21 states in 2012.</p> <p>American Congress of Obstetricians and Gynecologists (ACOG) conducted educational efforts to support reduction of early elective delivery.</p>

3. READMISSIONS EVIDENCE

Both the Medicare claims-based measure and the all-payer HEN-reported measures point to improvement.

Table 3-1—Evidence for Readmissions				
Measure	Source	Improvement	No Change	Worsening
Medicare FFS 30-Day All-Cause Readmissions ³⁻¹	Medicare Claims	✓ p ' control chart Comparison of Rates (<i>t</i> -tests) Pre/Post comparison of trends (<i>t</i> -tests)		
30-Day All-Cause All-Payer Readmissions	HENs	✓ p ' control chart Comparison of Rates (<i>t</i> -tests)		

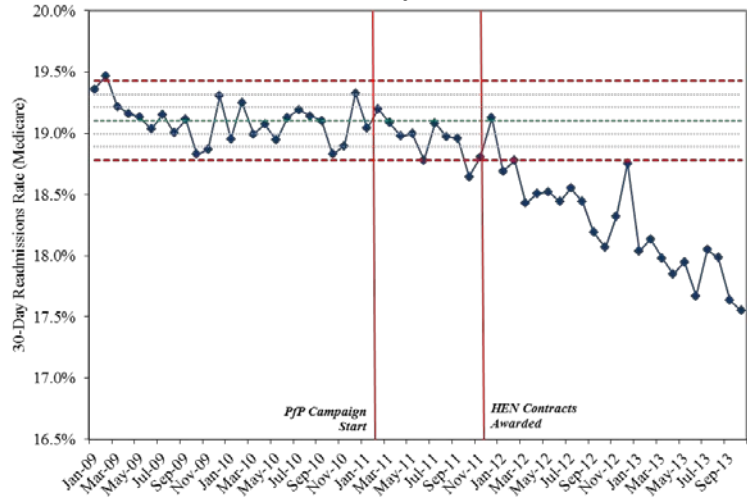
The following figures give more detail on each of the measures and analyses listed above in Table 3-1.

³⁻¹ Observation stays do not count as readmissions, because these stays are not billed as an admission, although to the patient the stay may be experienced similarly. There has been an increase in observation stays over the period displayed in the graph across the Medicare population; however, a recent article finds a similar downward trend with a composite measure of observation stays and readmissions taken together (Griffin W. Daughtridge, Traci Archibald, and Patrick Conway, “Quality Improvement of Care Transitions and the Trend of Composite Hospital Care,” *Journal of the American Medical Association*, vol. 311 no. 10, pp. 1013-1014, March 12, 2014. Note the measure provided by the QIOs allows each readmission to count as an admission, thus increasing the influence of individuals admitted multiple times in comparison to the measure calculated by the Evaluation Contractor.

Medicare FFS 30-Day All-Cause Readmissions (Medicare Claims)

- ◆ Evidence for improvement from the p' chart.
 - Rates in most 2012 and 2013 months are below the lower control limit.
 - More than 8 consecutive months are below the center line.
- ◆ Evidence from the comparisons of rates (t-tests), with a 7 percent improvement from the baseline period of 2010 to the follow-up period of Jan 2011 through Oct 2013.
 - All follow-up months have significantly lower rates than the baseline period.
- ◆ Evidence for improvement from the pre/post comparisons of trends (t-tests).
 - The follow-up periods show statistically significantly more improvement (rates of declines in readmissions) than the baseline period.
 - QIO program data shows that the seasonally adjusted readmissions rate, using a measuring approach that allows hospital readmission stays to also count as an index admission which can have a readmission, improved (declined) 20 percent from January 2011 to April 2013. (statistical tests not conducted.)

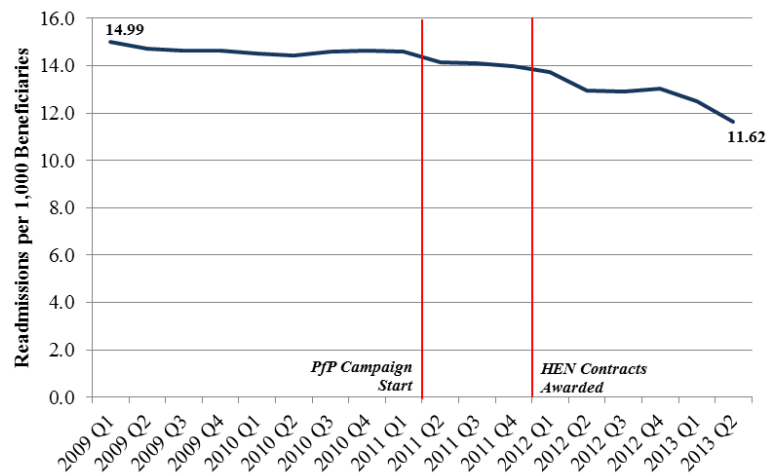
Figure 3-1—Medicare FFS 30-Day All-Cause Readmissions



Note: Control limits (p') constructed using monthly data from January 2009 to December 2010. The dashed green line is the center line; dashed red lines are the control limits; the closest dotted lines above and below the center line are the one-sigma limits; and the dotted lines just inside the control limits are the two-sigma limits.

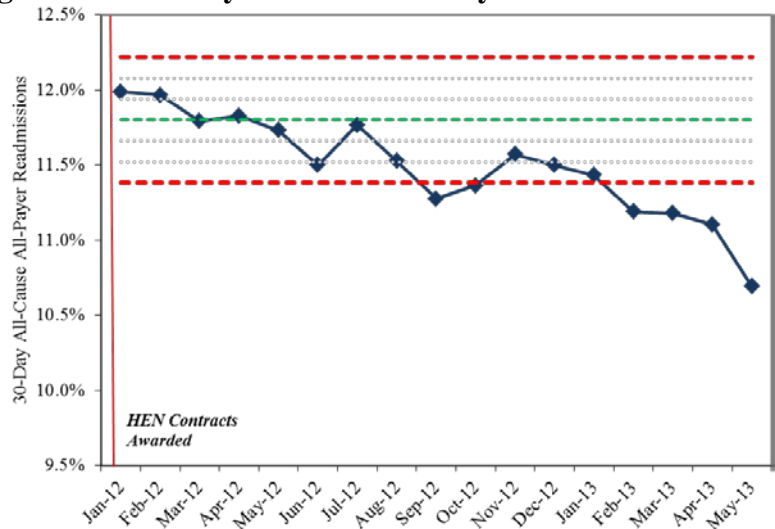
Calculations are based on Medicare FFS claims for all hospitals that reliably report present on admission (POA) status (≥ 95 percent of the hospital's diagnoses for a given quarter are accompanied by a valid code for POA) and that have the following characteristics: all hospitals paid under Medicare's IPPS, CAH, cancer hospitals, and Maryland hospitals. Data include between 773,535 and 981,065 discharges per month.

Figure 3-2—Medicare FFS 30-Day Seasonally Adjusted Readmissions



30-Day All-Cause All-Payer Readmissions (HENs)

Figure 3-3—30-Day All-Cause All-Payer Readmissions



- ◆ Evidence of improvement from the p' chart.³⁻²
 - The most recent four monthly observations are below the lower control limit.
 - 9.4 percent reduction from baseline (Jan – June 2012) to May 2013.

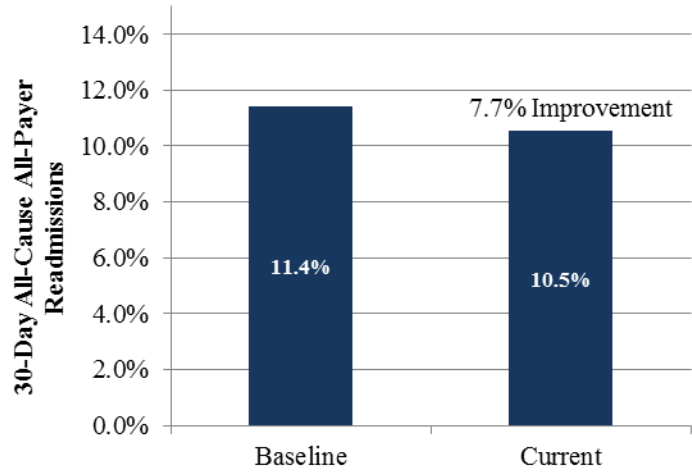
Note: Data are from 330 to 341 hospitals depending on the month. Control limits (p') constructed using monthly data from January to June 2012. The dashed green line is the center line; dashed red lines are the control limits; the closest dotted lines above and below the center line are the one-sigma limits; and the dotted lines just inside the control limits are the two-sigma limits.

³⁻² Note that these data are for only 330 to 340 hospitals. There are no pre-HEN baseline points for establishing that the process is in control.

30-Day All-Payer All-Cause Readmissions (HENs)

Figure 3-4—30-Day All-Payer All-Cause Readmissions

- ◆ Evidence of improvement from the comparisons of rates (*t*-tests).
 - A statistically significant 7.7 percent improvement in the current period compared to the baseline period.



Note: Data include 2,205 hospitals in the current period. HEN baseline periods varied, but were predominantly 2010 or 2011 data. Current periods also varied, but were predominantly one quarter in length during Q2 or Q3 2013, and were always in Q3 2012 or later.

4. ADE EVIDENCE

The only available measure for ADEs, from the AHRQ National Scorecard, shows improvement.

ADEs per 1,000 Discharges (AHRQ National Scorecard)

- ◆ Evidence for improvement, with the preliminary rate for 2012 15.4 percent lower than the rate in 2010.

Table 4-1—ADEs per 1,000 Discharges		
2010 HAC Rates (per 1,000 discharges)	2011 HAC Rates (per 1,000 discharges)	Preliminary 2012 HAC Rates (per 1,000 discharges)
49.5	48.7	41.9

5. VTE EVIDENCE

The analyses of the national Medicare claims-based measure (p ' chart, comparison of rates, and comparison of trends), and the HEN-reported measure of PSI-12 per 1,000 surgical discharges indicate improvement. Comparative change of HEN-aligned and non-HEN-aligned groups in the Medicare claims-based measure were similar.

Table 5-1—Evidence for VTE				
Measure	Source	Improvement	No Change	Worsening
Perioperative Pulmonary Embolism (PE) or Deep Vein Thrombosis (DVT) per 1,000 Surgical Discharges (AHRQ PSI-12)	Medicare Claims	✓ p ' control chart Comparison of Rates Pre/Post comparison of trends		
Perioperative PE or DVT per 1,000 Surgical Discharges (AHRQ PSI-12)	HENs (All-Payer)	✓ p ' control chart Comparison of Rates		
Venous Thromboembolism per 1,000 Discharges	AHRQ National Scorecard			✓ Statistical testing cannot be done ⁵⁻¹
Comparative change of the HEN-Aligned and Non-Aligned Groups in Perioperative PE or DVT per 1,000 Surgical Discharges (AHRQ PSI-12)	Medicare Claims		✓ Comparative change of the HEN-aligned and non-HEN-aligned groups	

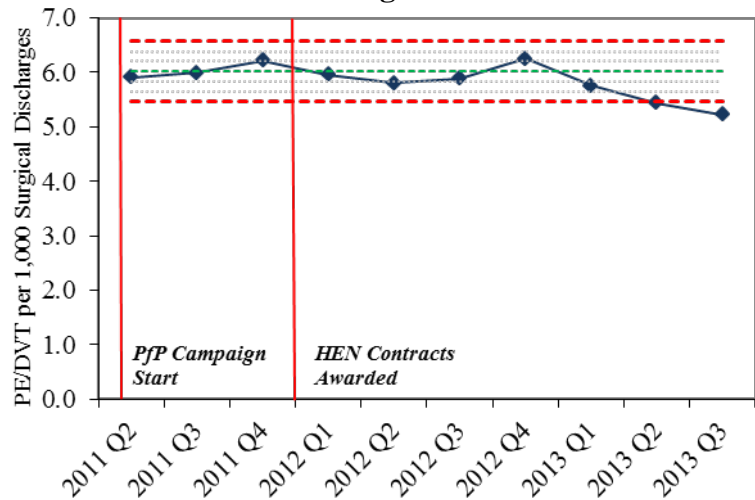
The following figures and table give more detail on each of the measures and analyses listed above in Table 5-1.

⁵⁻¹ AHRQ staff are exploring if there is a data issue whereby pulmonary embolisms were not included in the earlier year counts to the extent that they were in 2012.

Perioperative PE or DVT per 1,000 Surgical Discharges (AHRQ PSI-12) (Medicare Claims)

- ◆ Evidence for improvement from the p' chart.
 - The final two quarters are below the lower control limit.
- ◆ Evidence for improvement from the comparison of rates (*t*-test), with a 13.5 percent improvement in the follow-up period (Q1 2012 – Q3 2013).
 - Four of seven follow-up periods have a rate significantly less than the baseline, statistically.
- ◆ Evidence for acceleration in improvement from the pre/post comparison of trends (*t*-test).
 - Annual improvement in the year periods starting both Q2 2012 and Q3 2012 was statistically faster than in the baseline year.

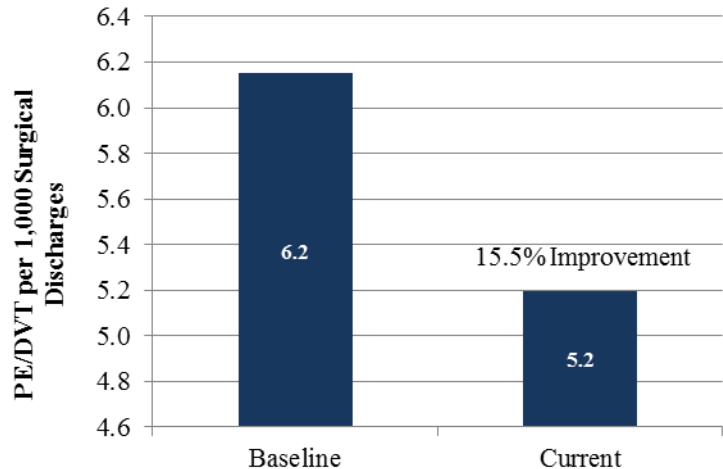
Figure 5-1—Perioperative PE or DVT per 1,000 Surgical Discharges



Note: Control limits (p') constructed using data from 2011 Q2 to 2012 Q1. The dashed green line is the center line; dashed red lines are the control limits; the closest dotted lines above and below the center line are the one-sigma limits; and the dotted lines just inside the control limits are the two-sigma limits. Calculations are based on Medicare FFS claims for all hospitals that reliably report present on admission (POA) status (>=95 percent of the hospital's diagnoses for a given quarter are accompanied by a valid code for POA) and that have the following characteristics: all hospitals paid under Medicare's IPPS, CAH, cancer hospitals, and Maryland hospitals. Data include between 637,923 and 690,101 discharges per quarter. Rates are adjusted for changes in Medicare FFS beneficiary demographics (age, sex, and race) over time, with composition for all periods adjusted to equal the HEN-aligned composition in 2012. Comparison group is propensity score reweighted set of non-aligned hospitals.

Perioperative PE or DVT per 1,000 Surgical Discharges (AHRQ PSI-12) (HENs)

Figure 5-2—Perioperative PE or DVT per 1,000 Surgical Discharges



- ◆ Evidence for improvement from the comparison of rates (*t*-test), with a 15.5 percent improvement in the current period compared to the baseline period.

Note: Data include 1,717 hospitals in the current period. HEN baseline periods varied, but were predominantly 2010 data. Some baselines extended into Q1 2013. Current periods also varied, but were predominantly one quarter in length during Q2 or Q3 2013, and were always in 2012 or later.

VTE per 1,000 Discharges (AHRQ)

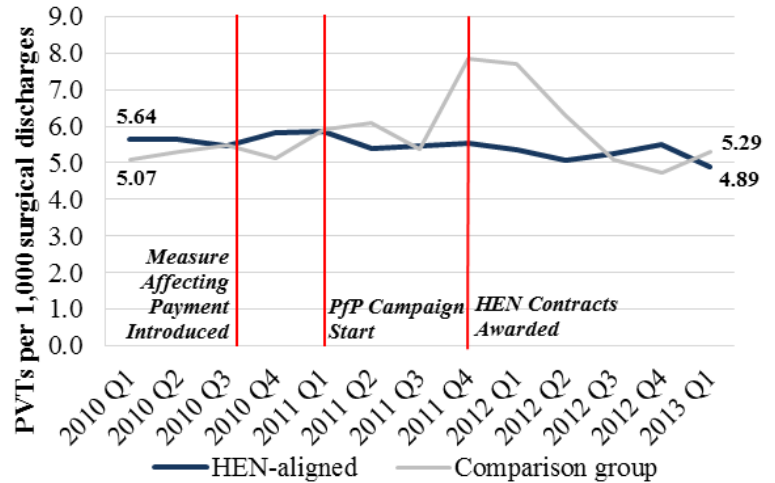
- ◆ Evidence for worsening, with the preliminary rate for 2012 36.7 percent higher than the rate in 2010.
 - However, the rate in 2011 was lower than the rate in 2010.

Table 5-2—VTE per 1,000 Discharges		
2010 HAC Rates (per 1,000 discharges)	2011 HAC Rates (per 1,000 discharges)	Preliminary 2012 HAC Rates (per 1,000 discharges)
0.49	0.46	0.67

Comparative Change in Rate of Perioperative PE or DVT (AHRQ PSI-12) (Medicare Claims)

- ◆ Zero evidence for no change.
- ◆ The two trends parallel each other from Q1 2010 through Q3 2011.
 - There is a transient elevation in estimated rates for the non-HEN-aligned group from Q4 2011 through Q2 2012, but then the two trends coincide again from Q3 2012 through Q1 2013.
 - IPPS Payment incentive for Postoperative PE or DVT became effective in October 2010.

Figure 5-3—Perioperative PE or DVT per 1,000 Surgical Discharges, HEN-Aligned vs. Comparison Group



Note: Calculations are based on Medicare FFS claims for all hospitals that reliably report present on admission (POA) status (>=95 percent of the hospital's diagnoses for a given quarter are accompanied by a valid code for POA) and that have the following characteristics: all hospitals paid under Medicare's IPPS, CAH, cancer hospitals, and Maryland hospitals.

6. VAP/VAE EVIDENCE

The p ' control chart for the NDNQI measure of VAP per 1,000 ventilator days, the comparison of rates in this measure, and the AHRQ National Scorecard measure all indicate improvement. However, the trends were similar in HEN-aligned and comparison group hospitals.

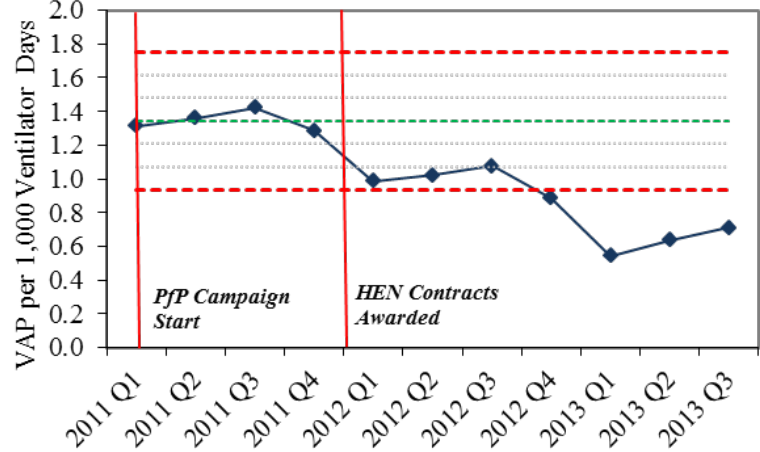
Table 6-1—Evidence for VAP/VAE				
Measure	Source	Improvement	No Change	Worsening
VAP per 1,000 Ventilator Days	NDNQI Less complete (reporting voluntary)	✓ p ' control chart (Figure 6-1), <i>t</i> -test for comparisons of rates	✓ Pre/Post comparison of trends	
VAP per 1,000 Discharges	AHRQ National Scorecard	✓ Unable to do statistical testing		

The following figures and table give more detail on each of the measures and analyses listed above in Table 6-1.

VAP per 1,000 Ventilator Days (NDNQI)⁶⁻¹

- ◆ Evidence for improvement from the p ' chart.
 - The most recent four quarters have rates below the lower control limit.
 - There are three consecutive points in the 2-sigma zone below the center line.
- ◆ Evidence for improvement from the comparison of rates.
 - All seven follow-up periods have rates significantly lower than the baseline rate (*t*-tests). The average rate over Q1 2012 to Q3 2013 is 47.1 percent lower than the baseline rate in 2011.
- ◆ No evidence of acceleration in improvement from pre/post comparison of trends.
 - The speed of improvement (decline in harms) in the follow-up period is not statistically significantly different than in the baseline period.

Figure 6-1—VAP per 1,000 Ventilator Days



Note: Data are between 482 and 547 hospitals per quarter. Control limits (p ') constructed using data from 2011 Q1 to 2011 Q4. The dashed green line is the center line; dashed red lines are the control limits; the closest dotted lines above and below the center line are the one-sigma limits; and the dotted lines just inside the control limits are the two-sigma limits.

⁶⁻¹ The VAP measure definition used has been changed by the CDC due to concerns about variable interpretation; however, no other sufficiently broad data are available for analysis.

VAP per 1,000 Discharges

- ◆ Evidence for improvement.
 - The rates from the National Scorecard show a steady decline from 2010 to 2012. The 2012 rate is 16.7 percent lower than the 2010 rate (0.2 fewer VAPs per 1,000 discharges).

Table 6-2—VAP per 1,000 Discharges		
2010 HAC Rates (per 1,000 discharges)	2011 HAC Rates (per 1,000 discharges)	Preliminary 2012 HAC Rates (per 1,000 discharges)
1.2	1.1	1.0

7. CAUTI EVIDENCE

The more complete NHSN SIR ICU measure shows no change or worsening. A measure with less complete reporting, NHSN SIR non-ICU, also shows no change. Another measure with less complete reporting, CAUTI per 1,000 catheter days (NDNQI), shows significant improvement. However, most improvement in this measure occurred in late 2011, prior to the HEN work period. The AHRQ National Scorecard measure also shows slight improvement. Trends in CAUTI for PfP-aligned hospitals and a comparison group are qualitatively similar.

Table 7-1—Evidence for CAUTI

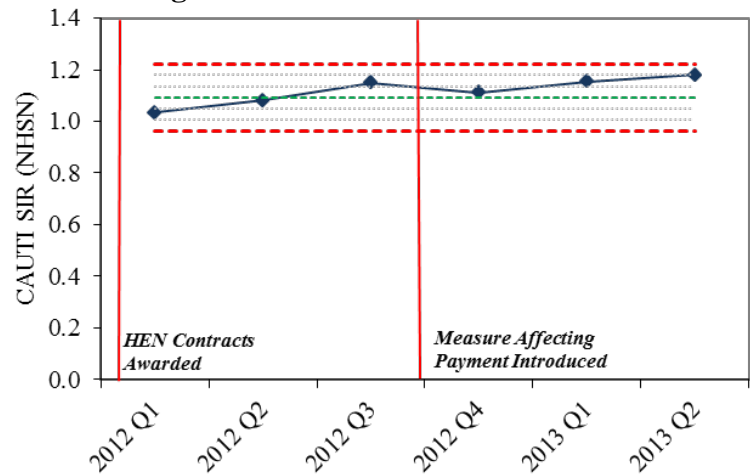
Measure	Source	Improvement	No Change	Worsening
CAUTI SIR ICU	NHSN More complete (mandatory reporting for Prospective Payment System [PPS] hospitals)		✓ X-chart (Figure 7-1)	✓ <i>t</i> -test of pre/post rates
CAUTI SIR non-ICU	NHSN Less complete (reporting voluntary)		✓ X-chart (Figure 7-2)	
CAUTI per 1,000 Catheter Days	NDNQI Less complete (reporting voluntary)	✓ p' control chart (Figure 7-3), <i>t</i> -test of pre/post rates		✓ <i>t</i> -test of pre/post trends
CAUTI per 1,000 Discharges	AHRQ National Scorecard (Unable to do statistical testing)	✓ Raw rates from AHRQ National Scorecard		
CAUTI SIR ICU, Comparative change for HEN-aligned vs. non-aligned comparison group	NHSN Reporting is mandatory for PPS hospitals, but limited to one procedure			✓ Comparative change
CAUTI per 1,000 Catheter Days in hospitals receiving intensive assistance	QIO program		Standardized rate	

The following graphs and summaries give more detail on each of the measures and analyses listed above in Table 7-1.

CAUTI Standardized Infection Ratio (SIR) (Observed/Expected) (ICUs) (NHSN)

- ◆ No evidence for improvement from the X-chart (i.e., it is consistent with common cause variation)
- ◆ Evidence of worsening; the SIR for the follow-up period (Q2 2012 – Q2 2013) is statistically significantly higher (unfavorable) by 14.2 percent than the rate for the baseline period of Q1 2012 (t-test).
- ◆ IPPS Payment incentive for Urinary Catheter Removed on Postoperative Day 1 or Postoperative Day 2 becomes effective October 2011

Figure 7-1—CAUTI SIR ICU

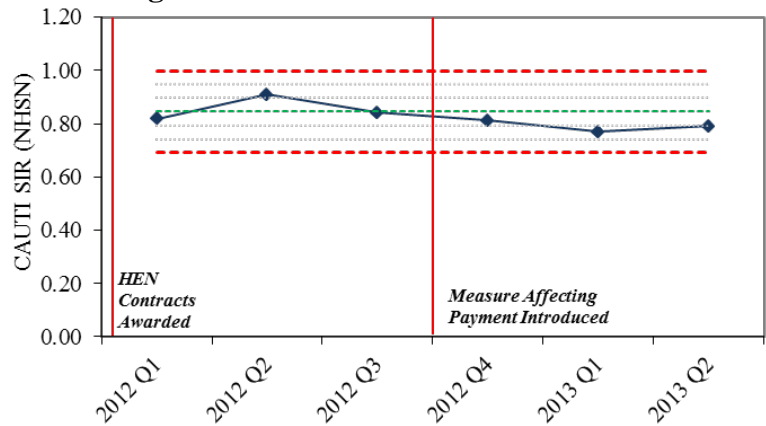


Note: Data are between 3,175 and 3,280 hospitals per quarter. Control limits (X-chart) constructed using data from 2012 Q1 to 2012 Q4. The dashed green line is the center line; dashed red lines are the control limits; the closest dotted lines above and below the center line are the one-sigma limits; and the dotted lines just inside the control limits are the two-sigma limits. SIR = Standardized Infection Ratio

CAUTI SIR (non-ICU Units) (NHSN)

- No evidence for improvement from the X-chart (that is, observed variation is consistent with common cause variation).⁷⁻¹
- ◆ The Q2 2013 is 3.3 percent lower than the Q1 2012 rate.
- ◆ IPPS payment incentive for CAUTI became effective October 2012

Figure 7-2—CAUTI SIR Non-ICU



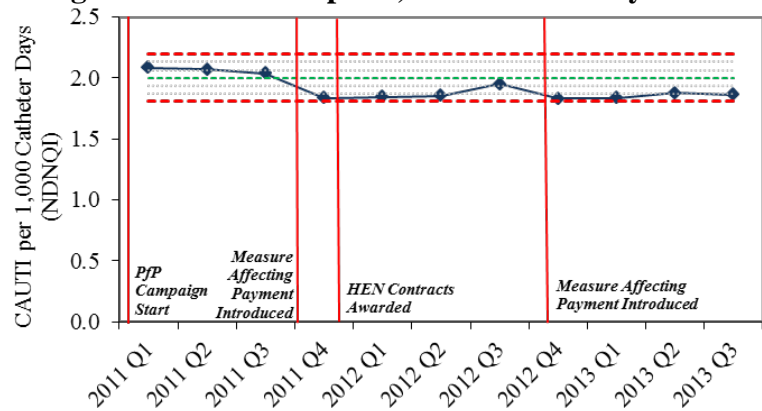
Note: Data are between 1,245 and 1,357 hospitals per quarter. Control limits (X-chart) constructed using data from 2012 Q1 to 2012 Q4. The dashed green line is the center line; dashed red lines are the control limits; the closest dotted lines above and below the center line are the one-sigma limits; and the dotted lines just inside the control limits are the two-sigma limits.
SIR = Standardized Infection Ratio

⁷⁻¹ No *t*-test results are available for the non-ICU data.

CAUTI per 1,000 Catheter Days, All Tracked Units (NDNQI)

- ◆ Evidence for improvement from the p ' control chart (that is, it is consistent with special cause variation) with lower and more favorable CAUTI rates.
 - There are 8 consecutive points below the center line.
 - There are 2 consecutive points lying more than 2 sigma limits below the center line.
- ◆ Evidence for improvement from the t-test comparisons of rates before and after HEN contracts
 - The great majority of follow-up quarters (6 of 7; Q1 2012 – Q3 2013) have rates that are significantly lower (more favorable) than the average baseline rate (CY 2011), with a decrease of 6.9 percent.
- ◆ Evidence for worsening from the comparison of trends before and after HEN contracts.
 - t-tests show deceleration of improvement (that is, less rapid decline in the rate of harms) in the follow-up period than during baseline 12 month period.
 - While the rate is consistently lower during the follow-up months, it is essentially unchanged from the final quarter of 2011, before HEN work began.
 - IPPS Payment incentive for Catheter-Associated Urinary Tract Infection became effective October 2012

Figure 7-3—CAUTI per 1,000 Catheter Days



Note: Data are between 623 and 717 hospitals per quarter. Control limits (p ') constructed using data from 2011 Q1 to 2011 Q4. The solid black line is the center line; solid red lines are the control limits; the closest dotted lines above and below the center line are the one-sigma limits; and the dotted lines just inside the control limits are the two-sigma limits.

CAUTI per 1,000 Discharges (AHRQ National Scorecard)

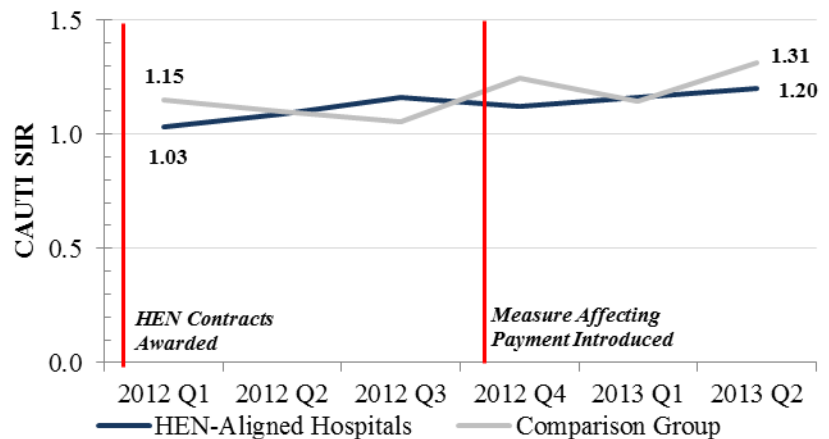
- ◆ Evidence for improvement from raw rates in this measure.
 - Steady improvement in rates (falling rates of harms) in 2010, 2011, and 2012, totaling 13.1 percent improvement.

Table 7-2—CAUTI per 1,000 Discharges		
2010 HAC Rates (per 1,000 discharges)	2011 HAC Rates (per 1,000 discharges)	Preliminary 2012 HAC Rates (per 1,000 discharges)
12.2	11.3	10.6

Comparative Change in CAUTI SIR (ICUs) NHSN

- ◆ Relative to the Q1 2012 baseline, rates over the course of the five follow-up quarters as a whole show the SIR has increased more among HEN-aligned hospitals than among the comparison group.⁷⁻² However, the trend charts make clear that there is no persisting divergence between the two.
- ◆ IPPS payment incentive for CAUTI became effective October 2012
- ◆ CAUTI SIR rates remained at 1.1 per 1,000 catheter days for 667 hospitals participating in QIO programs. (No startistical tests possible.)

Figure 7-4—CAUTI SIR (ICUs), HEN-Aligned vs. Comparison Group



Source: Aggregated NHSN data provided to the PEC Team by the CDC.
 Notes: NHSN data on CAUTI incidence are not available prior to 2012 due to limited reporting. Comparison group is propensity score reweighted set of non-aligned hospitals. SIR = Standardized Infection Ratio

⁷⁻² It has not been possible to correct the standard errors for hospital-level clustering. With a clustering adjustment, the difference in change between the two groups would likely not be statistically significant.

Table 7-3—Change in CAUTI Rates in Hospitals Participating in QIO Initiatives

Measure	Baseline 2/1/2011-7/31/2011 (670 Facilities)	Re-Measurement Period 3/1/2013 – 8/31/2013 (670 Facilities)
CAUTI Rate	2.05	2.02
CAUTI SIR Rate	1.1 per 1,000	1.1 per 1,000

8. CLABSI EVIDENCE

Four measures (NHSN CLABSI SIR ICU, NHSN CLABSI SIR non-ICU, NDNQI CLABSI/1,000 central line days, and AHRQ PSI-07 CR-BSI per 1,000 discharges) indicate improvement. There is no acceleration or deceleration of trend for the three measures that were tested for this. There is no persistent divergence between the trend for PfP-aligned and comparison group hospitals. AHRQ National Scorecard data show a slight improvement.

Measure	Source	Improvement	No Change	Worsening
CLABSI SIR ICU	NHSN More complete (mandatory reporting for PPS hospitals)	✓ <i>t</i> -tests of pre/post rates (Greater improvement among HEN-aligned hospitals than comparison group)	✓ X-chart (Figure 8-1) Pre/Post comparison of trends	
CLABSI SIR Non-ICU	NHSN Less complete (reporting voluntary)	✓ X-chart (Figure 8-2)		
CLABSI per 1,000 Central Line Days	NDNQI Less complete (reporting voluntary)	✓ X-chart (Figure 8-3)	✓ Pre/Post comparison of trends	
CR-BSI per 1,000 Discharges (AHRQ PSI-07)	Medicare Claims Narrower diagnosis, subject to under-reporting	✓ X-chart (Figure 8-4) <i>t</i> -tests of pre/post rates	✓ Pre/Post comparison of trends (No difference in improvement among HEN-aligned hospitals relative to the comparison group)	
CLABSI per 1,000 Discharges	AHRQ National Scorecard	✓ Unable to perform statistical testing		
CLABSI SIR ICU, Comparative change for HEN-aligned vs. non-aligned comparison group	NHSN Reporting is mandatory for PPS hospitals, but limited to one procedure	✓ Comparative change		

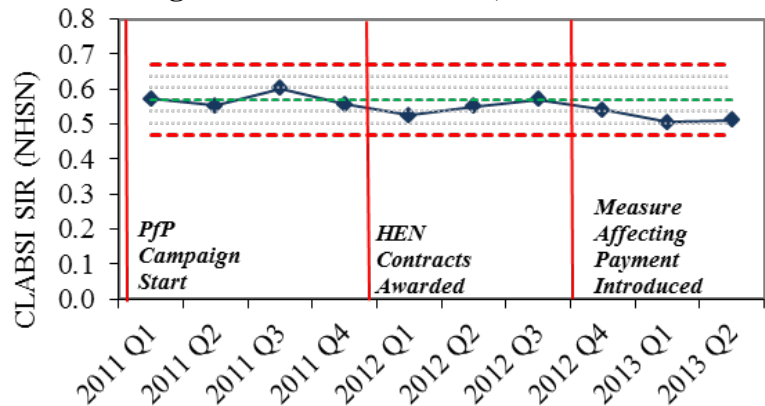
Table 8-1—Evidence for CLABSI				
Measure	Source	Improvement	No Change	Worsening
CR-BSI per 1,000 Discharges (AHRQ PSI-07), Comparative change for HEN-aligned vs. non-aligned comparison group	Medicare Claims Narrower diagnosis, subject to under-reporting		✓ Comparative change	

The following figures and tables give more detail on each of the measures and analyses listed above in Table 8-1.

CLABSI Standardized Infection Ratio (SIR) (Observed/Expected) (ICUs) (NHSN)

- ◆ No evidence for improvement from the X-chart (that is, observed variation is consistent with common cause variation).
- ◆ Possible evidence of improvement from *t*-test comparisons of rates.
 - Rates in Q1 2013 and Q2 2013 are significantly lower than baseline rates.
 - Average rate for the follow-up period as a whole is lower than the baseline rate.
 - 10.3 percent reduction from baseline (2011) to Q2 2013.
- ◆ No evidence for improvement from the pre/post comparisons of trends. That is, no acceleration or deceleration of the initial trend.
- ◆ IPPS payment for Vascular Catheter-Associated Infections became effective in October 2012.

Figure 8-1—CLABSI SIR, ICU

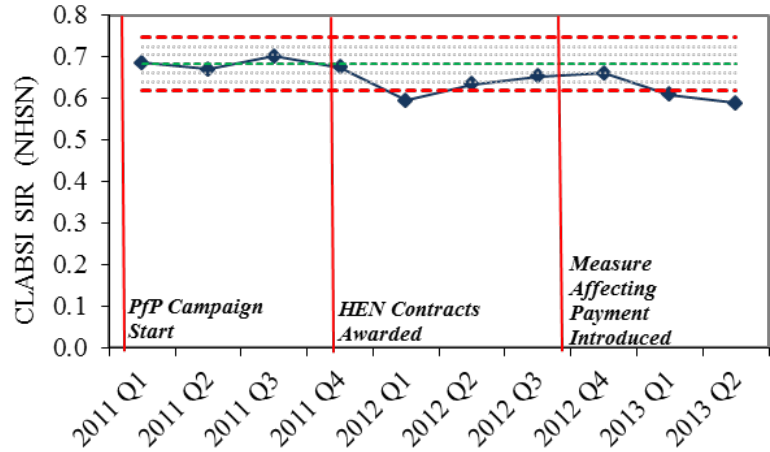


Note: Data are between 3,163 and 3,304 hospitals per quarter. Control limits (X-chart) constructed using data from 2011 Q1 to 2011 Q4. The dashed green line is the center line; dashed red lines are the control limits; the closest dotted lines above and below the center line are the one-sigma limits; and the dotted lines just inside the control limits are the two-sigma limits.
SIR = Standardized Infection Ratio

CLABSI SIR (Non-ICU Units) (NHSN)

- ◆ Evidence for improvement from the X-chart (that is, it is consistent with special cause variation) with lower and more favorable CLABSI rates.
 - There are 3 points that are below the 3-sigma lower control limit, all occurring after the awarding of the HEN contracts.⁸⁻¹
 - Q2 2013 rate is 13.9 percent lower than 2011 baseline.
- ◆ IPPS payment incentive for Vascular Catheter-Associated Infections became effective in October 2012.

Figure 8-2—CLABSI SIR, Non-ICU



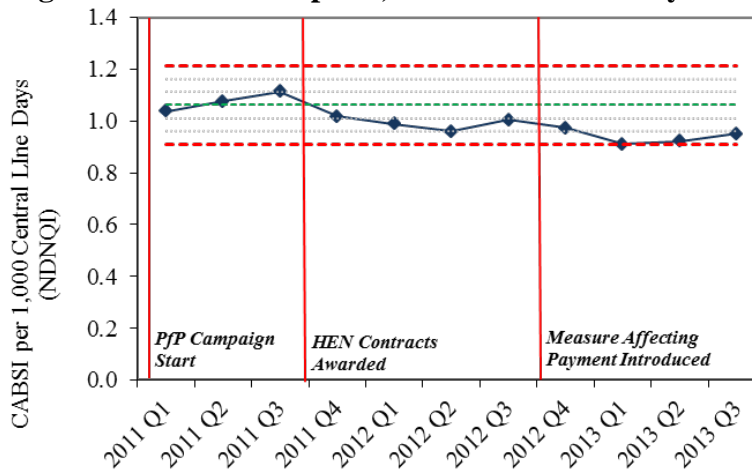
Note: Data are between 1,075 and 1,279 hospitals per quarter. Control limits (X-chart) constructed using data from 2011 Q1 to 2011 Q4. The dashed green line is the center line; dashed red lines are the control limits; the closest dotted lines above and below the center line are the one-sigma limits; and the dotted lines just inside the control limits are the two-sigma limits. SIR = Standardized Infection Ratio

⁸⁻¹ No *t*-test results are available for the non-ICU data.

CLABSI per 1,000 Central Line Days, All Tracked Units (NDNQI)

- ◆ Evidence for improvement from the X-chart (that is, it is consistent with special cause variation) with lower and more favorable CLABSI rates
 - One point (Q1 2013) is below the control limit.
 - Two consecutive points (Q2 2013 and Q3 2013) are in the 2 sigma zone below the center line.
 - Q3 2013 rate is 10.5 percent lower than 2011 baseline.
- ◆ Evidence for improvement from the t-test comparisons of rates
 - Six of 7 follow-up quarters have rates significantly lower than the baseline rate (*t*-tests).
 - IPPS payment incentives for Vascular Catheter-Associated Infections became effective in October 2012.

Figure 8-3—CLABSI per 1,000 Central Line Days

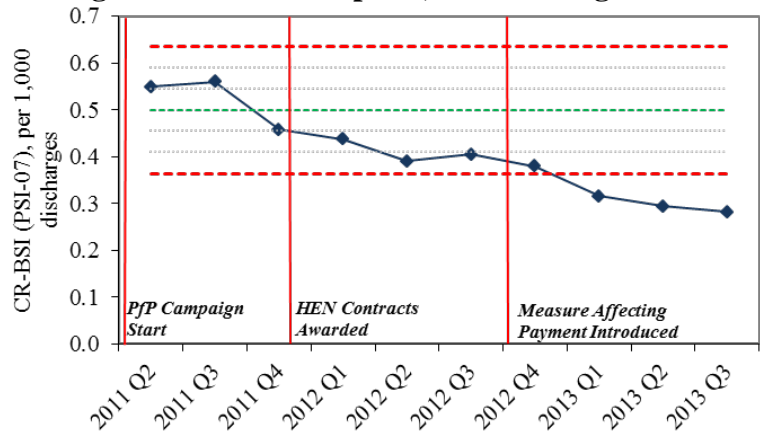


Note: Data are from between 1,075 and 1,279 hospitals per quarter. Control limits (p') constructed using data from 2011 Q1 to 2011 Q4. The dashed green line is the center line; dashed red lines are the control limits; the closest dotted lines above and below the center line are the one-sigma limits; and the dotted lines just inside the control limits are the two-sigma limits.

CR-BSI per 1,000 Discharges (AHRQ PSI-07) (Medicare Claims)

- ◆ Evidence for improvement from the p ' control chart (that is, it is consistent with special cause variation) with lower and more favorable CLABSI rates.
 - Three points are below the lower control (3-sigma) limit.
 - Three consecutive points (Q2 2012, Q3 2012, and Q4 2012) are in the 2 sigma zone below the center line.
 - Q3 2013 rate is 46.0 percent lower than the Q2 – Q4 2011 baseline.
- ◆ Evidence for improvement from the t-test comparisons of rates
 - All follow-up periods have rates significantly below the baseline rate.
- ◆ No evidence for acceleration in improvement from the comparisons of pre/post trends.
 - Decreases over 12-month spans during the follow-up period either showed no statistical significance relative to the baseline trend or showed statistically significant deceleration in the improvement trend, depending on the 12-month period measured.
- ◆ IPPS payment incentive for Vascular Catheter-Associated Infections became effective in October 2012.

Figure 8-4—CR-BSI per 1,000 Discharges



Note: Control limits (p ') constructed using data from 2011 Q2 to 2012 Q1. The dashed green line is the center line; dashed red lines are the control limits; the closest dotted lines above and below the center line are the one-sigma limits; and the dotted lines just inside the control limits are the two-sigma limits. Calculations are based on Medicare FFS claims for all hospitals that reliably report present on admission (POA) status (>=95 percent of the hospital's diagnoses for a given quarter are accompanied by a valid code for POA) and that have the following characteristics: all hospitals paid under Medicare's IPPS, CAH, cancer hospitals, and Maryland hospitals. Data include between 1,415,140 and 1,633,230 discharges per quarter.

CLABSI per 1,000 Discharges (AHRQ National Scorecard)

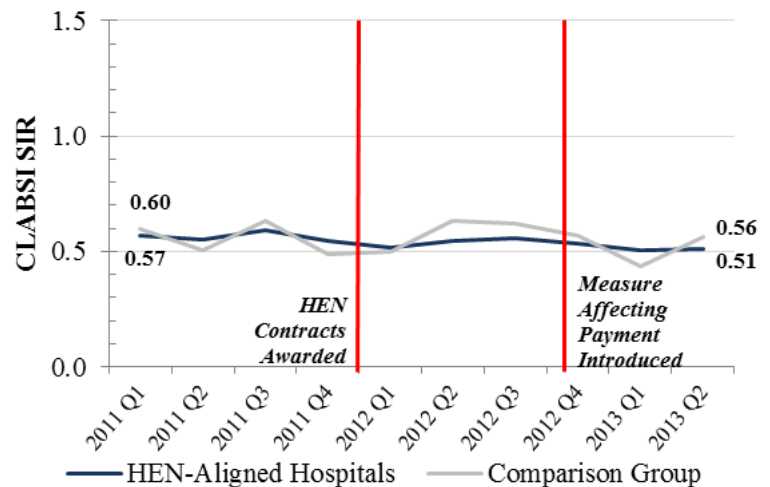
- ◆ Evidence for improvement from raw rates in this measure.
 - Steady decline in rates 2010, 2011, and 2012 (7.3 percent improvement).

Table 8-2—CLABSI per 1,000 Discharges		
2010 HAC Rates (per 1,000 discharges)	2011 HAC Rates (per 1,000 discharges)	Preliminary 2012 HAC Rates (per 1,000 discharges)
0.55	0.52	0.51

Comparative Change in CLABSI SIR (ICUs) (NHSN)

- ◆ Between the baseline (2011) and follow-up (Q1 2012 to Q2 2013) as a whole, SIRs improved more on average for HEN-aligned hospitals relative to the comparison group.⁸⁻² But as the chart shows, the magnitude of the difference is relatively small and there is no persisting divergence between the two.
- ◆ IPPS payment incentive for Vascular Catheter-Associated Infections became effective in October 2012.

Figure 8-5—CLABSI SIR (ICUs), HEN-Aligned vs. Comparison Group



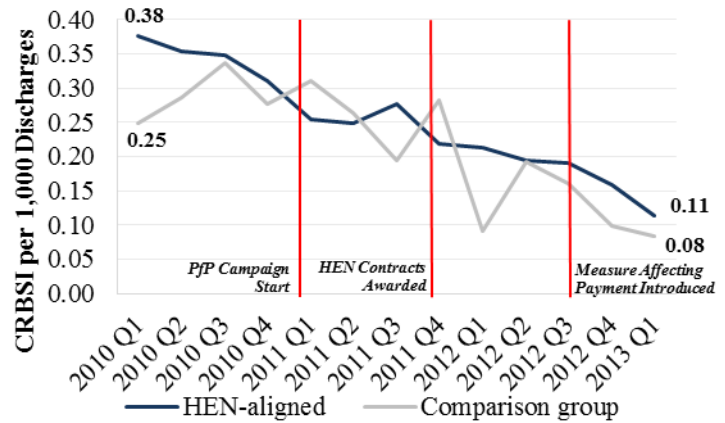
Source: Aggregated NHSN data provided to the PEC Team by the CDC.
 Notes: NHSN data on CLABSI incidence are not available prior to 2011 due to limited reporting. Comparison group is propensity score reweighted set of non-aligned hospitals. The SIR is defined as the observed infection rate relative to the rate that would have been expected, given patient and hospital characteristics, in 2006-2008.
 SIR = Standardized Infection Ratio

⁸⁻² It has not been possible to correct the standard errors for hospital-level clustering. With a clustering adjustment, the difference in change between the two groups would likely not be statistically significant.

Comparative Change in CR-BSI (AHRQ PSI-07) (Medicare Claims)

- ◆ The improvement experienced by HEN-aligned hospitals between baseline (2009-2011) and follow-up (through Q1 2013) does not differ statistically from the improvement experienced by comparison group hospitals.
- ◆ CLABSI rate falls from 1.2 per 1000 central line days to 0.6 per 1000 central line days in 148 hospitals receiving intensive assistance from their QIO in the reduction of HAIs. (No statistical tests possible.)

Figure 8-6—CR-BSI (PSI-07), HEN-Aligned vs. Comparison Group



Note: Calculations are based on Medicare FFS claims for all hospitals that reliably report present on admission (POA) status (≥ 95 percent of the hospital's diagnoses for a given quarter are accompanied by a valid code for POA) and that have the following characteristics: all hospitals paid under Medicare's IPPS, CAH, cancer hospitals, and Maryland hospitals. Rates are adjusted for changes in Medicare FFS beneficiary demographics (age, sex, and race) over time, with composition for all periods adjusted to equal the HEN-aligned composition in 2012. Comparison group is propensity score reweighted set of non-aligned hospitals.

Table 8-3—Changes in CLABSI Rates in Hospitals Participating in QIO Initiatives

Measure	Baseline 2/1/2011-7/31/2011 (148 Facilities)	Re-Measurement Period 3/1/2013 – 8/31/2013 (148 Facilities)
CLABSI Rate	2.30 per 1,000	1.10 per 1,000
CAUTI SIR Rate	1.2 per 1,000	0.6 per 1,000

9. FALLS EVIDENCE

The two NDNQI measures, which are more sensitive than claims-based measures, but which include fewer hospitals, show evidence of improvement. The AHRQ National Scorecard measure also shows improvement. The trends in the narrow post-operative hip fracture per 1,000 discharges (AHRQ PSI-08) show mixed results, with evidence of acceleration during the 12 months after Q2 2012, but not the 12 months after Q3 2012. There was no evidence of greater improvement in HEN-aligned hospitals relative to a comparison group.

Table 9-1—Evidence for Falls

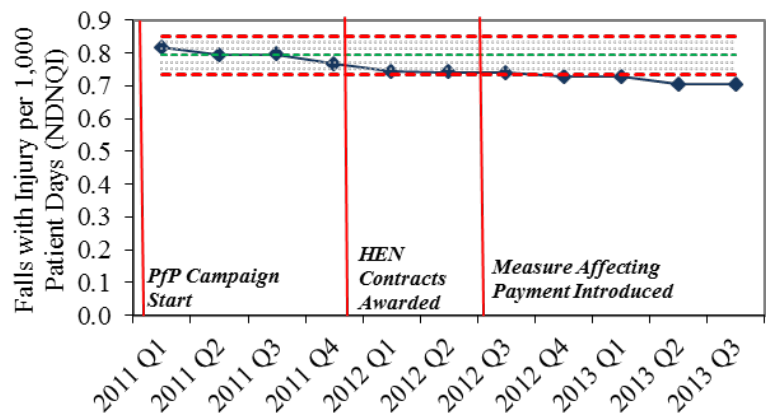
Measure	Source	Improvement	No Change	Worsening
Falls with Injury per 1,000 Patient Days	NDNQI More directly associated with harm	✓ p ' control chart (Figure 9-1) <i>t</i> -test of rates	✓ Pre/Post comparison of trends (<i>t</i> -test)	
Falls per 1,000 Patient Days	NDNQI Less directly associated with harm	✓ p ' control chart (Figure 9-2) <i>t</i> -test of rates	✓ Pre/Post comparison of trends (<i>t</i> -test)	
Post-Operative Hip Fracture per 1,000 Discharges (AHRQ PSI-08)	Medicare Claims Only a small fraction of falls with injury will be captured by this measure	Pre/Post comparison of trends mixed (<i>t</i> -test)	✓ p ' control chart (Figure 9-3) <i>t</i> -test of pre/post rates	
Falls per 1,000 Discharges	AHRQ National Scorecard	✓ Unable to perform statistical testing		
Comparative Change in Post-Operative Hip Fracture per 1,000 Discharges (AHRQ PSI-08)	Medicare Claims Very narrow measure, but compares the HEN-aligned and non-aligned groups		✓ Comparative change	

The following figures and tables give more detail on each of the measures and analyses listed above in Table 9-1.

Falls with Injury per 1,000 Patient Days (NDNQI)

- ◆ Evidence for improvement from the p' control chart (that is, it is consistent with special cause variation) with lower and more favorable fall rates.
 - The most recent 4 quarters have rates below the lower control limit.
- ◆ Evidence for improvement from the t-test comparisons of rates.
 - Rates during all follow-up quarters are statistically lower than baseline.
 - 7.9 percent reduction in rate from 2011 to Q3 2013.
- ◆ The reduction in rate of falls with injury is associated with 6,397 fewer falls with injury compared to the number projected had the baseline rate been sustained; this reduction is associated with an estimated \$4.2 million in hospital cost savings.
- ◆ No evidence of acceleration in improvement from pre/post comparison of trends (t-tests).
 - The speed of improvement during the baseline period was statistically slower than during the baseline 12-month period.
 - IPPS Payment incentive for Fall Trauma became effective in October 2012

Figure 9-1—Falls with Injury per 1,000 Patient Days

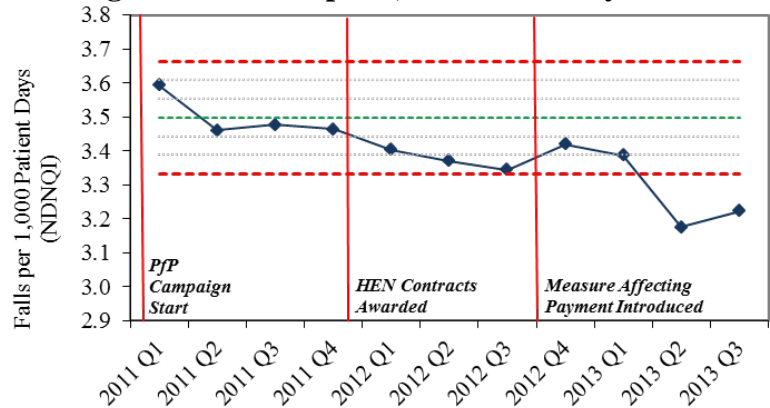


Note: Data are between 1,289 and 1,340 hospitals per quarter. Control limits (p') constructed using data from 2011 Q1 to 2011 Q4. The dashed green line is the center line; dashed red lines are the control limits; the closest dotted lines above and below the center line are the one-sigma limits; and the dotted lines just inside the control limits are the two-sigma limits.

Falls per 1,000 Patient Days (NDNQI)

- ◆ Evidence for improvement from the p ' control chart (that is, it is consistent with special cause variation) with lower and more favorable fall rates.
 - The most recent 2 quarters have rates below the lower control limit.
 - There are two consecutive quarters in the 2 sigma zone below the center line.
- ◆ Evidence for improvement from the t-test comparisons of rates.
 - Rates during the follow-up quarters are all statistically lower than baseline.
 - 11.3 percent reduction in rate from 2011 to Q3 2013.
- ◆ No evidence of acceleration in improvement from pre/post comparison of trends (t-tests).
 - Compared to the baseline year, the improvement (rate of decline in harms) in two of the moving calendar year follow-up periods (starting Q2 2012 and Q3 2012) is statistically significantly slower, and not statistically different in a third (Q1 2012 to Q1 2013).
 - IPPS Payment incentive for Fall Trauma became effective in October 2012

Figure 9-2—Falls per 1,000 Patient Days

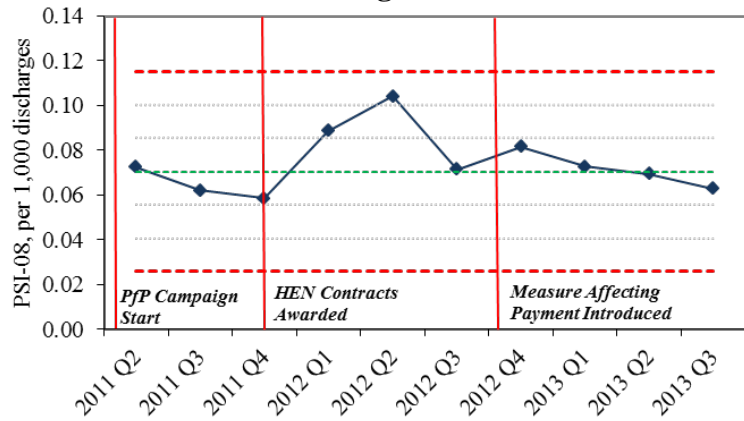


Note: Data are between 1,289 and 1,340 hospitals per quarter. Control limits (p ') constructed using data from 2011 Q1 to 2011 Q4. The green dashed line is the center line; dashed red lines are the control limits; the closest dotted lines above and below the center line are the one-sigma limits; and the dotted lines just inside the control limits are the two-sigma limits.

Post-Operative Hip Fracture per 1,000 Discharges (AHRQ PSI-08) (Medicare Claims)

- ◆ No evidence for improvement from the p'-chart (that is, it is consistent with common cause variation).
- ◆ Some evidence, though mixed, of acceleration in improvement from pre/post comparison of trends (t-tests).
 - Compared to the baseline 12-month period, the speed of improvement was statistically higher during the 12-months after 2012 Q2, though not the 12-months after 2012 Q3.
 - 2.5 percent reduction in rate from baseline (Q2 – Q4 2011) to Q3 2013.
IPPS Payment incentive for Fall Trauma became effective in October 2012

Figure 9-3—Post-Operative Hip Fracture per 1,000 Discharges



Note: Control limits (p') constructed using data from 2011 Q2 to 2012 Q1. The dashed green line is the center line; dashed red lines are the control limits; the closest dotted lines above and below the center line are the one-sigma limits; and the dotted lines just inside the control limits are the two-sigma limits. Calculations are based on Medicare FFS claims for all hospitals that reliably report present on admission (POA) status (>=95 percent of the hospital's diagnoses for a given quarter are accompanied by a valid code for POA) and that have the following characteristics: all hospitals paid under Medicare's IPPS, CAH, cancer hospitals, and Maryland hospitals. Data include between 350,036 and 399,520 surgical discharges per quarter.

Falls per 1,000 Discharges (AHRQ National Scorecard)

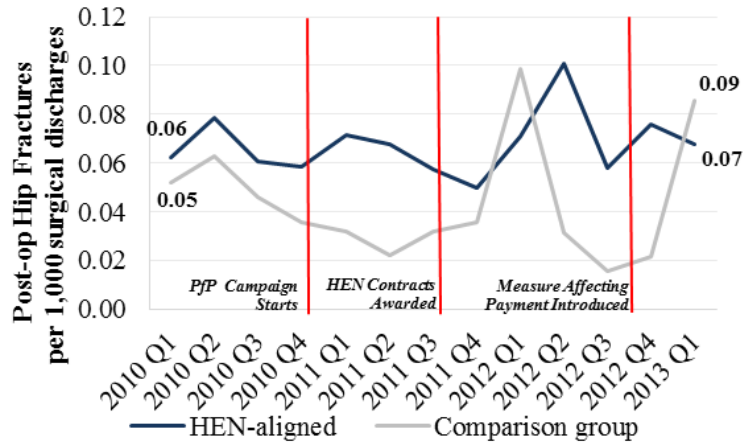
- ◆ Evidence for improvement from the raw rates in this measure.
 - Small decline (8.9 percent) in rates from 2010 to 2011; sharper decline in 2012.

Table 9-2—Falls per 1,000 Discharges		
2010 HAC Rates (per 1,000 discharges)	2011 HAC Rates (per 1,000 discharges)	Preliminary 2012 HAC Rates (per 1,000 discharges)
7.9	7.8	7.2

Comparative Change in Post-Operative Hip Fracture Rate (AHRQ PSI-08) (Medicare Claims)

Figure 9-4—Post Operative Hip Fractures per 1,000 Surgical Discharges, HEN-Aligned vs. Comparison Group

- ◆ No evidence for statistically greater improvement among HEN-aligned hospitals relative to the comparison group between the 2009-2011 baseline and follow-up period through Q1 2013.



Note: Calculations are based on Medicare FFS claims for all hospitals that reliably report present on admission (POA) status (≥ 95 percent of the hospital's diagnoses for a given quarter are accompanied by a valid code for POA) and that have the following characteristics: all hospitals paid under Medicare's IPPS, CAH, cancer hospitals, and Maryland hospitals. Rates are adjusted for changes in Medicare FFS beneficiary demographics (age, sex, and race) over time, with composition for all periods adjusted to equal the HEN-aligned composition in 2012. Comparison group is propensity score reweighted set of non-aligned hospitals.

10. OB-OTHER EVIDENCE

Two of the three HEN-reported measures show improvement, as does the AHRQ National Scorecard measure.

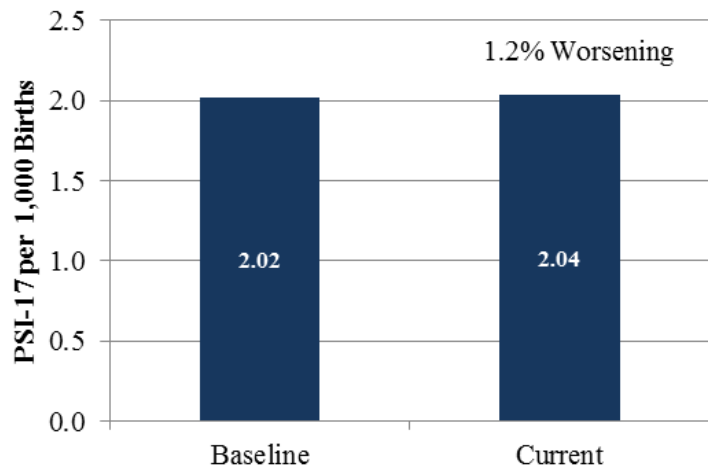
Measure	Source	Improvement	No Change	Worsening
Injury to Neonate (AHRQ PSI-17)	HENs The three HEN reported OB-Other measures are comparable, no single one is stronger		✓ <i>t</i> -test of rates (Figure 10-1)	
Obstetric Trauma, Vaginal Delivery with Instrument (AHRQ PSI-18)	HENs	✓ <i>t</i> -test of rates (Figure 10-2)		
Obstetric Trauma, Vaginal Delivery without Instrument (AHRQ PSI-19)	HENs	✓ <i>t</i> -test of rates (Figure 10-3)		
AHRQ PSI-18 and AHRQ PSI-19 Combined	AHRQ National Scorecard	✓ Unable to perform statistical testing		

The following figures and table give more detail on each of the measures and analyses listed above in Table 10-1.

Injury to Neonate per 1,000 Live Births (AHRQ PSI-17) (HENs)

- ◆ No evidence for improvement.
 - The most recent or current rate is actually slightly worse (by 1.2 percent, or 0.02 per 1,000 deliveries) than the baseline rate.

Figure 10-1—Injury to Neonate per 1,000 Live Births

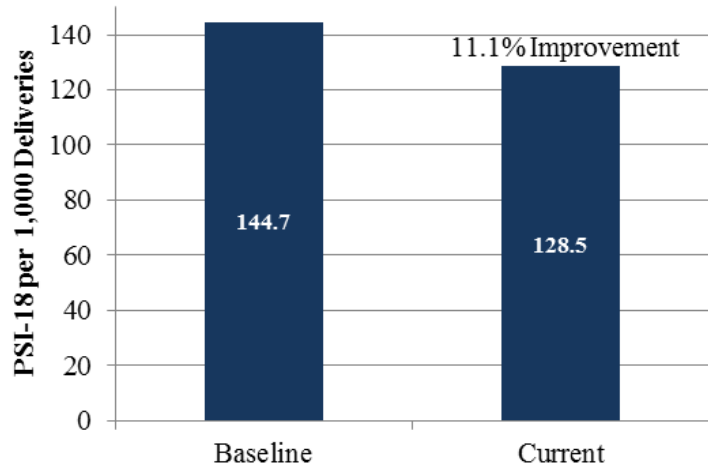


Note: Data include 1,177 hospitals in the current period. HEN baseline periods varied, but were predominantly 2010 data. Some baselines extended into 2012. Current periods also varied, but were predominantly one quarter in length during Q2 or Q3 2013, and were always in 2012 or later.

Obstetric Trauma, Vaginal Delivery with Instrument, Per 1,000 Instrumented Deliveries (AHRQ PSI-18) (HENS)

- ◆ Evidence for improvement.
 - The most recent or current rate is 11.1 percent lower (or 16.2 per 1,000 deliveries) than the baseline rate.
- ◆ The reduction in obstetric trauma (3rd or 4th degree lacerations) for births assisted by instruments is associated with an estimated 582 fewer traumas compared to the status if the baseline rate had been sustained; this reduction is associated with an estimated \$64,000 in hospital cost savings.

Figure 10-2—Obstetric Trauma per 1,000 Instrumented Deliveries

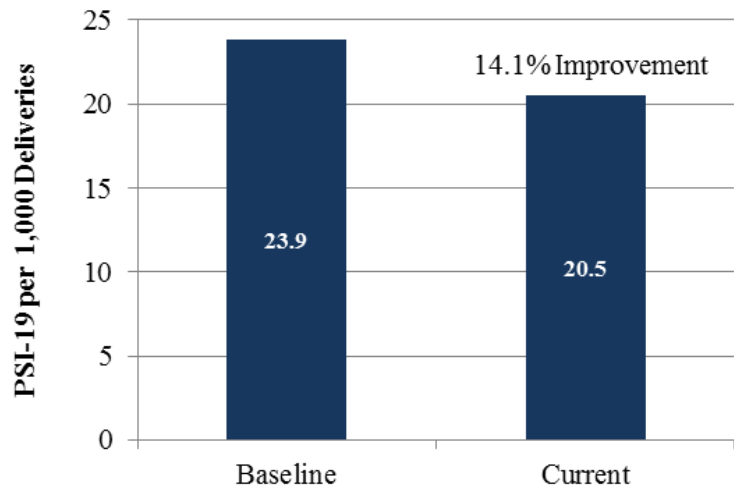


Note: Data include 1,392 hospitals in the current period. HEN baseline periods varied, but were predominantly 2010 data. Some baselines extended into 2012. Current periods also varied, but were predominantly one quarter in length during Q2 or Q3 2013, and were always in 2012 or later.

Obstetric Trauma, Vaginal Delivery without Instrument, Per 1,000 Non-Instrumented Deliveries (AHRQ PSI-19) (HENS)

- ◆ Evidence for improvement.
 - The most recent or current rate is 14.1 percent (or 3.4 per 1,000 deliveries) lower than the baseline rate.
- ◆ The reduction in obstetric trauma (3rd or 4th degree lacerations) for births without use of instruments is associated with 4,925 fewer traumas compared to the status if the baseline rate had been sustained; this reduction is associated with an estimated \$871,000 in hospital cost savings.

Figure 10-3—Obstetric Trauma per 1,000 Non-Instrumented Deliveries



Note: Data include 1,450 hospitals in the current period. HEN baseline periods varied, but were predominantly 2010 data. Some baselines extended into 2012. Current periods also varied, but were predominantly one quarter in length during Q2 or Q3 2013, and were always in 2012 or later.

Obstetric Trauma Per 1,000 Discharges (AHRQ PSI-18 and PSI-19) (AHRQ National Scorecard)

- ◆ Evidence for improvement from the rates in this measure.
 - Small decline (12.0 percent) in rates from 2010 to 2011; sharper decline in 2012.

Table 10-2—Obstetric Trauma per 1,000 Discharges		
2010 HAC Rates (per 1,000 discharges)	2011 HAC Rates (per 1,000 discharges)	Preliminary 2012 HAC Rates (per 1,000 discharges)
2.5	2.5	2.2

11. PRESSURE ULCER EVIDENCE

The voluntarily reported measures of the NDNQI data and the HEN-reported data show improvement, as does AHRQ’s National Scorecard measure. The measure from Medicare claims data focused on more severe pressure ulcers does not show improvement. The trends in the more severe pressure ulcers measure were qualitatively similar between HEN-aligned and comparison group hospitals.

Table 11-1—Evidence for Pressure Ulcers

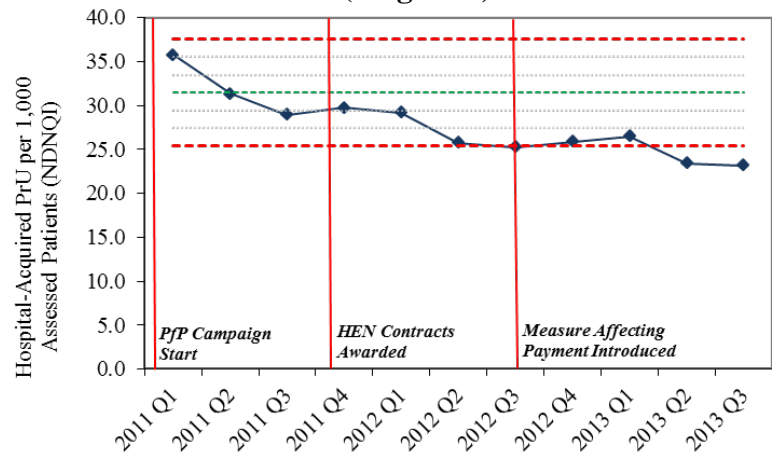
Measure	Source	Improvement	No Change	Worsening
Hospital-Acquired PrU per 1,000 Assessed Patients, Stages 2+	NDNQI Less complete (Reporting voluntary), but includes stage 2+ PrU	✓ p ' control chart, <i>t</i> -test of rates (Figure 11-1)	✓ Pre/Post comparison of trend (<i>t</i> -test)	
PrU per 1,000 Discharges, Stages 3+ (AHRQ PSI-03)	Medicare claims More complete reporting, but limited to most severe PrU		✓ Pre/Post comparison of trend (<i>t</i> -test)	
PrU per 1,000 Discharges, Stages 3+ (AHRQ PSI-03)	HENs (All-Payer) Less complete reporting, limited to most severe PrU	✓ <i>t</i> -test of rates (Figure 11-3)		
Pressure Ulcers	AHRQ National Scorecard		✓ Unable to perform statistical testing	
PrU per 1,000 Discharges, Stages 3+ (AHRQ PSI-03), Comparative change for HEN-Aligned vs. Non-Aligned Comparison Group	Medicare Claims		✓ Comparative change	

The following figures give more detail on each of the measures and analyses listed above in Table 11-1.

Hospital-Acquired PrU per 1,000 Assessed Patients, Stages 2+ (NDNQI)

- ◆ Evidence for improvement from the p ' chart.
 - There are three quarters that have rates below the lower control limit.
 - Two consecutive quarters below 2 sigma limit.
- ◆ Evidence for improvement from the comparisons of rates.
 - All seven follow-up periods have rates significantly lower than the baseline rate (*t*-test).
 - 26.3 percent reduction from 2011 rate to Q3 2013.
- ◆ No evidence of acceleration in improvement from pre/post comparison of trends.
 - The rate of improvement (decline in harms) in the follow-up period is statistically significantly slower than in baseline 12-month improvement.
 - IPPS Payment incentive for Pressure Ulcers Stages III and IV became effective in October 2012

Figure 11-1—Hospital-Acquired PrU per 1,000 Assessed Patients (Stages 2+)

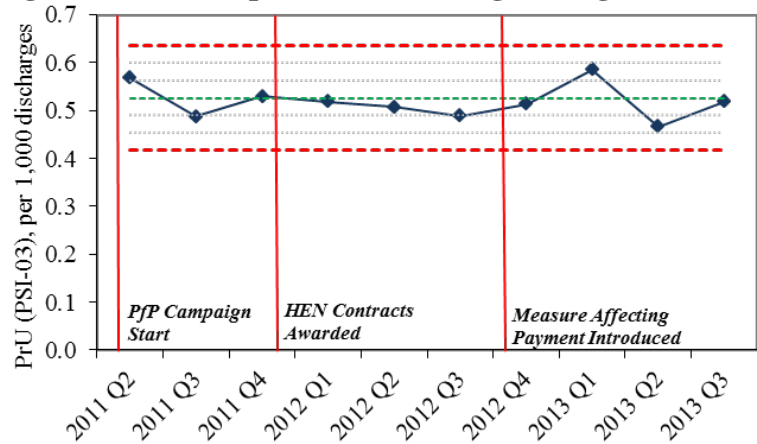


Note: Data are from between 1,278 and 1,341 hospitals per quarter. Control limits (p ') constructed using data from 2011 Q1 to 2011 Q4. The dashed green line is the center line; dashed red lines are the control limits; the closest dotted lines above and below the center line are the one-sigma limits; and the dotted lines just inside the control limits are the two-sigma limits.

PrU per 1,000 Discharges, Stages 3+ (AHRQ PSI-03), Medicare Claims

- ◆ p ' chart: No signal.
- ◆ t-test: Only one of seven follow-up quarters (Q2 2013) has a rate significantly below baseline.
- ◆ 2.0 percent reduction from Q2 – Q4 2011 rate to Q3 2013 (not significant).
- ◆ The reduction in pressure ulcers is associated with an estimated 112 fewer pressure ulcers compared to the status if the baseline rate had been sustained; this reduction is associated with an estimated \$1.1 million in hospital cost savings.
- ◆ No evidence of acceleration in improvement from comparison of trends.
 - Compared to the baseline, the 12-month period after Q2 2012 has a rate of change in harms that is not statistically significantly different; while the annual change starting in Q3 2012 showed statistically less improvement than in the initial year of change (in fact, the direction of change was adverse during this period).
 - IPPS Payment incentive for Pressure Ulcers Stages III and IV became effective in October 2012

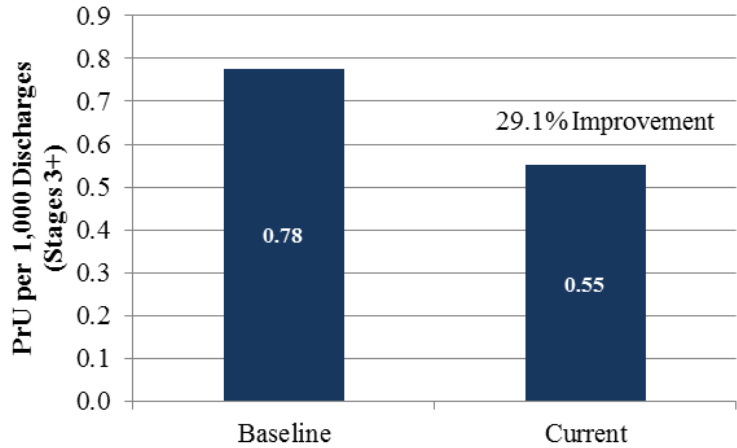
Figure 11-2—PrU per 1,000 Discharges (Stages 3+)



Note: Control limits (p ') constructed using data from 2011 Q2 to 2012 Q1. The dashed green line is the center line; dashed red lines are the control limits; the closest dotted lines above and below the center line are the one-sigma limits; and the dotted lines just inside the control limits are the two-sigma limits. Calculations are based on Medicare FFS claims for all hospitals that reliably report present on admission (POA) status (>=95 percent of the hospital's diagnoses for a given quarter are accompanied by a valid code for POA) and that have the following characteristics: all hospitals paid under Medicare's IPPS, CAH, cancer hospitals, and Maryland hospitals. Data include between 705,590 and 845,689 discharges per quarter.

PrU per 1,000 Discharges, Stages 3+ (AHRQ PSI-03) (HENs, All-Payer)

Figure 11-3—PrU per 1,000 Discharges (Stages 3+)



Note: Data include 1,139 hospitals in the current period. HEN baseline periods varied, but were predominantly 2010 or 2011 data. Some baselines extended into Q1 2012. Current periods also varied, but were predominantly one quarter in length during Q2 or Q3 2013, and were always in 2013 or later.

- ◆ Evidence for improvement from the comparison of rates.
 - The rate in the most recent or current period is 29.1 percent lower than the baseline rate (by 0.23 pressure ulcers per 1,000 discharges).

PrU per 1,000 Discharges (AHRQ National Scorecard)

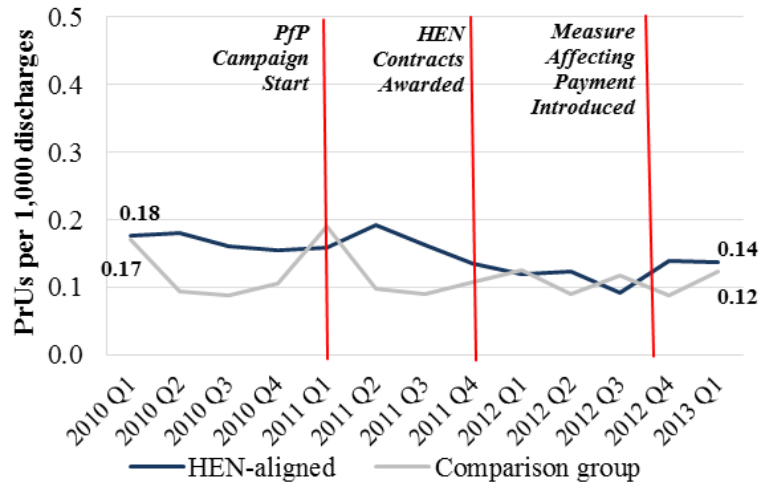
- ◆ Evidence of no significant change from the raw rates in this measure.
 - The 2012 rate is 2.2 percent lower than the 2010 rate, a change small enough that it is likely not statistically significant. Also, the 2011 rate is slightly higher than the 2010 rate (also not likely significantly so).

Table 11-2—PrU per 1,000 Discharges		
2010 HAC Rates (per 1,000 discharges)	2011 HAC Rates (per 1,000 discharges)	Preliminary 2012 HAC Rates (per 1,000 discharges)
40.3	40.4	39.4

Comparative Change in Rate of Stage 3+ PrU per 1,000 Discharges (AHRQ PSI-03) (Medicare Claims)

Figure 11-4—PrU per 1,000 Discharges (Stages 3+), HEN-Aligned vs. Comparison Group

- ◆ No evidence of improvement.
 - The average change between the baseline and follow-up periods is not statistically different for HEN-aligned hospitals than for the comparison group.
 - IPPS Payment incentive for Pressure Ulcers Stages III and IV became effective in October 2012



Note: Calculations are based on Medicare FFS claims for all hospitals that reliably report present on admission (POA) status (>=95 percent of the hospital's diagnoses for a given quarter are accompanied by a valid code for POA) and that have the following characteristics: all hospitals paid under Medicare's IPPS, CAH, cancer hospitals, and Maryland hospitals. Rates are adjusted for changes in Medicare FFS beneficiary demographics (age, sex, and race) over time, with composition for all periods adjusted to equal the HEN-aligned composition in 2012. Comparison group is propensity score reweighted set of non-aligned hospitals.

12. SSI EVIDENCE

The AHRQ National Scorecard measure, which includes a broad range of surgeries, suggests improvement; however, the denominator of the measure is all discharges, so that this measure would be biased toward showing more improvement if the number of surgeries taking place in the hospital decreased. The NHSN measure focused on abdominal hysterectomy surgeries did not show any change, and the NHSN national trend measure for SSI SIR after colon surgery indicates worsening. Trends are qualitatively similar in HEN-aligned and comparison group hospitals.

Table 12-1—Evidence for SSI

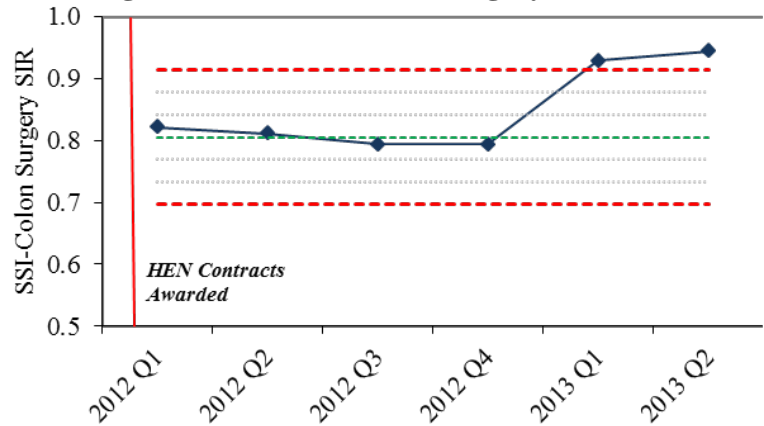
Measure	Source	Improvement	No Change	Worsening
SSI–Colon Surgery SIR	NHSN Reporting is mandatory for PPS hospitals, but limited to one procedure			✓ X-chart (Figure 12-1)
SSI–Abdominal Hysterectomy SIR	NHSN Reporting is mandatory for PPS hospitals, but limited to one procedure		✓ X-chart (Figure 12-2)	
SSIs	AHRQ National Scorecard	✓ Unable to do statistical testing		
SSI–Colon Surgery SIR, Comparative change for HEN-Aligned vs. Non-Aligned Comparison Group	NHSN Reporting is mandatory for PPS hospitals, but limited to one procedure		✓ Comparative change (Figure 12-3)	
SSI–Abdominal Hysterectomy SIR, Comparative change for HEN-Aligned vs. Non-Aligned Comparison Group	NHSN Reporting is mandatory for PPS hospitals, but limited to one procedure		✓ Comparative change (Figure 12-4)	

The following figures and table give more detail on each of the measures and analyses listed above in Table 12-1.

SSI-Colon Surgery SIR (NHSN)

- ◆ Evidence from X-chart of worsening.
 - The rates in the most recent 2 quarters are above the upper control limit.
- ◆ SSIs for colon surgery increased during 2013. No information is available on the reason for the increase.
 - Q2 2013 rate is 14.9 percent higher than Q1 2012.

Figure 12-1—SSI-Colon Surgery SIR

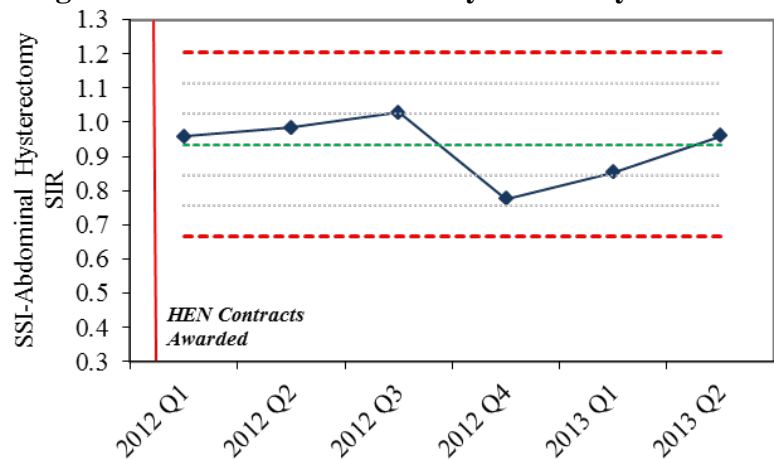


Note: Data are between 3,331 and 3,441 hospitals per quarter. Control limits (X-chart) constructed using data from 2012 Q1 to 2012 Q4. The dashed green line is the center line; dashed red lines are the control limits; the closest dotted lines above and below the center line are the one-sigma limits; and the dotted lines just inside the control limits are the two-sigma limits. SIR = Standardized Infection Ratio.

SSI-Abdominal Hysterectomy SIR (NHSN)

- ◆ No evidence for improvement from the X-chart (that is, observed variation is consistent with common cause variation).
- ◆ Q2 2013 rate is 0.2 percent higher than the Q1 2012 rate.

Figure 12-2—SSI-Abdominal Hysterectomy SIR



Note: Data are between 3,326 and 3,429 hospitals per quarter. Control limits (X-chart) constructed using data from 2012 Q1 to 2012 Q4. The dashed green line is the center line; dashed red lines are the control limits; the closest dotted lines above and below the center line are the one-sigma limits; and the dotted lines just inside the control limits are the two-sigma limits. SIR = Standardized Infection Ratio.

SSI per 1,000 Discharges (AHRQ National Scorecard)

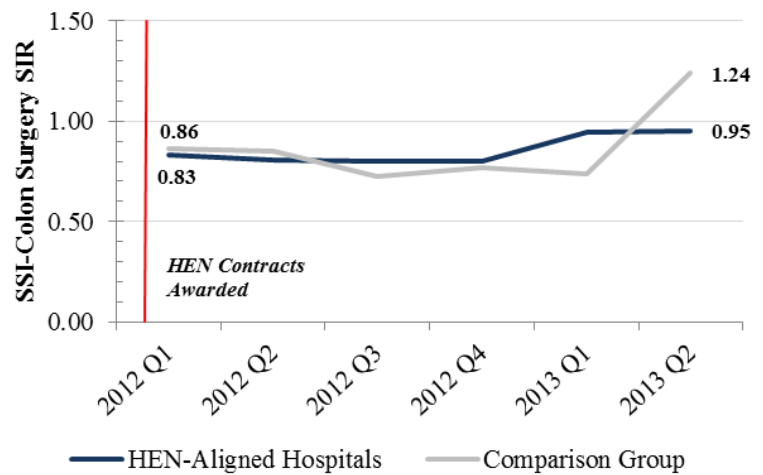
- ◆ Evidence for improvement.
 - The 2012 rate is 13.8 percent lower than the 2010 rate (although the 2012 rate is unchanged from the 2011 rate).

Table 12-2—SSI per 1,000 Discharges		
2010 HAC Rates (per 1,000 discharges)	2011 HAC Rates (per 1,000 discharges)	Preliminary 2012 HAC Rates (per 1,000 discharges)
2.9	2.5	2.5

Comparative Change in SSI—Colon Surgery SIR (NHSN)

Figure 12-3—SSI—Colon Surgery SIR, HEN-Aligned vs. Comparison Group

- ◆ No evidence for improvement.
 - Between baseline and the follow-up period as a whole, there is no statistically significant difference in change observed among HEN-aligned hospitals relative to the comparison group.¹²⁻¹



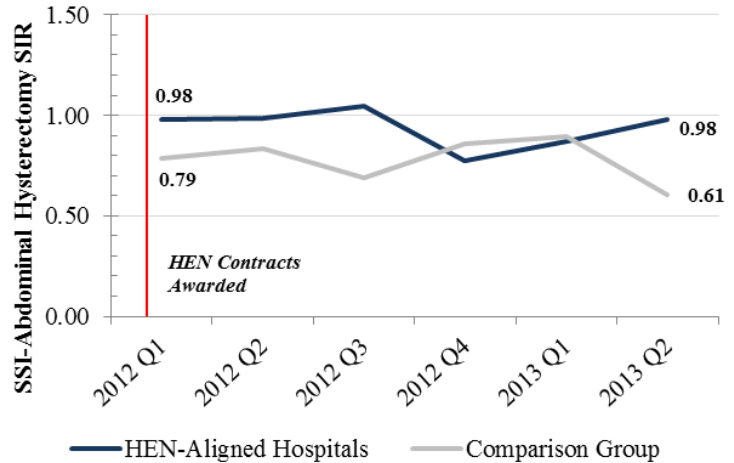
Source: Aggregated NHSN data provided to the PEC Team by the CDC.
 Notes: The comparison group is the propensity score reweighted set of non-aligned hospitals.
 SIR = Standardized Infection Ratio

¹²⁻¹ The size of the increase for the comparison group in Q2 2013 seems anomalous. The comparison group is smaller than the HEN-aligned group and thus will tend to have more random variation in observed outcomes. But the size of the increase nonetheless seems larger than reasonable. The Evaluation Contractor will check whether that change persists when updated NHSN data are received.

Comparative Change in SSI–Abdominal Hysterectomy SIR (NHSN)

- ◆ No evidence for improvement.
 - The HEN-aligned group has higher (more unfavorable) rates in Q1 2012 through Q3 2012, then the two trends coincide for Q4 2012 through Q1 2013, after which the HEN-aligned again has a higher (more unfavorable rate), in Q2 2013, due primarily to a large drop in the comparison group value.

Figure 12-4—SSI–Abdominal Hysterectomy SIR, HEN-Aligned vs. Comparison Group



Source: Aggregated NHSN data provided to the PEC Team by the CDC.
 Notes: The comparison group is the propensity score reweighted set of non-aligned hospitals.
 SIR = Standardized Infection Ratio.

This report was prepared by Andrew Clarkwest, Ph.D., Arnold Chen, M.D., Maureen Higgins, Valerie Cheh, Ph.D., Jelena Zurovac, Ph.D, and Keith Kranker, Ph.D. of Mathematica Policy Research, and Gina M. Tignini, Robert Fornango, Ph.D, Julia Lewis, and Sunny Bateman of HSAG, working under the direction of Sue Felt-Lisk, M.P.A., Mathematica, and Ryan Fair, HSAG.