Eliminating CAUTI: A National Patient Safety Imperative

Interim Data Report on the National *On the CUSP: Stop CAUTI* Project

A Project of:

Health Research & Educational Trust
Michigan Health & Hospital Association Keystone Center for Patient Safety & Quality
St. John Hospital and Medical Center
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Executive Summary

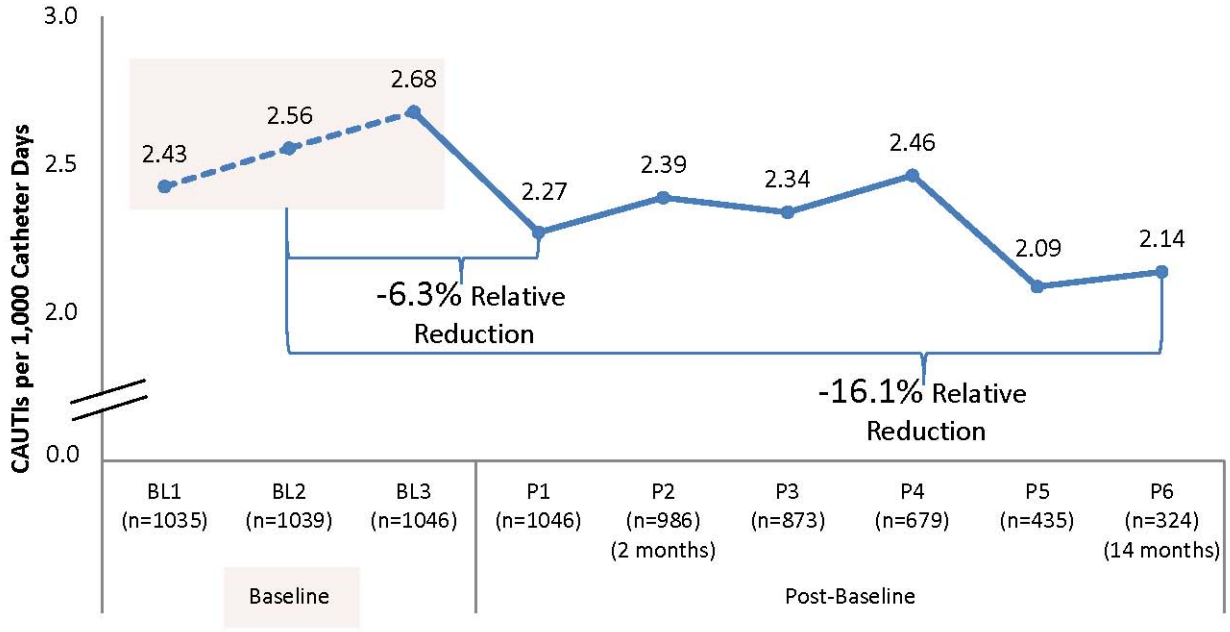
Healthcare-associated infections (HAIs) are a significant cause of illness, death, and excess cost in all health care settings. At any given time, HAIs affect 1 out of every 20 hospital patients. The U.S. Department of Health and Human Services' National Action Plan to Prevent Health Care-Associated Infections: Roadmap to Elimination focuses on the need to dramatically reduce these infections. As part of the National Action Plan, the Agency for Healthcare Research and Quality is funding a nationwide effort to promote the use of the Comprehensive Unit-based Safety Program (CUSP) to prevent catheter-associated urinary tract infection (CAUTI) in U.S. hospitals. This project combines the implementation of general socio-adaptive approaches to improve care in a particular unit or hospital coupled with evidence-based interventions focusing on the technical aspects of CAUTI prevention. The *On the CUSP: Stop CAUTI* project is a unit-based initiative with a primary goal of reducing the CAUTI rate in hospital units participating in the project by the completion of the 4-year initiative. Secondarily, this project seeks to make decreased CAUTI rates sustainable through fostering a culture of safety in participating units. The collaboration is led by the Health Research & Educational Trust and its partners, the Michigan Health & Hospital Association's Keystone Center for Patient Safety & Quality, St. John Hospital and Medical Center, the University of Michigan Health System, and the Johns Hopkins Medicine Armstrong Institute for Patient Safety and Quality, collectively referred to as the national project team.

To build on the strength of this collaboration and expand national support capacity, an Extended Faculty network has been developed. This Extended Faculty group is a network of content experts from professional societies well known throughout health care: the Association for Professionals in Infection Control and Epidemiology, the Emergency Nurses Association, the Society for Healthcare Epidemiology of America, and the Society of Hospital Medicine. This pool of faculty members serves as an additional resource for content development, leadership, and coaching for all stakeholders participating in the *On the CUSP: STOP CAUTI* national collaborative.

As of July 15, 2013, 6 cohorts have registered, collectively representing more than 850 hospitals and over 1,300 units located in 37 States, the District of Columbia, and Puerto Rico. The project continues to expand by increasing its reach both to new geographic locations and to new areas of the health care system, as well as by broadening exposure of participating units to national experts, and does so in an inclusive manner involving hospitals of all types, including rural and urban, teaching and non-teaching.

Overall, preliminary outcome data show that, among participating units, there has been a decrease in CAUTI rates from baseline, as shown in **Figure 1**, ranging from 6.3 percent relative reduction during post-baseline period two (2 months post-baseline) to 16.1 percent relative reduction during post-baseline period six (14 months post-baseline). Relative reduction improvements were more prominent in non–intensive-care units (ICUs) compared with ICUs. Catheter utilization rates have also been measured; these rates have stayed relatively constant over the time periods. Regarding both measures, it is important to note that due to the project's approach of staggered cohort implementation, CAUTI rates do not yet represent the complete data for all cohorts, as only cohorts 1–3 have completed participation and all remaining cohorts continue to submit data across all collection periods. Therefore, caution must be exercised when interpreting relative reductions and rates in later time periods, as additional data submission and analysis is ongoing.

Figure 1. CAUTI Rate of Units Reporting One Baseline and One Post-Baseline Data Point (CAUTI/Device Days x 1,000)



Future work will include both additional analyses and continued improvement efforts, as described below. Measures related to safety culture are key to assessing project-related improvements in patient safety culture. Two such culture measures are being collected throughout project participation: the Hospital Survey on Patient Safety Culture and the Team Checkup Tool. Ongoing efforts continue to increase culture-related data submission, and future analyses will be conducted with increased submissions. While the majority of participating units have successfully submitted data after registering for the project and have either shown a reduction in CAUTI or maintained a zero-CAUTI rate from baseline, efforts are ongoing to assist any units that continue to need project support. The national project team is working to identify opportunities for units experiencing difficulty with data submission and/or working to offer targeted interventions for units not yet able to reduce the CAUTI rate or sustain a reduced rate in order to enhance future cohort success. Some of this guidance comes from site visits conducted by national project leadership. In addition to providing such direct participant support, an Interdisciplinary Academy for Coaching and Training was developed in collaboration with experts at the University of Michigan and the Society of Hospital Medicine as a way to improve coaching, teamwork, and integration for faculty and State leads who provide this ongoing support and expertise to all project participants.

The project continues to expand with the completion of cohort 6 registration and the planning of cohort 7 registration underway. Additionally, the national collaborative has expanded its reach to Emergency Departments and broadened participant exposure to even more nationally known experts. These efforts alongside the progress made toward achieving the project's stated goals are encouraging, and they indicate that focused attention on reducing CAUTI using an effective approach that combines the technical and adaptive aspects of implementation can produce important results.

Introduction and Objectives

Healthcare-associated infections (HAIs) are a significant cause of illness, death, and excess cost in all health care settings. At any given time, HAIs affect 1 out of every 20 hospital patients. The U.S. Department of Health and Human Services' National Action Plan to Prevent Health Care-Associated Infections: Roadmap to Elimination focuses on the need to dramatically reduce these infections. As part of the National Action Plan, the Agency for Healthcare Research and Quality (AHRQ) is funding a nationwide effort to promote the use of the Comprehensive Unit-based Safety Program (CUSP) to prevent catheter-associated urinary tract infection (CAUTI) in U.S. hospitals. This project combines the implementation of general socio-adaptive approaches to improve care in a particular unit or hospital coupled with evidence-based interventions focusing on the technical aspects of CAUTI prevention. The *On the CUSP: Stop CAUTI* project is a unit-based initiative with a primary goal of reducing the CAUTI rate in hospital units participating in the project by the completion of the 4-year initiative. Secondarily, this project seeks to make decreased CAUTI rates sustainable through fostering a culture of safety in participating units. The collaboration is led by the Health Research & Educational Trust (HRET) and its partners, the Michigan Health & Hospital Association's Keystone Center for Patient Safety & Quality(MHA Keystone), St. John Hospital and Medical Center, the University of Michigan Health System, and the Johns Hopkins Medicine Armstrong Institute for Patient Safety and Quality, collectively referred to as the national project team.

To build on the strength of this collaboration and expand national support capacity, an Extended Faculty (EF) network has been developed. This EF group is a network of content experts from professional societies well known throughout health care: the Association for Professionals in Infection Control and Epidemiology (APIC), the Emergency Nurses Association (ENA), the Society for Healthcare Epidemiology of America (SHEA), and the Society of Hospital Medicine (SHM). This pool of faculty members serves as an additional resource for content development, leadership, and coaching for all stakeholders participating in the *On the CUSP: STOP CAUTI* national collaborative.

HAIs are among the most common preventable causes of mortality in the United States and a significant economic burden to the health care system. Approximately a quarter of all hospitalized patients have a urinary catheter placed during their hospital stay, and CAUTIs are among the most common HAIs in the United States. Yet, the majority of CAUTI cases are preventable. The national project team (NPT) believes that a national expansion of the original 10-State *On the CUSP: Stop CAUTI* initiative can play a critical role in reducing the frequency of catheter use and CAUTI. The NPT is charged with helping participating hospital units reduce their CAUTI rate and improve safety culture over the course of their 18- to 20-month participation in the *On the CUSP: Stop CAUTI* intervention.

The overall goal of this national expansion is to achieve a sustainable decrease in CAUTI and catheter use through the implementation of an evidence-based culture improvement strategy, CUSP, and application of the Centers for Disease Control and Prevention (CDC) Healthcare Infection Control Practices and Advisory Committee 2009 Guideline for the Prevention of Catheter-Associated Urinary Tract Infections. The Guideline's recommendations for the appropriate use of indwelling urinary catheters are similar to the "bladder bundle" developed by researchers working with the *Keystone: HAI*

initiative of the MHA Keystone Center.[1,2] The NPT has one primary goal and several secondary objectives for this project. The primary goal is to reduce the CAUTI rate in participating units upon completion of the 4-year initiative. This project also seeks to make decreased CAUTI rates sustainable through fostering a culture of safety in participating units. The project will accomplish this by developing a national infrastructure that equips leaders across the country to continue reducing CAUTI after this national effort ends, and by applying the intervention to other key quality and safety issues within health care settings. The secondary objective of this project is to maximize the impact of Federal resources invested in HAI reduction by ensuring effective coordination among these projects, the CDC's efforts to reduce HAIs through State health department-led efforts, Centers for Medicare & Medicaid Services' (CMS) investment in HAI reduction in the tenth scope of work for the Quality Improvement Organizations (QIOs), and CMS's Center for Medicare & Medicaid Innovation effort to reduce harm through Hospital Engagement Networks (HENs). The national project team builds on the original 10-State CAUTI reduction effort and leverages the connections, infrastructure, and expertise acquired in the highly successful national *On the CUSP: Stop CLABSI* effort in order to achieve these goals.

[1] Saint S, Olmsted RN, Fakih MG, et al. Translating health care–associated urinary tract infection prevention research into practice via the bladder bundle. Jt Comm J Qual Patient Saf. 2009 Sep;35(9):449-55. PMID: 19769204.

[2] Fakih MG, Watson SR, Greene MT, et al. Reducing inappropriate urinary catheter use: a statewide effort. Arch Intern Med. 2012 Feb 13;172(3):255-60. PMID: 22231611.

Methods

Data Sources

This report uses data stored in the MHA Care Counts database created and maintained by MHA Keystone Center in Lansing, Michigan. Data submission consists of nine periods over three phases throughout participation in the 18-month cohort. The three phases, including corresponding data collection periods, are baseline (three data collection periods, BL1, BL2, and BL3), implementation (two post-baseline data collection periods, P1 and P2), and sustainability (four post-baseline data collection periods, P3, P4, P5, and P6). During each of these periods, registered hospital units provide the number of catheter and patient days and CAUTIs observed, collectively referred to as "outcome" data in this project. In addition, units submit the number of patients and catheters, as well as the indications for the catheters, known in this project as "process" data. Process data are also collected during baseline implementation and sustainability phases of the project; however, process data are collected only within specific days for each of these periods—that is, 15 days during baseline periods one through three, 16 days during post-baseline periods one and two, and 5 days for each of the four remaining post-baseline periods. Units must submit process data directly into the Care Counts database, but outcome data may be entered into the CDC's National Healthcare Safety Network (NHSN) and then transferred into the Care Counts database at the State level. Two patient safety culture measures are collected, the Hospital Survey on Patient Safety Culture (HSOPS) and the Team Checkup Tool (TCT). The HSOPS survey is used to assess change in the system and unit patient safety culture over time and is collected both at the start of project participation and one year post baseline. The TCT is used to provide continual team feedback of barriers to unit safety culture and is intended to be completed quarterly.

Of note, the process measure for catheter insertion "appropriateness" was required at the launch of the project in November 2010; however, the NPT has determined, following review of the data, that this measure will be optional for the remaining project cohorts 5–7. Initial evaluation of appropriateness data has shown very high levels of reported appropriateness, with marginal variability and therefore limited opportunities for improvement. Following this investigation, it was determined that the measure should be changed from mandatory to optional. The catheter appropriateness tool and data collection system are still strongly recommended for use to identify barriers to CAUTI reduction. Measurement is critical for assessing success; however, measurement systems should continually be reviewed to limit data burden wherever possible in order to balance required resources with the value of return.

Currently, 39 sponsors have recruited six cohorts, representing units in 37 States, the District of Columbia, and Puerto Rico. These cohorts entered the project at different times; therefore, not all cohorts are included in each of the nine periods of data collection across the three phases of baseline, implementation, and sustainability.

All analyses in this report are based on data drawn from the Care Counts database as of July 15, 2013, which includes outcome and process data submitted through May 2013. Units that have formally withdrawn from the project are removed from these analyses. The project periods by cohort are detailed in **Table 1** and **Table 2**. Of note, in early fall 2011, after observing data submission rates, the NPT decided to offer units the opportunity to restart their data collection efforts. Nineteen units from cohort 2 opted to start over. The intervention date and data collection periods for these 19 units have been shifted to cohort 2b to accommodate the new start date. A complete list of hospitals that have contributed to the national project database can also be found on the project Web site at www.onthecuspstophai.org.

Hospital and Unit Characteristics

To more fully assess hospital characteristics, registered information provided by unit team leaders was linked to data from the annual American Hospital Association (AHA) 2010 National Survey results. This additional coordination of efforts reduced the data burden on hospital staff and provided an opportunity to make similar comparisons across hospitals and unit types, an important objective of national process improvement efforts.

Table 1. Project Outcome Data by Cohort*

			Baseline Periods	Post-Baseline Data Collection Periods					
Cohort	N†	Intervention Date	1–3	1	2	3	4	5	6
1	74	6/1/2011	Mar–May 2011	6/1/2011	7/1/2011	10/1/2011	1/1/2012	4/1/2012	7/1/2012
2	295	9/1/2011	Jun–Aug 2011	9/1/2011	10/1/2011	1/1/2012	4/1/2012	7/1/2012	10/1/2012
2b	24	11/1/2011	Aug–Oct 2011	11/1/2011	12/1/2011	3/1/2012	6/1/2012	9/1/2012	12/1/2012
3	325	4/1/2012	Jan–Mar 2012	4/1/2012	5/1/2012	8/1/2012	11/1/2012	2/1/2013	5/1/2013
4	483	10/1/2012	Jul–Sep 2012	10/1/2012	11/1/2012	2/1/2013	5/1/2013	-	-
5	128	4/1/2013	Jan–Mar 2013	4/1/2013	5/1/2013	-	-	-	-
6	37	10/1/2013	Jul–Sep 2013	-	-	-	-	-	-

*This table represents the expected data provided in the July 15, 2013, data extract. Unit teams are given 45 days from the end of a measurement period listed in the table above to enter outcome data.

†Number of registered units.

Table 2. Project Process Data by Cohort*

			Baseline Periods	Post-Baseline Data Collection Periods					
Cohort	N†	Intervention Date	1 - 3	1	2	3	4	5	6
1	74	6/1/2011	May 2–6, 9–13, 16–20 2011	Jun 6–10, 13–17 2011	Jun 21, 28 Jul 5, 12, 19, 26 2011	Oct 10–14 2011	Jan 9–13 2012	Apr 9–13 2012	Jul 9–13 2012
2	295	9/1/2011	Aug 1–5, 8–12, 15–19 2011	Sep 5–9, 12–16 2011	Sep 20, 27 Oct 4, 11, 18, 25 2011	Jan 9–13 2012	Apr 9–13 2012	Jul 9–13 2012	Oct 9–13 2012
2b	24	11/1/2011	Oct 3–7, 10–14, 17–21 2011	Nov 7–11, 14–18 2011	Nov 22, 29 Dec 6, 13, 20, 27 2011	Mar 12–16 2012	Jun 11–15 2012	Sep 11–15 2012	Dec 11–15 2012
3	325	4/1/2012	Mar 5–9, 12–16, 19–23 2012	Apr 2–6, 9–13 2012	Apr 17, 24 May 1, 8, 15, 22 2012	Aug 13–17 2012	Nov 12–16 2012	Feb 11–15 2013	May13–17 2013
4	483	10/1/2012	Sep 3–7, 10–14, 17–21 2012	Oct 1–5, 8–12 2012	Oct 16, 23, 30 Nov 6, 13, 20 2012	Feb 11–15 2013	May13–17 2013	-	-
5	128	4/1/2013	Mar 4–8, 11–15, 18–22 2013	Apr 1–5, 8–12 2013	Apr 16, 23, 30 May7, 14, 21 2013	-	-	-	-
6	37	10/1/2013	-	-	-	-	-	-	-

*This table represents the expected data provided in the July 15, 2013, data extract. Unit teams are given 2 weeks from the end of a measurement period to enter process data.

†Number of registered units.

Measures

The project measurement goals are to establish CAUTI rates, monitor catheter utilization and appropriateness rates, and assess team safety culture. These areas will be measured in the *On the CUSP: Stop CAUTI* project (outcome, process, and culture). Outcome and process measures are described throughout the remainder of this report. Process measures related to safety culture (specifically unit teamwork and communication) are being collected and will be incorporated into future data analyses.

To assess project success, the following three measures are captured and tracked: CAUTI NHSN rate, CAUTI population rate, and catheter utilization ratio. To be included in CAUTI rate and catheter utilization ratio calculations, participating units are required to submit data for at least one of three baseline data periods and at least one post-baseline data collection period. As a result, units may be missing some baseline or post-baseline data but still be included in the analyses.

CAUTI Rates

CAUTI rates were calculated using two methods. First, CAUTI rates were measured using the CDC NHSN methodology.[3] The NHSN measure accounts for the risk of infection for patients with an indwelling catheter. A CAUTI rate is calculated using the NHSN definition by dividing the total number of CAUTI episodes within a specific time period by the total number of catheter days within the same time period, then multiplying by 1,000 (see **Equation 1**).

Equation 1. CAUTI Rate Using NHSN Calculation

$$CAUTI\ Rate = \frac{CAUTI\ Episodes}{Catheter\ Days} \times 1{,}000$$

The CAUTI rate was also estimated using a population-based denominator.[4] Because the target of many CAUTI interventions is reducing the number of catheter days, this measure has been shown to be more sensitive in intervention studies,[5] as it is standardized by the population, which is typically relatively constant, unlike the number of catheter days, which typically decreases during an intervention. A population CAUTI rate is calculated by dividing the total number of CAUTI episodes within a specific time period by the total number of patient days within the same time period, then multiplying by 10,000 (see **Equation 2**).

Equation 2. **Population CAUTI Rate**

$$Population\ CAUTI\ Rate = \frac{CAUTI\ Episodes}{Patient\ Days} \times 10{,}000$$

Catheter Utilization Ratio

A catheter utilization ratio was calculated to assess more closely the relationship between changes in catheter utilization and patient volume. Because the target of many CAUTI interventions is decreasing

[3]Dudeck MA, Horan TC, Peterson KD, et al. National Healthcare Safety Network (NHSN) Report, data summary for 2010, device-associated module. Am J Infect Control. 2011Dec; 39(10): 798-816. PMID: 22133532.

[4] Fakih, MG, Greene, MT, Kennedy EH, et al. Introducing a population-based outcome measure to evaluate the effect of interventions to reduce catheter-associated urinary tract infection. Am J Infect Control 2012 May; 40(4): 359-64. PMID: 21868133.

[5] Wright M-O, Kharasch M, Beaumont JL, et al. Reporting catheter-associated urinary tract infections: denominator matters. Infect Control Hosp Epidemiol 2011 Jul;32(7):635-640. PMID: 21666391.

the number of catheter days, this measure assesses if a reduction in catheter days is the result of a decrease in utilization (i.e., ratio decrease with time) or a decrease in patient volume (i.e., ratio remains relatively constant).

Catheter utilization is calculated by dividing the total number of catheter days in a given time period by the total number of patient days in the corresponding time period and reflected as a percent (see **Equation 3**).

Equation 3. Catheter Utilization Ratio

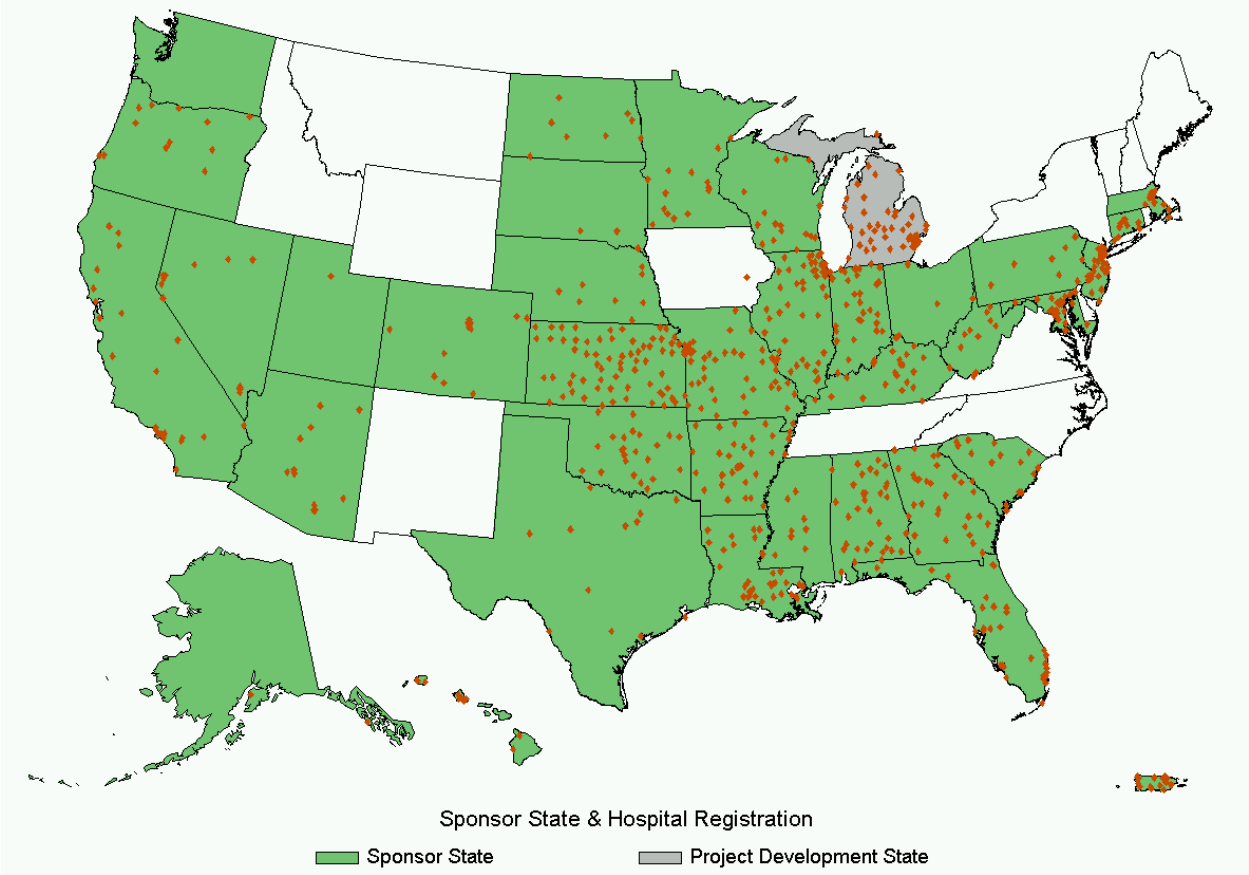
$$Catheter\ Utilization\ Ratio = \frac{Catheter\ Days}{Patient\ Days}$$

Results

Types of Hospitals Represented

There are 861 registered hospitals participating in the initiative as of July 15, 2013. These hospitals are located in 37 States, the District of Columbia, and Puerto Rico and have been recruited by 39 sponsors (37 State hospital associations, plus Puerto Rico and UHC's HEN; see **Figure 2**). To assess hospital characteristics for cohorts 1–6, participating hospital data were linked to the annual AHA 2010 National Survey results. Hospitals not participating in the AHA survey (n=44) were excluded from analyses examining hospital characteristics.

Figure 2. Sponsor State Hospital Associations and Hospitals Registered in the Project*†‡



*The work on which this project is based originated in Michigan, the project development State.
†The State of Washington does not disclose names of participating hospitals.
‡Map includes all available hospitals and States (including cohort 6) registered in the Care Counts system as of July 15th, 2013. Units sponsored by missing AHA Survey data are not shown.

The majority of participating hospitals are categorized as having between 26 and 175 total hospital beds (44.9%; n=367), a finding similar to the AHA National Survey data (51%; n=3,201). On average, participating hospitals have 185 beds (median = 117; standard deviation [SD] = 204; Min = 6; Max = 1,597), a slightly larger number of beds than the AHA National Survey average of 154 (median = 87; SD = 184; Min = 1; Max = 2,261). Additional characteristics of participating hospitals, including comparisons to national data, are shown in **Table 3**.

Table 3. Characteristics of Registered Hospitals for Cohorts 1–6 (n=817)* as Compared With Like Hospital Data From the AHA National Survey

Category	Registered Hospitals† (n=817)		National Hospitals†† (n=6,334)	
	n	%	N	%
Bed Size Category				
1–25	138	16.9%	1,249	19.7%
26–175	367	44.9%	3,201	50.5%
176–325	174	21.3%	1,064	16.8%
326–475	73	8.9%	455	7.2%
>475	65	8.0%	365	5.8%
Hospital Type				
System	426	52.1%	3,669	57.9%
Rural	333	40.8%	2,226	35.1%
Teaching	239	29.3%	1,543	24.4%
Critical Access	183	22.4%	1,315	20.8%
In Top 100 Largest Cities	112	13.7%	1,143	18.0%

*Represents the total number of hospitals registered in the project that could be linked to their AHA 2010 National Survey results.

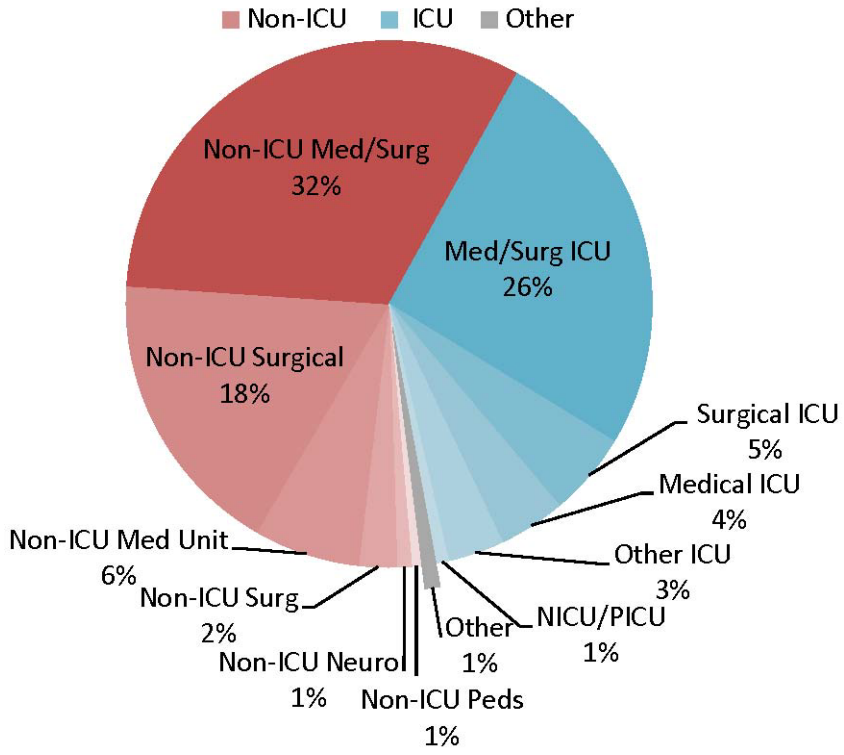
†Forty-four hospitals could not be linked to their AHA 2010 National Survey results and were excluded.

††Represents the total number of hospitals included in the AHA 2010 National Survey results.

Types of Units Represented

Figure 3 depicts the types of units registered in the project (n=1,366 registered units). More than 60 percent of the registered units are non-ICUs, with the majority of these being medical/surgical units (38%).

Figure 3.Types of Units Registered in the Project



Data Submission

Within each State, there is some variation in the lag time between the data collection period and the actual data submission date. The majority of units are entering data directly into Care Counts; therefore their data are submitted within 45 days immediately following the data collection period; however, the remaining units submit data through the State leads after retrieval from another system, such as CDC's NHSN, which can result in up to a three-month lag in their submission. **Table 4** presents the outcome data submission rates by cohort as of July 15, 2013, for all expected measurement periods across all units not formally withdrawn from the initiative.

Table 4. Outcome Data Submission by Cohort

	Baseline Collection Periods			Post-Baseline Collection Periods					
Cohort	1	2	3	1	2	3	4	5	6
1	80%	79%	77%	77%	77%	76%	30%	66%	15%
2	86%	85%	87%	86%	81%	77%	71%	65%	56%
3	98%	98%	98%	96%	96%	93%	90%	81%	61%
4	96%	96%	95%	94%	91%	83%	51%		
5	91%	91%	90%	84%	54%				
Total	**93%**	**93%**	**92%**	**91%**	**86%**	**84%**	**65%**	**73%**	**54%**

One hundred seventy-two units have formally withdrawn from the project and are not included in the analyses. See **Table 5** for units withdrawn by cohort. Emergency departments (EDs) and post-acute care units were also excluded from outcome analyses, as these units do not incur patient or device days.

Table 5. Units Formally Withdrawn From the Project by Cohort

Cohort	Registered Units	Number of Units Formally Withdrawn	Percent of Units Formally Withdrawn	Post-Baseline Collection Period (Number of Units Formally Withdrawn)					
				1	2	3	4	5	6
1	74	3	4.1%	1		2			
2	319	67	21.0%	34	4	14	14		1
3	324	44	13.6%	10	17	3	4	8	2
4	484	37	7.6%	13	14	9	1		
5	128	20	15.6%	6	14				
Totals	1,329	171	12.9%	64	49	28	19	8	3

Additionally, submission of at least one baseline and one post-baseline data point is required for inclusion in outcomes analyses, and missing data totals for these analyses are reflected in **Table 6**. A total of 1,051 remaining units met the inclusion criteria for analysis. Due to the inconsistency of missing data within each of the data collection periods, these 1,051 units reflect the total number of unique units represented in analyses for all tables and graphs below and do not reflect a sum of the units across all time periods. Analyses to assess the effect of cohort participation and missing data on these key measures are ongoing.

Outcome and Process Measures

CAUTI rates were calculated following both the NHSN method and a population-adjusted method (see **Measures** for details). Catheter utilization reflects a ratio of the total catheter days divided by the total number of patient days and is presented as a percent. Data were pooled at each time period, regardless of cohort assignment. Due to the staggered assignment of cohort startup in this nationwide effort, data submission is also staggered. As of July 15, 2013, cohorts 1, 2, and 3 have entered data for all data collection periods, cohort 4 has entered data through post-baseline data collection period four (P4), and cohort 5 has entered data through post-baseline data collection period two (P2). All remaining tables and figures reflect only these expected data submission points for cohorts 1–5. For units to be included in tables and figures depicting outcome and process measures, units had to have submitted a minimum of one baseline and one post-baseline data point.

Table 6. Units Missing Expected Data in CAUTI Rates and Catheter Utilization Ratio Figures (n=1,051)*

Baseline			Post-Baseline Collection Period					
1	2	3	1	2	3	4	5	6
1.5%	1.1%	0.5%	0.5%	6.2%	9.0%	29.2%	19.7%	40.2%

*Post-baseline data are not yet available for cohort 4 post-baseline periods five and six or for cohort 5 post-baseline periods three through six. These units are not reflected in the denominator when calculating missing data percentages.

Outcome Measures

CAUTI Rates

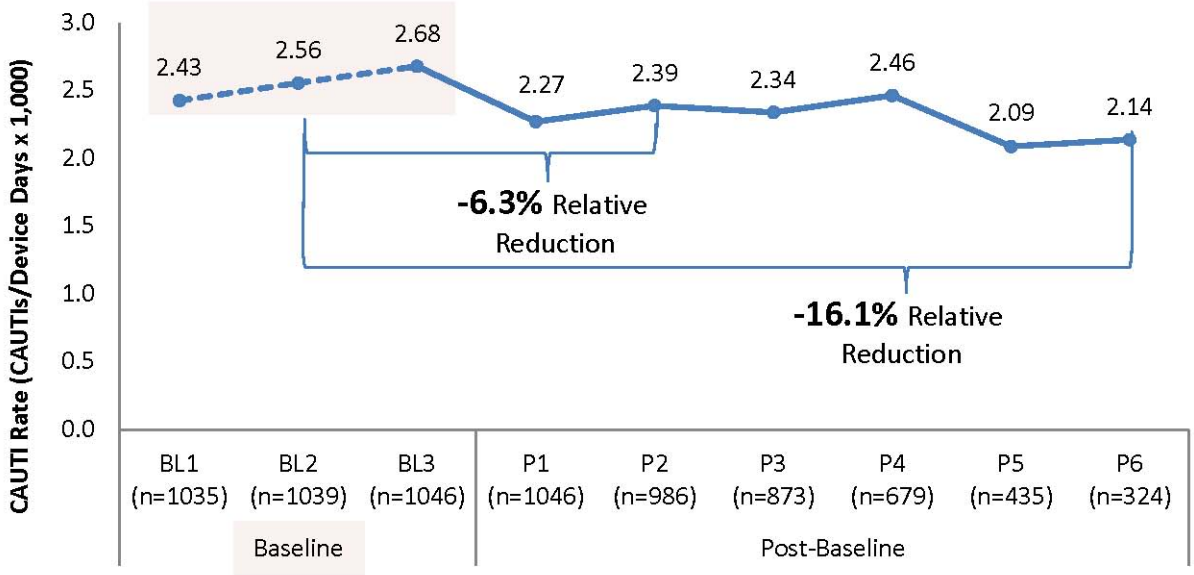
CAUTI Rate Using NHSN Calculation

CAUTI rates calculated using NHSN methodology can be found in **Figure 4** through **Figure 7**. Rates were examined as: overall CAUTI rate and CAUTI rate by cohort, ICU status, and bed size.

Overall

Overall, CAUTI rates have decreased over time compared to baseline. Although variability is found across the 3 baseline periods (BL1–BL3), the average baseline CAUTI rate was 2.55 infections per 1,000 catheter days. The decrease in CAUTI rate from baseline ranges from 6.3 percent during post-baseline period two (2 months post-baseline) to 16.1 percent during post-baseline period six (14 months post-baseline), as shown in **Figure 4** (see **Table** for all relative changes over time). Catheter utilization rates have also been measured; however, this rate has stayed relatively constant over the time periods. Regarding both measures, it is important to note that due to the project's approach of staggered cohort implementation, CAUTI rates do not yet represent the complete data for all cohorts, as only cohorts 1–3 have completed participation and all remaining cohorts continue to submit data across all collection periods. While the initial relative reduction shown represents cohorts 1–5, the relative reduction reported at P6 does not include data from cohorts 4–5 (cohort 6 has not yet completed baseline data submission and is therefore not included in the analysis). Of note, cohort 4, representing over 400 units, had a higher baseline, while cohort 5, representing less than 100 units, had a lower baseline. Therefore, caution must be exercised when interpreting relative reductions and rates in later time periods, as additional data submission and analysis is ongoing.

Figure 4. CAUTI Rate During Baseline (BL) and Post-Baseline (P) Collection Periods – NHSN Calculation – (CAUTIs/Catheter Days) x 1,000*



*BL1 to P2 represents cohorts 1–5, P3 and P4 represent cohorts 1–4, and P5 and P6 represent cohorts 1–3.

Note: n's represent the total number of reporting units for corresponding collection periods.

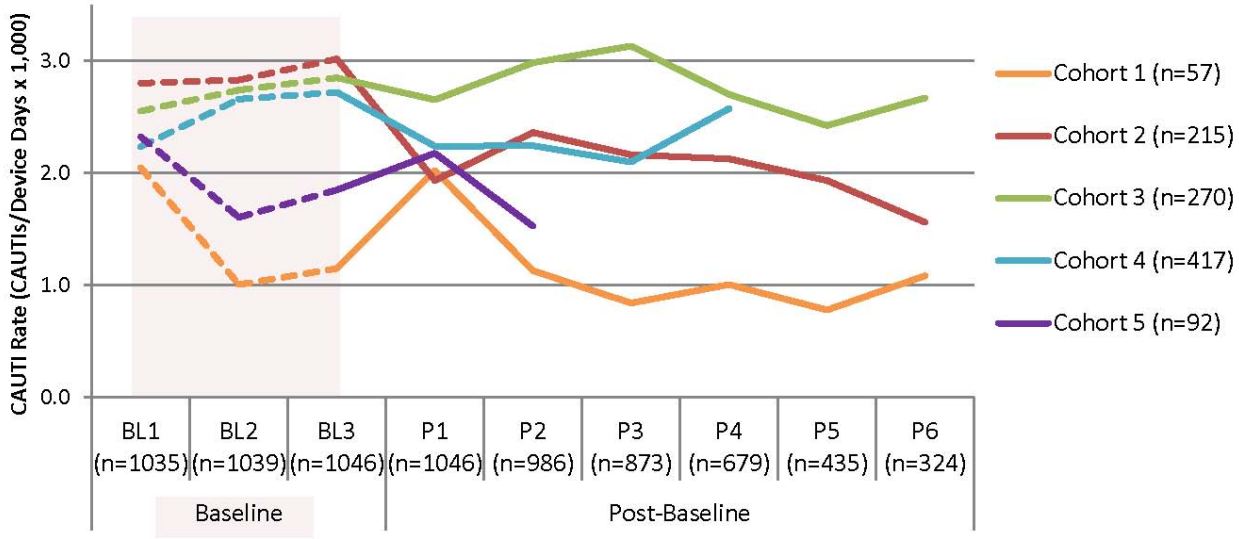
Table 7. Relative Change From Baseline*

	Post-Baseline Collection Periods					
	1	2	3	4	5	6
Units Reporting	1,046	986	873	679	435	324
NHSN Rate	2.271	2.389	2.339	2.464	2.088	2.138
Relative Reduction	-10.9%	-6.3%	-8.2%	-3.3%	-18.1%	-16.1%

*Baseline aggregated over three baseline time periods (BL1–BL3).

Cohort Status

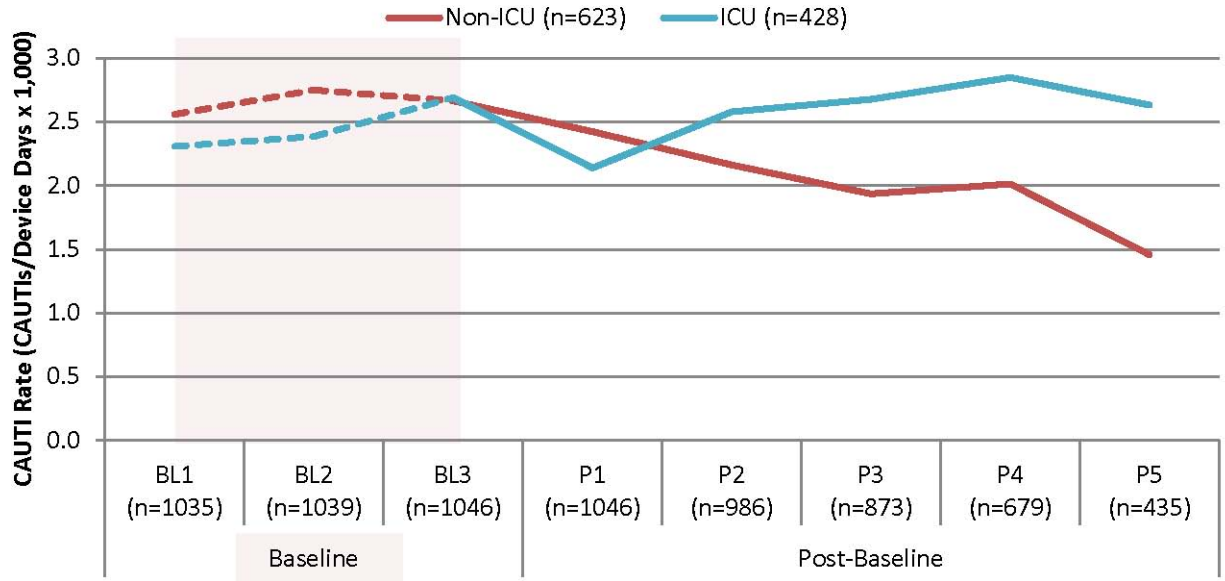
Figure 5. CAUTI Rate During Baseline (BL) and Post-Baseline (P) Collection Periods – NHSN Calculation – By Cohort Status – (CAUTIs/Catheter Days) x 1,000



Note: n's represent the total number of reporting units for corresponding cohorts and collection periods.

ICU Status

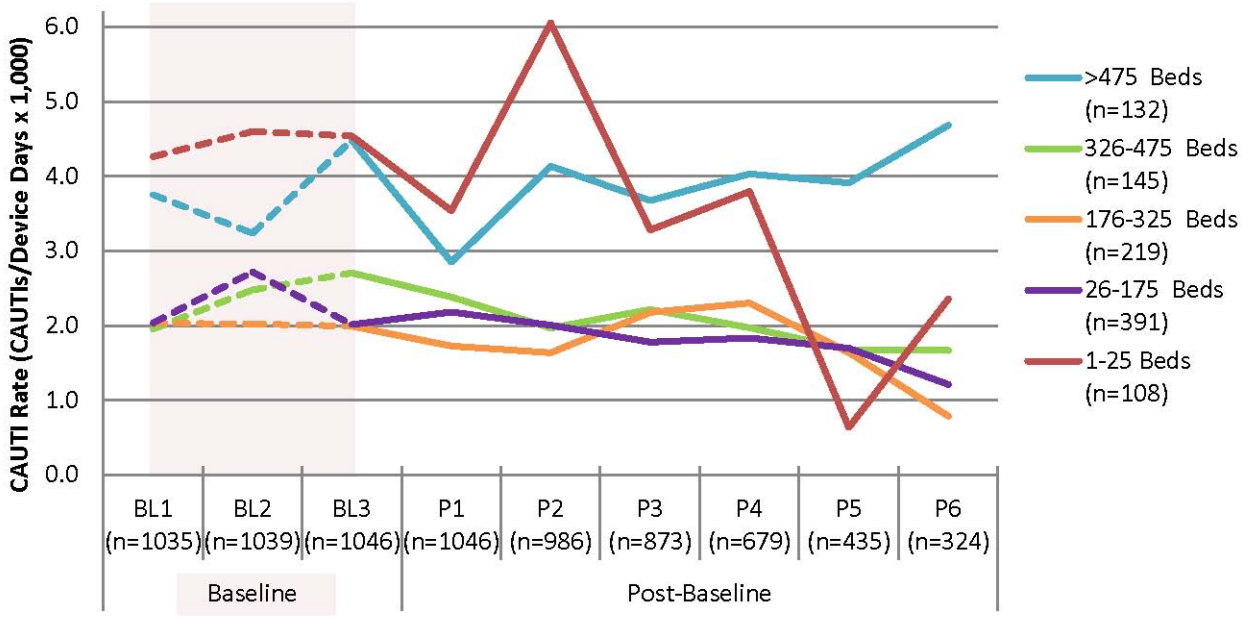
Figure 6. CAUTI Rate During Baseline (BL) and Post-Baseline (P) Collection Periods – NHSN Calculation – By ICU Status – (CAUTIs/Catheter Days) x 1,000



Note: n's represent the total number of reporting units for corresponding unit types and collection periods.

Bed Size

Figure 7. CAUTI Rate During Baseline (BL) and Post-Baseline (P) Collection Periods – NHSN Calculation – By Bed Size – (CAUTIs/Catheter Days) x 1,000*



*Fifty-six units in hospitals with unknown total bed size

Note: n's represent the total number of reporting units for corresponding bed sizes and collection periods.

Population CAUTI Rate

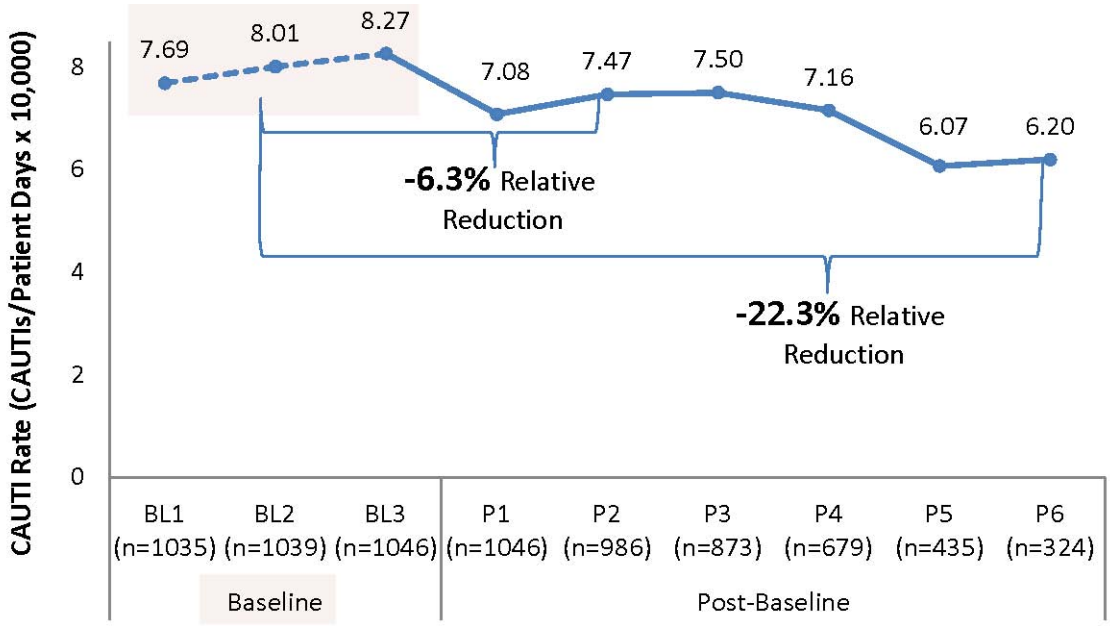
Population CAUTI rates can be found in **Figure 8** through **Figure 11**. Rates examined were overall population CAUTI rate and population CAUTI rate by cohort, ICU status, and bed size.

Overall

Overall, CAUTI rates have decreased over time compared to baseline. Although variability is found among the three baseline periods (BL1–BL3), the average baseline CAUTI rate is 7.97 infections per 10,000 patient days. Over time, CAUTI rates have decreased from baseline with a relative reduction ranging from 6.3 percent during post-baseline period two (2 months post-baseline) to 22.3 percent during post-baseline period six (14 months post-baseline) (see Table for all relative changes over time).

While the relative reduction of the population rate is 22.3 percent, it is worth noting that the relative reduction based upon device days—the CAUTI NHSN rate—is 16.1 percent. Due to the project's approach of staggered cohort implementation, CAUTI rates for later time periods do not represent the complete data for all cohorts, as only Cohorts 1–3 have reached the end of the project while all remaining cohorts continue to submit data. Therefore, caution must be exercised when interpreting relative reductions in later time periods.

Figure 8. CAUTI Rate During Baseline (BL) and Post-Baseline (P) Collection Periods – Population CAUTI Rate – (CAUTIs/Patient Days) x 10,000



Note: n's represent the total number of reporting units for corresponding collection periods.

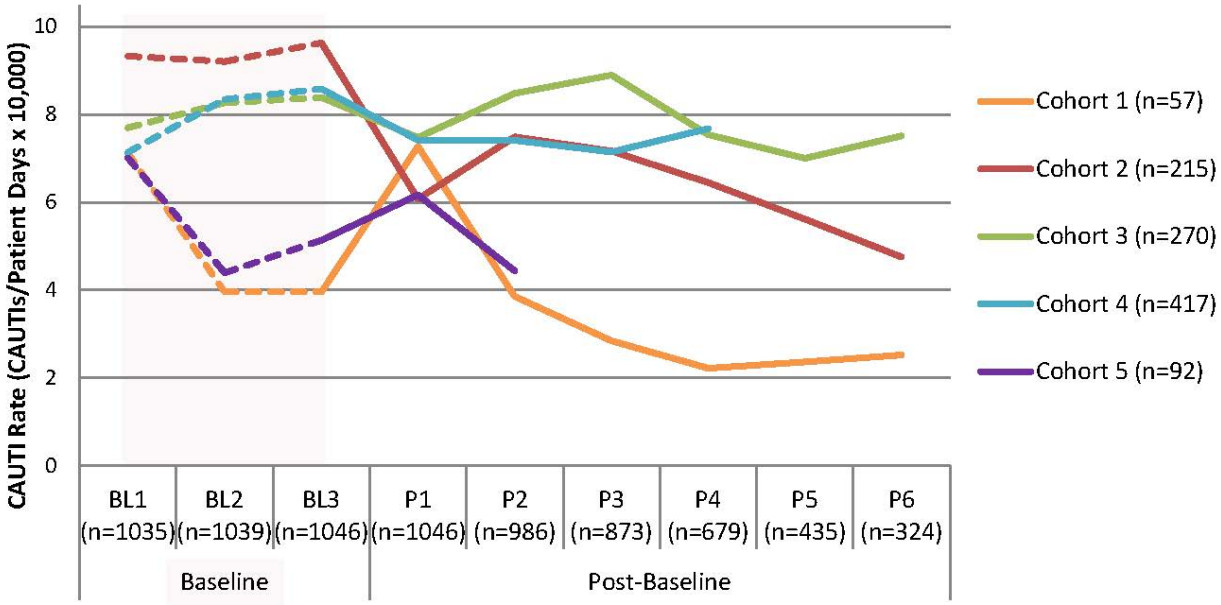
Table 8. Relative Change From Baseline*

	Post-Baseline Collection Periods					
	1	2	3	4	5	6
Units Reporting	1,046	986	873	679	435	324
Population Rate	7.083	7.469	7.504	7.157	6.073	6.199
Relative Reduction	-11.2%	-6.3%	-5.9%	-10.2%	-23.8%	-22.3%

*Baseline aggregated over three baseline time periods (BL1–BL3).

Cohort Status

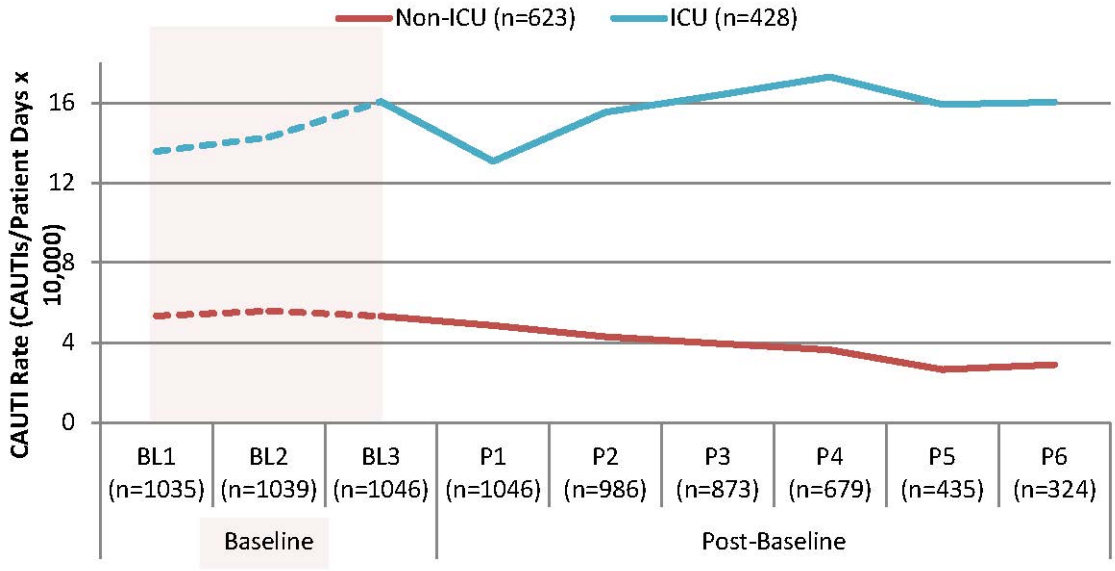
Figure 9. Population CAUTI Rate by Cohort for all Baseline (BL) and Post-Baseline (P) Collection Periods – (CAUTIs/Patient Days) x 10,000



Note: n's represent the total number of reporting units for corresponding cohorts and collection periods.

ICU Status

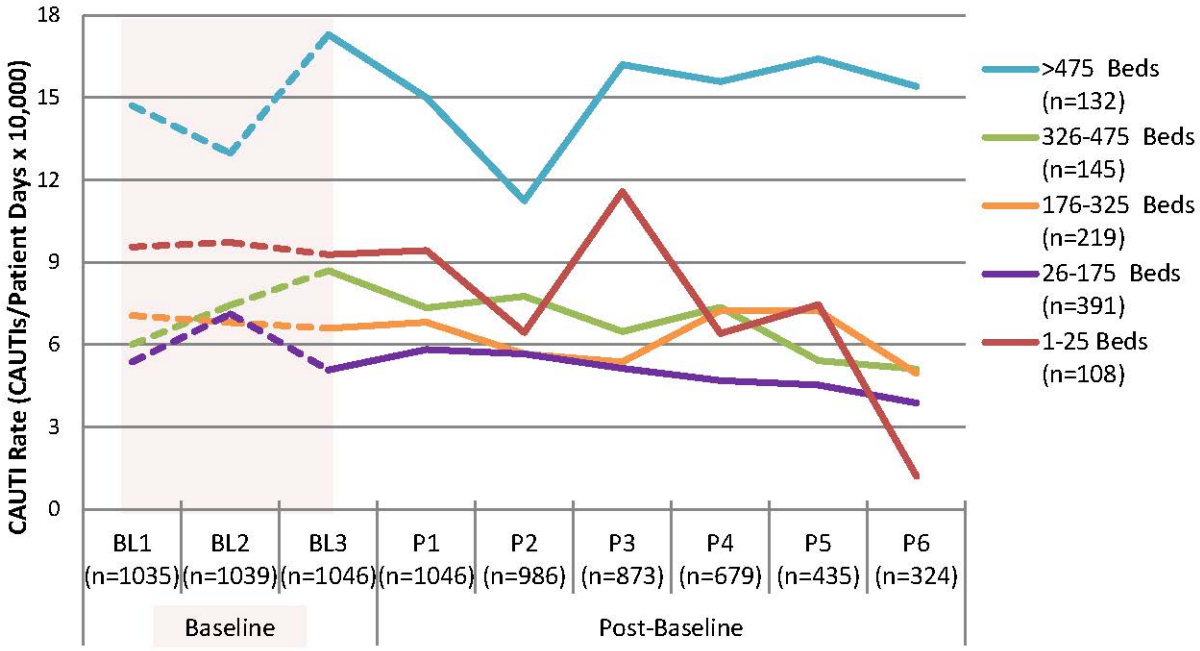
Figure 10. CAUTI Rate During Baseline (BL) and Post-Baseline (P) Collection Periods – Population CAUTI Rate – By ICU Status – (CAUTIs/Patient Days) x 10,000



Note: n's represent the total number of reporting units for corresponding unit types and collection periods.

Bed Size

Figure 11. CAUTI Rate During Baseline (BL) and Post-Baseline (P) Collection Periods – Population CAUTI Rate – By Bed Size – (CAUTIs/Patient Days) x 10,000*



*Fifty-six units in hospitals with unknown total bed size

Note: n's represent the total number of reporting units for corresponding bed sizes and collection periods.

Process Measures

Catheter Utilization Ratio

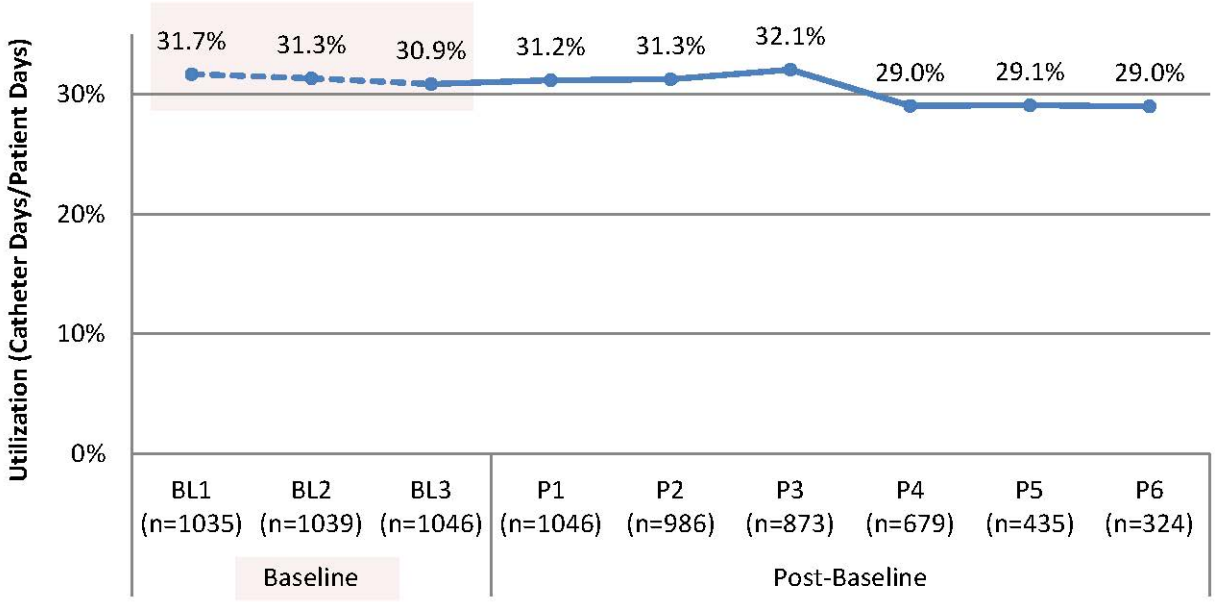
Catheter utilization ratios (reflected as a percent) can be found in **Figure 12** through **Figure 15**. Ratios examined were overall utilization ratio and utilization ratio by cohort, ICU status, and bed size.

Overall

The average catheter utilization ratio when aggregating the three baseline periods (BL–BL3) was 31.3 percent. Overall, catheter utilization has remained relatively the same over the time periods; however, some variability is present (see **Table 9** for relative change over time).

Due to the project's approach of staggered cohort implementation, catheter utilization rates for later time periods do not represent the complete data for all cohorts, as only cohorts 1–3 have reached the end of the project while all remaining cohorts continue to submit data. Therefore, caution must be exercised when interpreting relative reductions in later time periods.

Figure 12. Catheter Utilization Ratio During Baseline (BL) and Post-Baseline (P) Collection Periods – (Catheter Days/Patient Days)



Note: n's represent the total number of reporting units for corresponding collection periods.

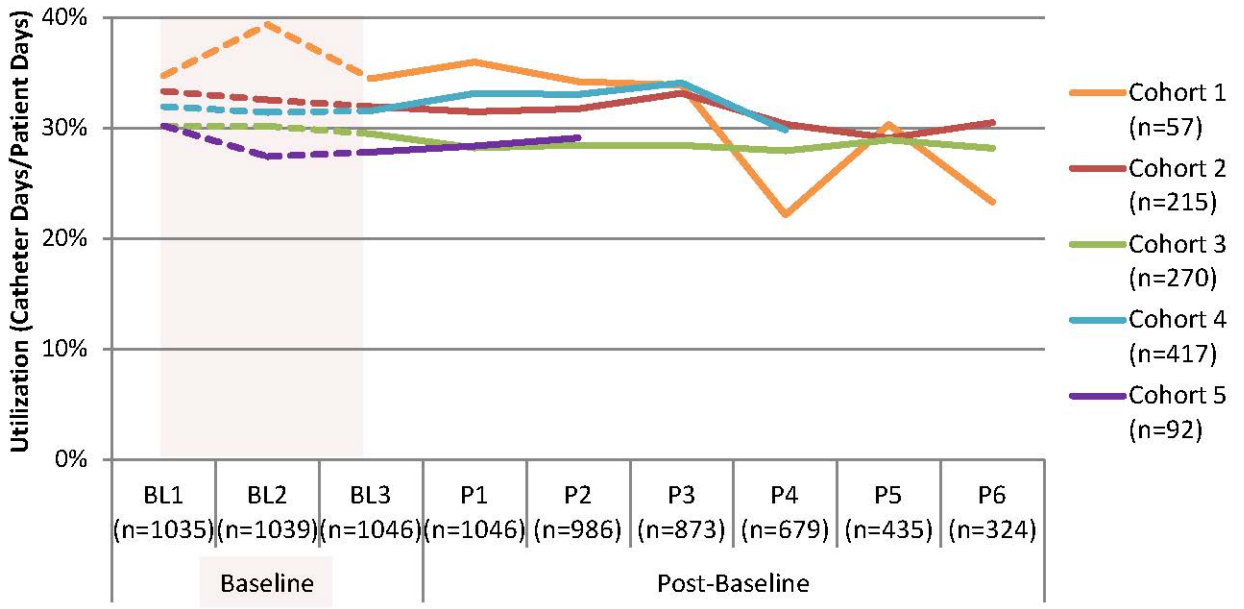
Table 9. Relative Change From Baseline*

	Post-Baseline Collection Periods					
	1	2	3	4	5	6
Units Reporting	1,046	986	873	679	435	324
Utilization Ratio	31%	31%	32%	29%	29%	29%
Relative Change	-0.3%	-0.1%	2.5%	-7.2%	-7.0%	-7.3%

*Baseline aggregated over three baseline time periods (BL1–BL3).

Cohort Status

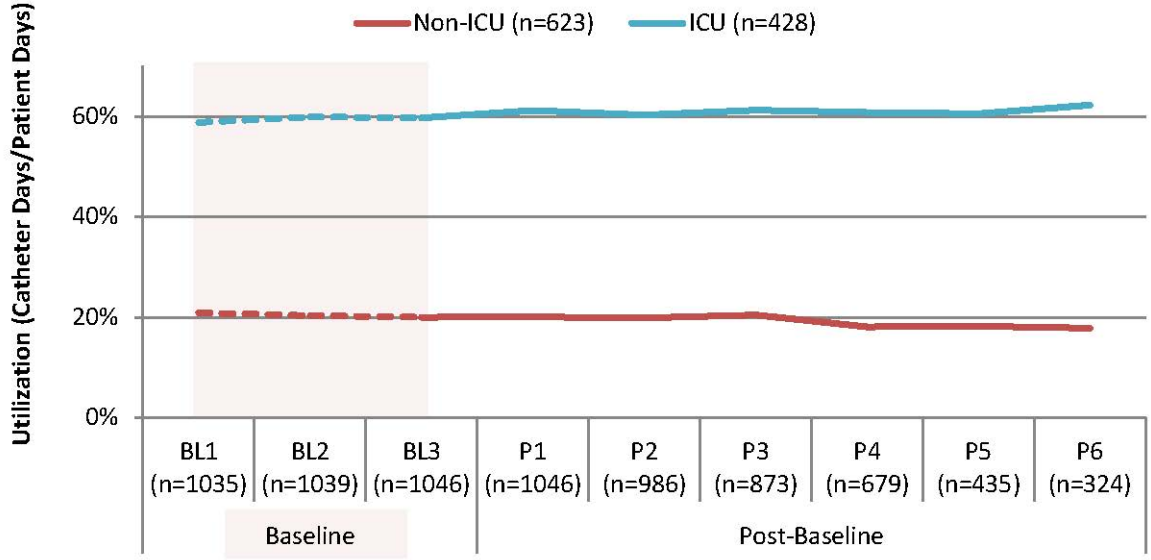
Figure 13. Catheter Utilization Ratio During Baseline (BL) and Post-Baseline (P) Collection Periods – By Cohort Status – (Catheter Days/Patient Days)



Note: n's represent the total number of reporting units for corresponding cohorts and collection periods.

ICU Status

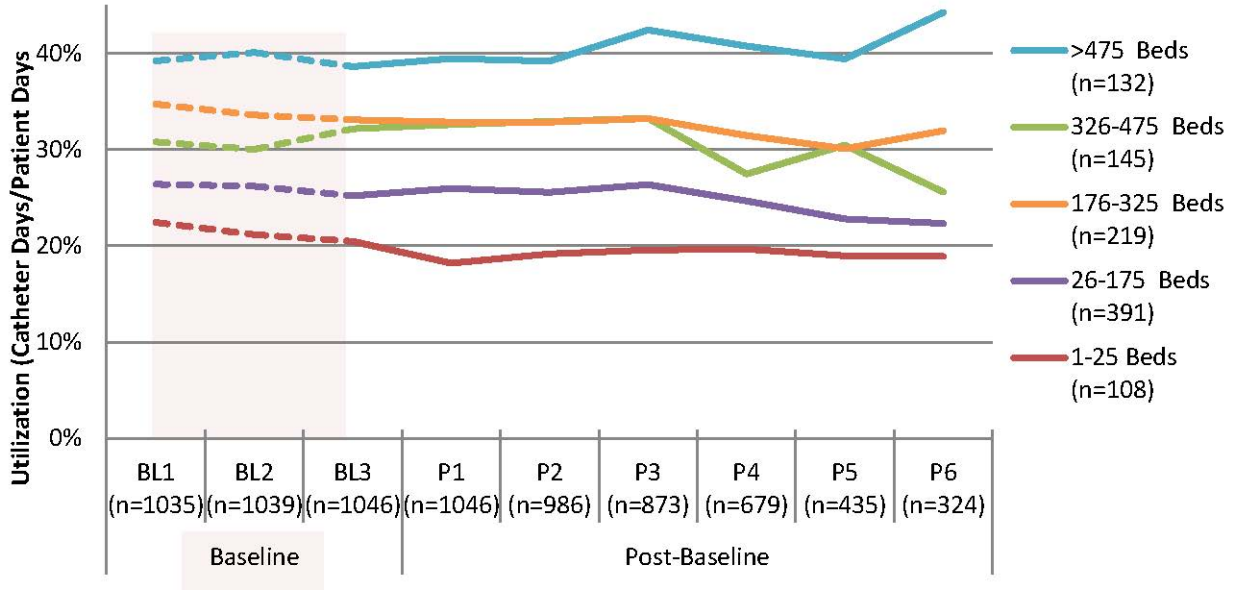
Figure 14. Catheter Utilization Ratio During Baseline (BL) and Post-Baseline (P) Collection Periods – By ICU Status – (Catheter Days/Patient Days)



Note: n's represent the total number of reporting units for corresponding unit types and collection periods.

Bed Size

Figure 15. Catheter Utilization Ratio During Baseline (BL) and Post-Baseline (P) Collection Periods – By Bed Size – (Catheter Days/Patient Days)



Note: n's represent the total number of reporting units for corresponding bed sizes and collection periods.

Culture Measures

Hospital Survey on Patient Safety Culture

The Hospital Survey on Patient Safety Culture (HSOPS) is a reliable and valid survey[6] designed to assess clinician and staff perceptions of the culture of safety within their unit and overall hospital. The instrument contains seven unit-level safety culture dimensions, four hospital-level dimensions, and four outcome variables. To date we have collected over 700 baseline surveys, representing 56 percent of participating units, and over 300 followup surveys, representing 24 percent of participating units.

Team Checkup Tool

Participating units were requested to complete a Team Checkup Tool (TCT) evaluating three primary domains: adoption of CUSP activities, implementation of CAUTI reduction steps, and progress barriers. While HSOPS is a validated survey looking at hospital safety improvements both before and after intervention, the TCT is designed to keep patient safety culture front and center at both the system and unit level. This is accomplished by the team working through the tool to identify common barriers, thereby providing the awareness and information needed to address issues related to patient safety barriers. TCTs are to be completed and submitted by unit teams quarterly throughout project participation. Currently, 628 TCTs have been completed across five cohorts, representing less than 60 percent of participating teams. Ongoing efforts continue to increase both HSOPS and TCT data submission. Future analyses will be conducted with increased submissions.

[6] Agency for Healthcare Research and Quality. "Safety Culture Dimensions and Reliabilities." User's Guide: Hospital Survey on Patient Safety Culture. AHRQ Publication No. 04-0041. Rockville, MD: Agency for Healthcare Research and Quality. September 2004. http://www.ahrq.gov/professionals/quality-patient-safety/patientsafetyculture/hospital/userguide/hospdim.html

Conclusions

The national project team is committed to the overall project goals of reducing CAUTI and enhancing the safety culture in participating hospitals. Progress made towards achieving the project's stated goal of CAUTI reduction is encouraging and indicates that focused attention using an effective approach that combines the technical and adaptive aspects of implementation can produce important results.

The project continues to expand with the recent completion of cohort 6 registration and ongoing planning for cohort 7. Although data submission has been challenging, interventions are in place to assist struggling units with this process. Additional interventions are in development for units not reaching the stated project goals. Continued analyses and ongoing data collection efforts will provide a further understanding of the effect of the intervention at a national level. Although progress has been made towards achieving the project's stated goals, substantial work remains, including, but not limited to, the following next steps: increase sample size, increase data submission, target additional interventions, and expand future analyses.

Increase Sample Size

HRET seeks to recruit the remaining States to participate in the final cohort. HRET is encouraging States to enroll as many hospitals as possible, suggesting a minimum of 10 within a State to participate. It is noteworthy that the health care environment has seen a sharp increase in the number of programs addressing health care improvement efforts. This increase has had an impact on all those associated with these efforts, not only our national project team, but also the capacities of State hospital associations and hospitals. HRET remains committed to the national dissemination of the *On the CUSP: Stop CAUTI* project but recognizes the need to be flexible with the requirements. Therefore, while we strongly encourage a minimum of 10 hospitals per State, we allow participation with fewer hospitals, as needed on a case-by-case determination. In addition, HRET is dedicated to coordinating efforts with CMS, QIO, and HEN CAUTI reduction initiatives through increasing project participation for all hospitals nationwide over the course of the *On the CUSP: Stop CAUTI* project.

Increase Data Submission

Of the 1,195 registered and active units in the data submission phase of the project (cohorts 1–6), 64 have not submitted any outcome data (5.4 percent). This number has improved through the project cycle as the national project team continues to reach out to units struggling with data submission. Although more units have submitted at least one outcome data point, efforts are ongoing to ensure data submission continues throughout the project life cycle. Outcome data submission rates are lower for the final two post-baseline data collection periods (11 and 14 months after baseline, respectively) compared with baseline and implementation periods. Ongoing efforts to assist units with low data submission include: process development to identify appropriate solutions to increase submission rates (see the 3-I's process explained below under Continuous Improvement); analyses to predict units that may struggle with data submission; working with other improvement initiatives, such as the Partnership for Patients Hospital Engagement Networks providing seamless data measure transfers between projects; eliminating unnecessary data collection requirements by accepting previously completed culture data; and continuing coaching efforts with State leaders to identify ways to increase their States' data submission rates.

Target Additional Interventions

It is important to identify improvement opportunities across all project aspects, including expansion to new health care settings, continuous improvement of project delivery processes, and new training opportunities. These efforts serve to create a wide-ranging package of targeted interventions.

Emergency Department

Always diligent in the pursuit of efforts to achieve best possible outcomes for patients, the NPT in collaboration with ENA and with an endorsement from the American College of Emergency Physicians (ACEP) have developed a new project component, the Emergency Department Improvement Intervention. Although CAUTIs are typically identified following admission to an in-patient setting, more than half of all hospitalized patients are admitted through the ED. Therefore, avoiding placement of unnecessary urinary catheters in the ED may significantly decrease the number of patients with catheters, thereby reducing not only overall catheter utilization during hospitalization, but also subsequent infections. Hence, the ED Improvement Intervention was designed to promote the appropriate use of urinary catheters according to accepted insertion guidelines, provide education and support on proper insertion techniques, and instill a culture of partnership between the ED and in-patient units. Additionally, the intent of the new component is both to expand the reach of the *On the CUSP: STOP CAUTI* national collaborative to additional areas within the health care setting and to broaden participants' exposure to national experts from the ACEP and the ENA. Recruitment is underway with over 50 EDs participating in the initial cohort.

Continuous Improvement

HRET has developed an integrated project database that allows for continual monitoring of the above categories at national, State, and unit levels. This database captures outcome, process, and cultural measures described above and highlights additional project activities, such as State-level participation rates for onboarding, coaching, and content calls. This database has been a useful tool for easily determining project status across and within States. To complement the project status tracker, HRET has developed a method for evaluating the abilities and needs of the States in order to identify methods that best support State leads and their teams in reaching project goals. The State evaluation process, named the 3-I's process, is a means for Identifying, Investigating, and Intervening (3-I's) with States to support teams' efforts in achieving best possible outcomes for CAUTI reduction. This process consists of, but is not limited to, reviews of the education materials, question-and-answer sessions with team and State leads, and site visits (during which informal qualitative evaluations may take place to understand barriers). In addition, EF support will be available to assist NPT and State partners in monitoring and following up with participating teams. NPT members have also participated in site visits to facilities that would like additional assistance in reducing CAUTI; these site visits have been modeled after the successful approach used in Michigan hospitals.[7,8]

Training Opportunities

In addition to creating support process for program participants, a specialized training and coaching event was developed for faculty and State hospital association leads. The Interdisciplinary Academy for Coaching and Training (I-ACT) was developed in collaboration with national experts from the University of Michigan and the Society of Hospital Medicine. I-ACT was created as a collaborative and interactive workshop to provide NPT and State leads alike a venue to develop and practice the skills needed to coach interdisciplinary teams through the implementation phase of CAUTI initiative through data collection and sustainability. The skills gained through this workshop were designed to support coaching

[7] Krein SL, Kowalski C, Harrod M, et al. Barriers to reducing urinary catheter use: A qualitative assessment of a statewide initiative. JAMA Intern Med. 2013 May 27;173(10):881-6. PMID: 23529627.

[8] Saint S, Greene MT, Kowalski CP, et al. Preventing catheter-associated urinary tract infection in the United States: A national comparative study. JAMA Intern Med. 2013 May 27; 173(10):874-9. PMID: 23529579.

objectives for individual States and frontline improvement teams, allowing for effective change from a distance. Program objectives were as follows:

1. Provide clinical solutions and the latest research updates on complex CAUTI issues and barriers to prevention, such as:
    a. Morbidly obese patients
    b. Spinal cord injury patients with urinary retention
    c. Catheter exchange routines
2. Offer a foundational understanding of Just Culture and examples of applications
3. Review implementation challenges and discuss strategies to overcome them
4. Address perspectives of CAUTI multidisciplinary team members, identify "what's in it for them," and develop engagement strategies
5. Provide effective coaching techniques to address challenging issues such as coaching from a distance, assessing organizational culture in a snapshot, and managing difficult personalities

Overall, about 90 percent of attendees gave "excellent" ratings regarding program satisfaction, importance of the program items, and agreement with program statements. In addition, all presenters were rated highly by attendees. The I-ACT training was well attended and received by all participants, and HRET is strongly encouraged and working on ways to improve, spread, and replicate the program for future faculty and State leads.

Additional training and support is also provided to units that have been identified in the following categories:

- No outcomes data
- No process data
- Consistent increases in CAUTI rates post intervention
- Consistent increase in catheter utilization post intervention
- Data indicating a dramatic increase in rates and/or catheter days from one period to the next

Expand Future Analyses and Dissemination of Findings

As participation continues to increase, future analyses will examine the effect of independent, explanatory variables on CAUTI rates. Cohort assignment, the relationship between hospital characteristics and outcome measures, and the effect of multiple units participating within a single hospital (i.e. "nesting") will be analyzed using mixed modeling techniques and allow for random effects. Furthermore, data collection related to the assessment of safety culture is ongoing. Future analyses will also assess unit teamwork and communication within units utilizing the AHRQ Hospital Survey on Patient Safety Culture (HSOPS) and the Team Checkup Tool. In addition to completing robust examinations of the program results, it is important to disseminate broadly the findings of national quality improvement efforts. Therefore, in addition to these important public reports, the NPT has established a manuscript committee, charged with the development and publication of peer-reviewed papers. The NPT is pleased to announce that through this work and the support of AHRQ, one paper has already been accepted for publication and several others are in development.

Resources

Additional information regarding this project can be found online at:

http://www.onthecuspstophai.org/on-the-cuspstop-cauti/

www.catheterout.org/