

Performance Improvement

Virtual Breakthrough Series, Part 1: Preventing Catheter-Associated Urinary Tract Infection and Hospital-Acquired Pressure Ulcers in the Veterans Health Administration

Lisa Zubkoff, PhD; Julia Neily, RN, MS, MPH; Beth J. King, RN, BSN, MA, CCM; Mary Ellen Dellefield, PhD, RN; Sarah Krein, PhD, RN; Yinong Young-Xu, PhD; Shoshana Boar, MS; Peter D. Mills, PhD, MS

Preventing hospital-acquired conditions (HACs) is an important aspect of providing high-quality and safe care—so much so that the Centers for Medicare & Medicaid Services (CMS) has specifically noted preventing HACs as a top priority.^{1,2} To support these efforts CMS developed programs to limit paying for preventable conditions.^{3,4}

Recent work by Wang et al. indicates that these conditions are declining;⁵ however, continued improvement is still necessary and preventing health care–associated infections (HAIs) remains one of the Joint Commission National Patient Safety Goals.⁶ Ideally, hospitals could implement improvement efforts to address all conditions at once. Building on current expertise and existing efforts in the Veterans Health Administration (VHA) of the Department of Veterans Affairs (VA), we decided to implement a Virtual Breakthrough Series (VBTS) collaborative focused on two of these conditions: reducing catheter-associated urinary tract infections (CAUTIs) and hospital-acquired pressure ulcers (HAPUs).⁵ Previous quality improvement efforts in the VHA on these topics have focused on data feedback to prompt change, whereas the VBTS model uses active personalized coaching and group education to facilitate successful implementation of interventions.

Preventing HAIs is an area of concern in patient safety. Urinary tract infections have been identified as one of the most frequent HAIs,⁷ with the majority of these infections related to the use of urinary catheters.^{7,8} Indeed, CAUTI is a common HAI, affecting hospitalized patients worldwide.^{7,9,10} Moreover, bacteriuria, a common occurrence among catheterized patients, can lead to bloodstream infections,¹¹ as well as contribute to the inappropriate use of antibiotics,¹² which in turn supports the development of multidrug-resistant organisms.¹³

Despite some progress in reducing CAUTI rates in the United States and in a number of other countries,^{7,14,15} there are still opportunities for improvement.^{9,10,16} In fact, CMS has identified treatment for CAUTI as one of the conditions for which

Article-at-a-Glance

Background: In 2014 the Veterans Health Administration (VHA) of the Department of Veterans Affairs (VA) implemented a Virtual Breakthrough Series (VBTS) collaborative to help VHA facilities prevent hospital-acquired conditions: catheter-associated urinary tract infection (CAUTI) and hospital-acquired pressure ulcers (HAPUs).

Methods: During the prework phase, participating facilities assembled a multidisciplinary team, assessed their current system for CAUTI or HAPU prevention, and examined baseline data to set improvement aims. The action phase consisted of educational conference calls, coaching, and monthly team reports. Learning was conducted via phone, web-based options, and e-mail. The CAUTI bundle focused on four key principles: (1) avoidance of indwelling urinary catheters, (2) proper insertion technique, (3) proper catheter maintenance, and (4) timely removal of the indwelling catheter. The HAPU bundle focused on assessment and inspection, pressure-relieving surfaces, turning and repositioning, incontinence management, and nutrition/hydration assessment and intervention.

Results: For the 18 participating units, the mean aggregated CAUTI rate decreased from 2.37 during the prework phase to 1.06 per 1,000 catheter-days during the action (implementation) phase ($p < 0.001$); the rate did not change for CAUTI nonparticipating sites. HAPU data were available only for 21 of the 31 participating units, whose mean aggregated HAPU rate decreased from 1.80 to 0.99 from prework to continuous improvement ($p < 0.001$). Staff education and documentation improvement were the most frequently implemented changes.

Conclusion: This project helped improve CAUTI and HAPU rates in the VHA and presents a promising model for implementing a virtual model for improvement.

health care providers will not be reimbursed.^{4,17,18} CAUTI rates in many developing countries are substantially higher than those in the United States,^{9,16} where the decrease in CAUTI rates has not been observed across all hospital locations and settings.¹⁰ Moreover, although emerging evidence suggests that targeted programs focusing on the use of key practices can be a vital strategy for CAUTI prevention,^{15,19,20} how best to implement such programs remains an important question.

Pressure ulcers are among the most common clinical conditions found in hospitalized and long-stay patients. Each year, an estimated 2.5 million pressure ulcers are treated in acute care in the United States.^{21–23} The incidence and prevalence of pressure ulcers varies by clinical site.^{21–23} Prevalence rates in hospitals have ranged between 1% and 5%.^{24–27} In nursing homes, 14% to 24% of patients have pressure ulcers on admission.

Pressure ulcers are associated with increased morbidity, mortality, and patient suffering.^{22,27} Recent reviews have found that effective prevention efforts include special support surfaces, along with a multicomponent strategy such as a team approach, use of skin champions, staff education, and audit and feedback.^{27,28}

The VHA has focused on pressure ulcer prevention in all clinical settings, including inpatient, outpatient, mental health, the operating and procedure centers, and nursing homes. Efforts to improve pressure ulcer prevention in the VHA have been made on the local, regional, and national level, with special emphasis on the interprofessional dimensions of effective pressure ulcer prevention. Nonetheless, HAPU prevention remains a high priority issue for the VHA.²⁹

The purpose of the study described in this article is to describe the approaches and experiences of hospitals within the VHA system that participated in a CAUTI and HAPU prevention VBTS collaborative. This article is only the second, in addition to Neily et al.,³⁰ to compare the outcomes of VBTS collaborative participants to nonparticipants during the same time frame for a clinical topic (CAUTI).

Methods

VIRTUAL BREAKTHROUGH SERIES

The Breakthrough Series (BTS), developed by the Institute for Healthcare Improvement (IHI) in 1995, is a collaborative model for achieving improvement.³¹ The details and history of this model have been described elsewhere.^{32–34} Building on the IHI model of the BTS,³¹ we developed a virtual version to address the improvement needs of VHA facilities across the United States.^{30,35} This eliminates the need for travel, thereby keeping clinicians at the bedside, while providing ongoing access to

expert faculty.

Topic Selection. The goal of this VBTS collaborative was to provide a virtual learning opportunity to help VHA clinical teams more fully implement evidence-based practices to prevent CAUTIs and HAPUs. As described earlier, these topics were selected because they are priority areas for the VHA.

Expert Faculty/Facility Recruitment. The faculty included clinical topic and quality improvement experts. They advised and guided the project, taught process improvement strategies and interventions, and helped with coaching. Each team was assigned an Implementation Coach and a Clinical Coach to guide the team throughout the VBTS collaborative.

Change Package. Teams were given a Change Package, which included the evidence-based bundles for CAUTI or HAPU prevention interventions to guide their efforts. The CAUTI bundle³⁶ focused on four key principles: (1) avoiding the use of indwelling urinary catheters (Foleys) through use of a bladder scanner;³⁷ straight catheter;³⁸ or external condom catheter³⁹ and appropriate indications⁴⁰; (2) proper insertion technique⁴¹; (3) proper catheter maintenance⁴²; and (4) timely removal of the indwelling catheter.⁴³ The HAPU bundle relied on the VA Skin Bundle, which consists of assessment and inspection, pressure-relieving surfaces, turning and repositioning, incontinence management, and nutrition and hydration assessment and intervention.⁴⁴

Recruitment and Team Enrollment. In November 2013 teams from VHA hospital facilities nationwide were invited via e-mail from VHA leadership to participate in this project. Our application and participation process for this VBTS collaborative was voluntary to reach as many teams as possible that were interested. It is possible that we got high performers or teams that were struggling. Each team was required to represent a single unit. If a hospital had multiple units participating, it was required to have a team for each unit. Teams applied to work on a single topic, either CAUTI or HAPU prevention. Sometimes specific team members such as a computer expert or a quality improvement specialist served on multiple teams simultaneously. The recruitment strategy and time period was the same for both topics.

The teams represented 15 of the 21 Veterans Integrated Service Networks (VISNs); some VISNs were represented by more than one team.

Forty-nine teams were accepted to participate in the project; CAUTI had 18 teams, and HAPU had 31 teams. The teams made a six-month commitment to actively make changes with coaching, followed by six months of independent continuous improvement.

Catheter-Associated Urinary Tract Infection (CAUTI) and Hospital-Acquired Pressure Ulcers (HAPUs)

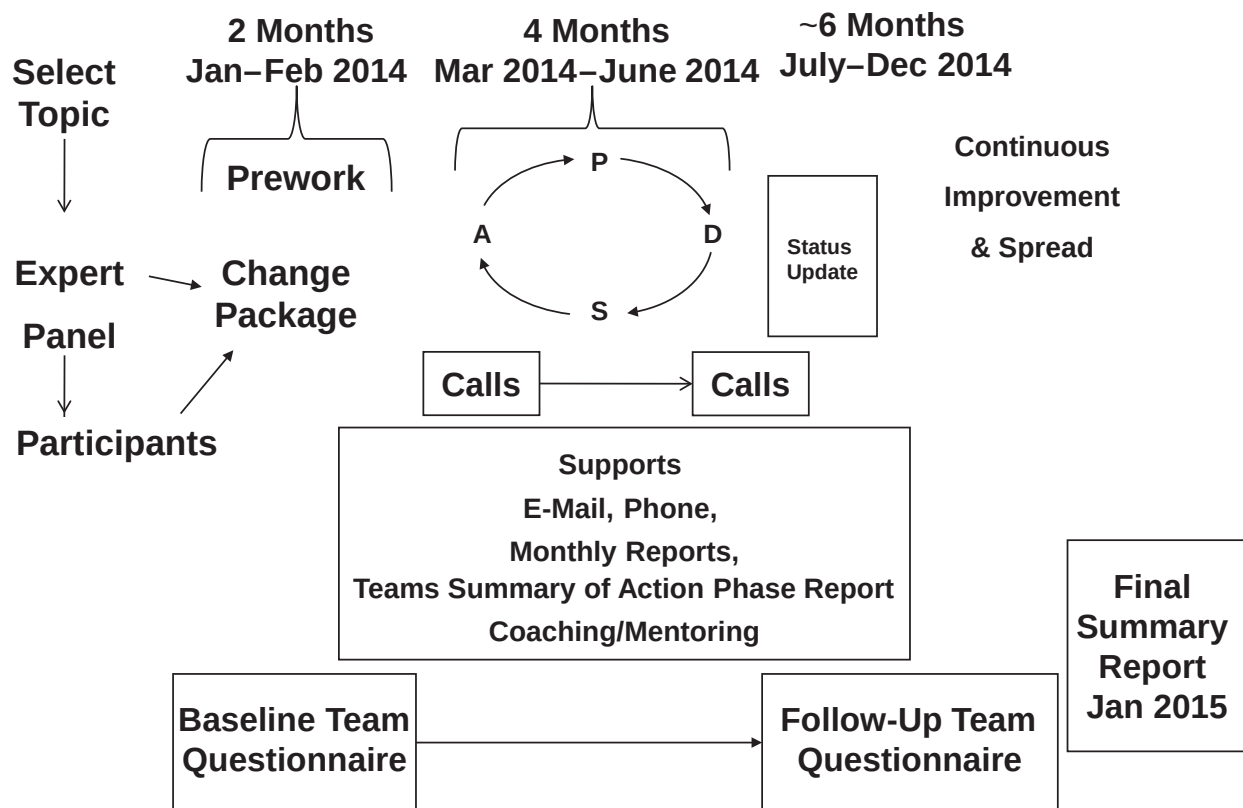


Figure 1. Activities in the three phases of the CAUTI and HAPUs Virtual Breakthrough Series project are shown. PDSA, Plan-Do-Study-Act.

PROJECT PHASES

We established three four-month phases for this project (Figure 1, page 487):

- **Prework:** January 2014–February 2014 (for the purposes of analysis we included November and December 2013)

- **Action:** March 2014–June 2014

- **Continuous Improvement:** July 2014–October 2014

To prepare teams for the action phase, we provided sites with guidance on how to build a team, collect baseline data, and identify project goals. We followed the model in terms of the elements of each of the project phases, as described elsewhere.^{30,35}

Learning Activities. All learning was conducted via phone; web-based options, if available; and e-mail. Two learning session calls occurred per month. Topics covered included key elements of the bundles, data collection and documentation, lessons learned and best practices, patient engagement and education, and barriers to implementing evidence-based inter-

vention, including a culture of patient safety.

Senior Leader Reports. Teams were required to submit a Senior Leader Report—a progress report that included their overall aims for the collaborative, specific changes implemented during the month, and measures of process and outcome being tracked. The reports also included lessons learned that month and plans for the future.

Coaching. Team cohorts of six to eight teams were assigned a coaching pair (one Implementation Coach and one Clinical Coach). The Implementation Coaches had quality improvement knowledge and experience; Clinical Coaches had expertise in preventing CAUTIs or HAPUs. Coaching pairs conducted small-group calls monthly in which teams shared work completed that month and reviewed monthly Senior Leader Reports. The coaches also provided written feedback on the monthly Senior Leader Reports. Coaching feedback focused on process improvements to trial interventions as well as ideas to manage or eliminate barriers impeding frontline changes.

Feedback from coaches was sent to the entire team, including the team's senior leader.

EVALUATION

Process Assessment. To assess participation, we used final reports submitted by teams at the end of the continuous improvement phase (that is, the last submitted report) to quantify the number and type of new or modified interventions. Interventions were coded by consensus by two authors [L.Z., J.N.].

Team Characteristics Questionnaire. A 20-item Team Characteristics Questionnaire was sent to be completed as a team during the prework (baseline) phase and at end of the action phase of the VBTS collaborative (follow-up). Response options ranged from 1 = strongly disagree to 7 = strongly agree. We compared mean scores at baseline and at follow-up using an unpaired *t*-test. The validated questionnaire asked teams about prior work together, leadership support, and available resources⁴⁵ (Appendix 1, available in online article). We used a statistically significant *p* value of 0.0024 to account for multiple comparisons.

Outcome Assessment. CAUTI and HAPU rates were the outcome measures.

CAUTI Data. In the VHA, there is a structured system for CAUTI measurement. CAUTI rates, defined as the number of CAUTI infections/number of catheter-days $\times$ 1,000, were obtained from the VHA Inpatient Evaluation Center (IPEC). VHA hospitals submit CAUTI data for specified units (for example, general medical/surgical wards, ICUs) to IPEC. IPEC disseminates results through electronic reports. Data are also accessible to patient safety managers, administrators, and other authorized personnel throughout the VHA.

HAPU Data. During the time of this project, HAPU measurement was in a state of transition. VHA hospitals were collecting their own number of HAPUs for local improvement purposes but were not submitting to a centralized national database. For this reason we contacted teams individually and requested data in a standardized format (number of HAPUs per month and bed-days of care).

STATISTICAL ANALYSIS

We compared data before, during, and after the project for participating teams for the time frames described above. For CAUTI we calculated rates for the same time intervals for these nonparticipating units. We also examined the number of catheter-days during the study period across the VHA. The nonparticipant comparison data were not available for HAPU rates. The rates were calculated as the total number of events di-

vided by the total bed-days of care. Comparisons of rates were conducted using the Poisson regression model. All tests were two-tailed, and a *p* value of < 0.05 was considered to indicate a statistically significant difference. Analyses were performed using STATA statistical software version 11 (StataCorp LP, College Station, Texas).

Results

CATHETER-ASSOCIATED URINARY TRACT INFECTION

Team Participation. Eighteen CAUTI teams participated in the project. CAUTI teams submitted monthly reports on average 85% (range: 72%–100%) of the time.

Interventions. There were 33 unique interventions implemented overall by CAUTI teams. The most frequently implemented change was staff education ($N = 18$, 100% of teams). Examples of staff education include review of bladder protocols, CAUTI infection prevention tips, and methods to avoid Foley placement when possible. The next most common interventions were improvement of documentation, such as a handoff checklist or Foley template ($N = 9$, 50%), and routine review of patients with catheters to assess continued need ($N = 8$, 44%). To better understand the interventions, we grouped them into domains based on the CAUTI bundle: Staff and Patient Education, Aseptic Insertion, Alternatives to Indwelling Catheters, Documentation, Appropriate Indications, Catheter Maintenance, Early Removal, Discontinuation of Non-recommended Practices, and Other (Table 1, pages 489–490). When grouped by domain, interventions to help with early removal of catheters were the most common interventions ($N = 23$). Some examples of early removal interventions included routine review of patients with catheters to assess continued need, CAUTI rounds in which staff checked on bundle compliance, automatic stop orders, and labeling bags with the date of insertion. Within the “Other” domain, an example was the use of whiteboards to note when the Foley was inserted. We also observed that we devoted time to advising teams to stop non-evidence-based interventions, such as unwarranted urinalyses and subsequent antibiotic treatment.⁴⁶ The modal number of interventions implemented by each team was 4.00, with an average number of interventions equal to 4.72 (range 2.00–8.00).

Baseline and Follow-Up Questionnaires. Baseline questionnaires were received from 16 of the 18 CAUTI teams (89%). Follow-up questionnaires were received from 13 of the 18 teams (72%). There were no significant changes from baseline to follow-up.

Outcomes. VHA IPEC data on CAUTI rates were available for 17 of the 18 teams that participated in the project. One

Table 1. CAUTI Team Intervention

Domain	Team ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Number of Teams that Implemented Intervention
Staff and Patient Education	Staff education	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	18
	Patient education								1										1	2
Aseptic Insertion	Buddy system for Foley insertion									1										1
Alternatives to Indwelling Catheters	Intake and output documentation		1																	1
	Non-invasive urine output measurement							1	1						1					3
	Straight catheters to prevent Foley catheters							1												1
	Prevent insertion during interventional procedures							1												1
	Bladder management protocol	1						1												2
Documentation	Documentation improvement (Foley appropriate rationale, peri-care, etc.)				1	1	1			1			1		1		1	1	1	9
Appropriate Indications	RN assess for indication before insertion and continuation															1				1
Catheter Maintenance	Closed catheter leg bag kits				1															1
	Standardization of catheter products					1														1
	Closed catheter insertion kit				1															1
	New Foley drainage bags																		1	1
	Revised bundle to keep a closed system									1										1
	Advanced Foley tray										1									1
Early Removal	Label with date of insertion				1									1		1		1	1	5
	Early removal of unnecessary catheters	1						1	1											3
	Nurse driven protocol for Foley removal									1			1							2
	Routine review to assess continued need for catheters	1			1	1		1			1	1	1					1		8
	CAUTI rounds (bundle compliance, auto stop orders)		1		1															2
	Auto stop orders		1								1						1			3

(continued on page 490)

Table 1. CAUTI Team Intervention (continued)

Domain	Team ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Number of Teams that Implemented Intervention
Discontinuation of Non-recommended Practices	Stopping catheter clamping with bladder training								1											1
	Discontinued bladder irrigation			1																1
	Reduced frequent catheter changes			1																1
Other	Data feedback												1				1			2
	Whiteboards with Foley insertion date													1	1	1				3
	Adequate supplies					1			1											2
	Algorithm for Foley management									1										1
	Thorough review of catheter use											1								1
	Monitor aspects of bundle compliance				1					1						1				3
	Urinary acidifying agent irrigation to prevent clogging			1																1
	Intermittent catheterization to prep for Foley at home (spinal cord injury)			1																1
TOTAL INTERVENTIONS BY TEAM		4	4	5	8	5	2	7	6	7	4	3	5	3	4	5	4	4	5	

ID, identifier; CAUTI, catheter-associated urinary tract infection.

team focused on a spinal cord injury unit, which is not required to submit IPEC data. There were 592 units with comparable data identified as nonparticipants in the VBTS collaborative. For participating units, the mean aggregated CAUTI rate decreased from 2.37 during the prework phase to 1.06 per 1,000 catheter days during the action phase ($p < 0.001$). The number of catheter-days decreased significantly overall for the VHA during the study period ($p = 0.02$) at a rate of 0.8 catheter-days per month.

There were no significant changes for the continuous improvement phase. For nonparticipating sites, the CAUTI rate did not change between the prework phase (1.50), the action phase (1.55), or the continuous improvement phase (1.54) (Figure 2, page 491).

HOSPITAL-ACQUIRED PRESSURE ULCERS

Team Participation. Thirty-one HAPU teams participated in the project. HAPU teams submitted monthly reports on

average 82% (range: 58%–100%) of the time.

Interventions. There were 45 unique interventions implemented overall by the teams. The most frequently implemented unique changes were staff education ($N = 21$, 68%), improvement of documentation ($N = 15$, 48% of teams), and use of equipment such as green egg foam cushions and boots ($N = 13$, 42%). To better understand the interventions, we grouped them into domains based on the HAPU bundle (which, as noted earlier, was based on the VA Skin Bundle): Assess Skin and Risk Status, Select Surfaces and Devices to Redistribute/Relieve Pressure, Keep Turning and Repositioning, Incontinence Management, and Nutrition and Hydration Assessment and Intervention (Table 2a, page 492). In addition to skin bundle domains, we grouped additional interventions into “Non-Bundle” domains: Tracking and Data, Education, Dressings, and Other (Table 2b, page 493). When grouped by domain, the interventions focused on education were implemented the most—58 times. The most common number of interventions

Catheter-Associated Urinary Tract Infection (CAUTI) Rates per 1,000 Catheter-Days Across the Three Project Phases

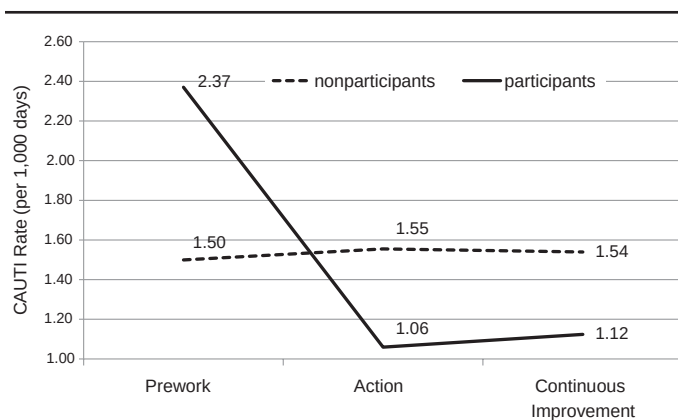


Figure 2. ment phase. For nonparticipating sites, the CAUTI rate did not change between the prework phase (1.50), the action phase (1.55), or the continuous improvement phase (1.54). CAUTI, catheter-associated urinary tract infection. For participating units, the mean aggregated CAUTI rate decreased from 2.37 during the prework phase to 1.06 per 1,000 catheter days during the action phase ($p < 0.001$).

implemented by each team was 4.00, with an average number of interventions equal to 6.58 (range 1.00–11.00).

Baseline and Follow-Up Questionnaires. HAPU questionnaires were received from 26 (84%) of the 31 teams at baseline and follow-up. There were no significant changes from baseline to follow-up.

Outcomes. HAPU data were received from 22 of the 31 (71%) teams. For participating units, the mean aggregated HAPU rate decreased from 1.80 to 0.99 from prework to continuous improvement ($p < 0.001$) (Figure 3, page 494).

Discussion

Participants in the VBTS collaborative showed improvements in patient outcomes for both clinical topics, with complication rates reduced by approximately half. For participating CAUTI units, the mean aggregated CAUTI rate decreased from 2.37 during the prework phase to 1.06 per 1,000 catheter-days during the action phase ($p < 0.001$), and these changes were maintained for four months after the action phase. This improvement is notable given that the CAUTI measure used catheter-days as the denominator, and many interventions involved reducing catheter-days by early removal or other non-catheter interventions (Table 1), which could have instead led to a paradoxical increase in rates.⁴⁷ During this same time period, CAUTI rates for VHA units not participating in the VBTS col-

laborative did not change. The HAPU teams in the VBTS collaborative had similar improvements, with rates that decreased significantly from prework (1.80) to continuous improvement (0.99) ($p < 0.001$).

Overall, the interventions implemented for both CAUTI and HAPU were consistent with other interventional studies to prevent these conditions.^{27,28,43} There were fewer interventions for CAUTI than for HAPU, and the CAUTI interventions were less complex. The top two single interventions for both CAUTI and HAPU were education and documentation. These were also frequent interventions in prior VBTS/VBTS collaborative. When implemented and coded, the intervention of documentation was implemented in prior studies ranging from 14% to 50% and education at 70%.^{35,48,49} When interventions were grouped by domain, the CAUTI interventions were more focused on bedside changes, such as early removal of catheters, whereas HAPU interventions were more focused on the domain of education. This makes sense, as many teams described the need to educate staff on how to prevent pressure ulcers because preventing skin breakdown is a marker of high-quality nursing care.

This CAUTI program was the first VBTS collaborative in which we advised teams *not* to do certain non-evidence-based interventions such as routine changing of catheters or urinalysis for asymptomatic patients.⁴⁶ It was a novel experience to advise teams to do less in a certain area but also difficult at times for teams to convince some providers to stop current care practices. To address this issue we reiterated the evidence on small-group coaching calls and discussed the rationale for discontinuing the practice of routine unwarranted urinalyses and catheter irrigation. We also used peer-to-peer clinician communication to promote best practices. In the future, we plan to integrate the importance of de-implementing non-evidence-based interventions, which will create more time for value-added, evidence-based practices.

LESSONS LEARNED

We learned that having standardized measurement for primary outcomes is important when assessing changes over time in the VBTS collaborative. For example, CAUTI measurement was straightforward and already established for systemwide centralized reporting, whereas HAPU was more challenging because during the VBTS collaborative there was no established system for centralized reporting. We required participating teams to submit data, but there was no nonparticipant comparison. Another lesson is to measure CAUTI rates using bed-days of care rather than catheter-days as the denominator so that

Table 2a. HAPU Bundle Interventions

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Number of Teams that Implemented Intervention	
BUNDLE INTERVENTIONS (NEW OR MODIFIED)	A = Assess Skin and Risk Status	Wound treatment or prevention protocol																						1				1				1		3	
		Increased interprofessional rounding												1																			1		
		Wound rounds (such as modified walking or wound huddles)				1				1									1	1					1			1	1			1		8	
		Admission assessment (second verifier)										1																					1		
		Daily skin assessments											1																				1		
		Increased skin risk and assessment documentation to multiple times a day												1			1												1	1				4	
		Post HAPU audit and review by wound care team																								1								1	
	S = Select Surfaces and Devices to Relieve/Redistribute Pressure	Pressure mapping																	1	1														2	
		Specialty mattresses and beds					1	1		1								1	1	1		1	1	1						1				10	
		Decreased bedding layers															1	1	1	1					1		1							6	
		Equipment (such as foam cushions, boots, adequate supplies available, oxygen tubing improvements, incontinence product improvements)			1		1	1		1							1		1	1						1		1	1			1	1	1	13
		Improved bed pads																				1	1	1								1		4	
		Repositioning alert systems							1								1	1					1	1	1			1						7	
		Modified staffing and scheduling to improve turning compliance																													1			1	
	I = Incontinence Management	Incontinence protocol																	1	1		1	1	1										5	
		Protective cream/skin barriers																				1	1	1							1		1	5	
	N = Nutrition and Hydration Assessment and Intervention	Nutritional protocol																													1			1	
		Improved nutrition (protein drinks, monitor NPO)				1		1																							1		1	4	
	TOTAL INTERVENTIONS BY TEAM			0	0	2	1	3	2	1	3	0	2	1	1	1	4	2	6	6	0	5	5	5	3	2	2	2	4	2	4	2	5	1	
HAPU, hospital-acquired pressure ulcer; NPO, nothing by mouth.																																			

Table 2b. HAPU Non Bundle Interventions

		Team ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Number of Teams that Implemented Intervention	
NON-BUNDLE INTERVENTIONS (NEW OR MODIFIED)	Tracking and Data	Data Feedback	1	1																				1										3	
		Data review and tracking	1	1												1	1							1	1	1			1					8	
		Monitoring interventions for compliance															1	1						1						1		1		5	
		Chart audit													1						1			1	1						1			5	
	Education	Patient/family education						1											1	1		1	1	1	1						1		1	9	
		Education for nursing assistants	1																						1									2	
		Education for physicians	1											1										1							1			4	
		Education for nurses			1	1		1				1	1								1	1	1		1		1				1		1	12	
		Education (audience not specified)		1			1	1	1	1			1			1	1	1	1	1		1	1	1	1			1	1	1	1	1	1	21	
		Board with educational information	1																															1	
		Cognitive aids (such as regarding staging/skin bundle)														1						1	1	1			1			1				6	
		Display of dressings, skin protectants, or staging			1			1																										2	
		Binder of specialty beds			1																														1
	Dressings	Sacral dressing protocol		1																															1
		New type of skin care products				1																													1
		Specialty border dressing																			1	1	1	1									1	5	
		Use of particular silicone dressings																										1							1
		Other	Signage to identify patient risk	1	1															1	1														4
	PUP bundle			1																															1
	Policy update																		1	1		1	1	1										5	
	Discharge huddle for follow-up care																														1			1	
	Wound consults timeliness							1				1																			1				3
	Handoff communication (such as whiteboard for turn schedule)											1	1			1											1								4
	Standardization of supply rooms																				1													1	
	Unit-based peer resources															1									1			1		1	1				5
	Documentation improvement				1	1		1	1		1		1		1						1				1			1	1	1	1	1		1	15
	Outpatient wound care clinic																								1										1
TOTAL INTERVENTIONS BY TEAM			6	6	4	3	1	5	3	1	1	3	3	3	5	4	2	4	4	4	6	6	6	8	6	1	4	4	3	7	7	2	5		
HAPU, hospital-acquired pressure ulcer; PUP, pressure ulcer prevention.																																			

Hospital-Acquired Pressure Ulcer (HAPU) Rates per 1,000 Bed-Days of Care (BDOC) Across the Three Project Phases

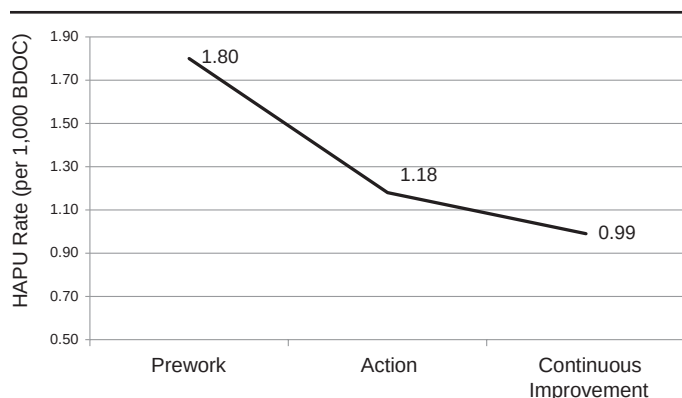


Figure 3. HAPU data were received from 22 (71%) of the 31 (71%) teams. For participating units, the mean aggregated HAPU rate decreased from 1.80 to 0.99 from prework to continuous improvement ($p < 0.001$).

CAUTI rates do not paradoxically increase when interventions focus on reducing the number of catheter-days. As for HAPU measurement as we move forward, the VHA is working on new methods of standardized data collection. The VHA has since elected to adopt another approach for tracking pressure ulcers.

The scope of work on which teams focused varied, depending on the precision of the bundle interventions. For example, in HAPU work, when addressing equipment and products to relieve pressure, teams tried numerous devices. They also tried various products related to incontinence management: skin barriers, creams, ointments, and underpads. Choosing which particular brands to use took time. When conducting projects in which the interventions involve product choices, it would be more efficient to set up a method for teams to share product preferences. To some degree teams did share these, but moving forward we plan to anticipate this and develop a system for this type of collaboration earlier in the project.

Finally, asking to have a specific team per unit appeared to help them focus on small cycles of change with frontline staff rather than facilitywide change. This is consistent with the model for improvement, which focuses on small, rapid cycles of change. We also wanted to promote unit-based teams that included staff who were asked to make changes. To do so, we asked teams to track and report unit-based process changes and outcomes to provide the most accurate depiction of activities.

LIMITATIONS

This work has several limitations. First, the results are self-reported; we did not observe the teams implementing changes or verify their reported rates. Because the educational sessions were virtual, we don't know if presence on a call denoted active participation or which member(s) of the team attended. Another limitation is that the action phase was shorter than in prior work, and the process changes and outcomes might not be sustainable. In addition, we did not randomly assign teams to intervention and control groups, so results are associative and not causal. Teams volunteered to participate and therefore may have been more motivated to make changes. To address the possibility of a volunteer bias we compared CAUTI outcomes for participants versus nonparticipants for the same time frame, and participants still did better. Unfortunately, we were unable to do this for HAPU, so we can not draw the same conclusion for the HAPU group. The scope of our work overall in the VHA was limited because the percentage of units in the VBTS collaborative was small in relationship to the total number of units in the VHA.

The topics in this project remain clinically important in the VHA. At the same time, we did not build in a specific plan for supporting sustainability from the VBTS collaborative staff. Our goal was to transition ongoing support to leadership at each local facility. Ideally, the teams would embed their improved practices into their usual care. We realize there would be an added benefit if the VBTS collaborative team could provide ongoing sustainability support. This is an area of great interest to us and we look forward to working on this topic.

Conclusion

Its limitations notwithstanding, the current project provides evidence that the participation of local multidisciplinary teams in a VBTS collaborative was associated with significant reductions in CAUTI rates when compared with nonparticipating facilities and HAPU rates. The VBTS collaborative approach as implemented in the VHA, the largest integrated health care system in the United States, thus presents a promising model for preventing hospital-acquired conditions in other hospitals, particularly for those that are part of integrated networks or health care delivery systems. **J**

The authors thank the Virtual Breakthrough Series coaches—Tara Berry, Sarah Hartley, Milisa Manojlovich, Kristen Miller, Debbie Zawol, Christina Gilbert, Shweta Shah, Tiffany (Bo) Kim, Karen J. Baris, Denise A Sadowski-Leist, Ann Marie Carlin, and Sybill King.

Lisa Zubkoff, PhD, is Health Science Specialist, White River Junction Department of Veterans Affairs (VA) Medical Center, White River Junction, Vermont; and Assistant Professor of Psychiatry, Geisel School of Medicine at Dartmouth, Hanover, New Hampshire. **Julia Neily, RN, MS, MPH**, is Associate Director, VA National Center for Patient Safety (NCPS), White River Junction. **Beth J. King, RN, BSN, MA, CCM**, is Program Manager, VA NCPS, Ann Arbor, Michigan. **Mary Ellen Dellefield, PhD, RN**, is Research Nurse Scientist, VA San Diego Healthcare System; and Clinical Professor of Nursing, Hahn School of Nursing and Health Science, University of San Diego. **Sarah Krein, PhD, RN**, is Research Career Scientist, Center for Clinical Management Research, VA Ann Arbor Healthcare System; and Research Professor, Internal Medicine, with an adjunct appointment, School of Nursing at the University of Michigan, Ann Arbor. **Yinong Young-Xu, PhD**, is Statistician, and **Shoshana Boar, MS**, is Health Science Specialist, White River Junction VA Medical Center. **Peter D. Mills, PhD, MS**, is Director, VA NCPS, White River Junction; and Adjunct Associate Professor of Psychiatry, Geisel School of Medicine at Dartmouth. Please address correspondence to Lisa Zubkoff, Lisa.Zubkoff@va.gov.

Online Only Content

<http://www.ingentaconnect.com/content/jcahol/jcqqs>

See the online version of this article for
Appendix 1. Team Questionnaire: Baseline and Follow-Up

References

- Stone PW, et al. CMS changes in reimbursement for HAIs: Setting a research agenda. *Med Care*. 2010;48:433–439.
- Wald H, et al. Chief nursing officers' perspectives on Medicare's hospital-acquired conditions non-payment policy: Implications for policy design and implementation. *Implement Sci*. 2012 Aug 28;7:78.
- Centers for Medicare & Medicaid Services. Hospital-Acquired Conditions and Present on Admission Indicator Reporting Provision. Dec 2015. Accessed Sep 22, 2016. <https://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/Downloads/wPOA-Fact-Sheet.pdf>.
- GovTrack. H.R. 3590 (111th): Patient Protection and Affordable Care Act. Mar 23, 2010. Accessed Sep 22, 2016. <https://www.govtrack.us/congress/bills/111/hr3590>.
- Wang Y, et al. National trends in patient safety for four common conditions, 2005–2011. *N Engl J Med*. 2014 Jan 23;370:341–351.
- The Joint Commission. National Patient Safety Goals Effective January 1, 2016: Hospital Accreditation Program. 2016. Accessed Sep 22, 2016. https://www.jointcommission.org/assets/1/6/2016_NPSG_HAP.pdf.
- Magill SS, et al. Multistate point-prevalence survey of health care–associated infections. *N Engl J Med*. 2014 Mar 27;370:1198–1208.
- Weber DJ, et al. Incidence of catheter-associated and non-catheter-associated urinary tract infections in a healthcare system. *Infect Control Hosp Epidemiol*. 2011;32:822–823.
- Rosenthal VD, et al. International Nosocomial Infection Control Consortium (INICC) report, data summary of 43 countries for 2007–2012. Device-associated module. *Am J Infect Control*. 2014;42:942–956.
- Dudeck MA, et al. National Healthcare Safety Network report, data summary for 2013, Device-associated Module. *Am J Infect Control*. 2015 Mar 1;43:206–221.
- Fortin E, et al. Healthcare-associated bloodstream infections secondary to a urinary focus: The Québec provincial surveillance results. *Infect Control Hosp Epidemiol*. 2012;33:456–462.
- Trautner BW, et al. Overtreatment of asymptomatic bacteriuria: Identifying provider barriers to evidence-based care. *Am J Infect Control*. 2014;42:653–658.
- Cope M, et al. Inappropriate treatment of catheter-associated asymptomatic bacteriuria in a tertiary care hospital. *Clin Infect Dis*. 2009 May 1;48:1182–1188.
- Leblebicioglu H, et al. Impact of a multidimensional infection control approach on catheter-associated urinary tract infection rates in adult intensive care units in 10 cities of Turkey: International Nosocomial Infection Control Consortium findings (INICC). *Am J Infect Control*. 2013;41:885–891.
- Rosenthal VD, et al. Impact of a multidimensional infection control strategy on catheter-associated urinary tract infection rates in the adult intensive care units of 15 developing countries: Findings of the International Nosocomial Infection Control Consortium (INICC). *Infection*. 2012;40:517–526.
- Ling ML, Apisarnthanarak A, Madriaga G. The burden of healthcare-associated infections in Southeast Asia: A systematic literature review and meta-analysis. *Clin Infect Dis*. 2015 Jun 1;60:1690–1699.
- Padula WV, et al. Comparative effectiveness of quality improvement interventions for pressure ulcer prevention in academic medical centers in the United States. *Jt Comm J Qual Patient Saf*. 2015;41:246–256.
- Centers for Medicare & Medicaid Services. Press Release: Medicare Takes New Steps to Help Make Your Hospital Stay Safer. Aug 4, 2008. Accessed Sep 22, 2016. <http://www.cms.gov/Newsroom/MediaReleaseDatabase/Fact-sheets/2008-Fact-sheets-items/2008-08-045.html>.
- Agency for Healthcare Research and Quality. Eliminating CAUTI: Interim Data Report: Executive Summary. Jul 2013. Accessed Sep 22, 2016. <http://www.ahrq.gov/professionals/quality-patient-safety/cus/cauti-interim/cauti-interim1.html>.
- Saint S, et al. Preventing catheter-associated urinary tract infection in the United States: A national comparative study. *JAMA Intern Med*. 2013 May 27;173:874–879.
- Reddy M, Gill SS, Rochon PA. Preventing pressure ulcers: A systematic review. *JAMA*. 2006 Aug 23;296:974–984.
- Lyder CH. Pressure ulcer prevention and management. *JAMA*. 2003 Jan 8;289:223–226.
- National Pressure Ulcer Advisory Panel. The Role of Nutrition in Pressure Ulcer Prevention and Treatment: National Pressure Ulcer Advisory Panel White Paper. Dorner B, Posthauer ME, Thomas D. 2009. Accessed Sep 22, 2016. <http://www.npuap.org/wp-content/uploads/2012/03/Nutrition-White-Paper-Website-Version.pdf>.
- Petzold T, Eberlein-Gonska M, Schmitt J. Which factors predict incident pressure ulcers in hospitalized patients? A prospective cohort study. *Br J Dermatol*. 2014;170:1285–1290.
- Lyder CH, et al. Hospital-acquired pressure ulcers: Results from the national Medicare Patient Safety Monitoring System study. *J Am Geriatr Soc*. 2012;60:1603–1608.
- Li Y, et al. Association of race and sites of care with pressure ulcers in high-risk nursing home residents. *JAMA*. 2011 Jul 13;306:179–186.
- Baumgarten M, et al. Pressure ulcers among elderly patients early in the hospital stay. *J Gerontol A Biol Sci Med Sci*. 2006;61:749–754.
- Sullivan N, Schoelles KM. Preventing in-facility pressure ulcers as a patient safety strategy: A systematic review. *Ann Intern Med*. 2013 Mar 5;158:410–416.
- Chou R, et al. Pressure ulcer risk assessment and prevention: A systematic comparative effectiveness review. *Ann Intern Med*. 2013 Jul 2;159:28–38.
- Dellefield ME, Morgan S. Building interprofessional partnerships: VHA's Pressure Ulcer Prevention Initiative. In Rick C, Kritek PB, editors: *Realizing*. Washington, DC: US Department of Veterans Affairs, Veterans Health Administration, 2015, 621–627.
- Neily J, et al. Virtual Breakthrough Series, part 2: Improving fall prevention

practices in the Veterans Health Administration. *Jt Comm J Qual Patient Saf.*

31. Institute for Healthcare Improvement (IHI). *The Breakthrough Series: IHI's Collaborative Model for Achieving Breakthrough Improvement*. IHI Innovation Series white paper. Cambridge, MA: IHI, 2003.

32. Øvretveit J, et al. Quality collaboratives: Lessons from research. *Qual Saf Health Care.* 2002;11:345–351.

33. Kilo CM. A framework for collaborative improvement: Lessons from the Institute for Healthcare Improvement's Breakthrough Series. *Qual Manag Health Care.* 1998;6(4):1–13.

34. Schouten LM, et al. Evidence for the impact of quality improvement collaboratives: Systematic review. *BMJ.* 2008 Jun 28;336:1491–1494.

35. Zubkoff L, et al. Using a Virtual Breakthrough Series collaborative to reduce postoperative respiratory failure in 16 Veterans Health Administration hospitals. *Jt Comm J Qual Patient Saf.* 2014;40:11–20.

36. Catheterout.org. Home page. Accessed Sep 22, 2016. <http://www.catheterout.org>.

37. Sparks A, et al. The clinical benefits of the bladder scanner: A research synthesis. *J Nurs Care Qual.* 2004;19:188–192.

38. Gould CV, et al. Healthcare Infection Control Practices Advisory Committee. Guideline for prevention of catheter-associated urinary tract infections 2009. *Infect Control Hosp Epidemiol.* 2010;31:319–326.

39. Saint S, et al. Condom versus indwelling urinary catheters: A randomized trial. *J Am Geriatr Soc.* 2006;54:1055–1061.

40. Catheterout.org. Indications for Indwelling Urinary Catheter Use. Accessed Sep 22, 2016. <http://catheterout.org/?q=Indications-for-indwelling-urinary-catheter-use>.

41. Catheterout.org. Decision to Insert a Urinary Catheter. Accessed Sep 22, 2016. http://catheterout.org/sites/webservices.itcs.umich.edu.drupal.Bladder%20Bundle/files/Section%20H_Aseptic%20Insertion_05292014.pdf.

42. Catheterout.org. Catheter Maintenance. Manojlovich M. (Updated: May 22, 2013). Accessed Sep 22, 2016. http://catheterout.org/sites/webservices.itcs.umich.edu.drupal.Bladder%20Bundle/files/Indwelling%20Urinary%20Catheter%20Maintenance%20Supplement_052213_0.pdf.

43. Meddings J, et al. Systematic review and meta-analysis: Reminder systems to reduce catheter-associated urinary tract infections and urinary catheter use in hospitalized patients. *Clin Infect Dis.* 2010 Sep 1;51:550–560.

44. US Department of Veterans Affairs, Office of Nursing Services. Pressure Ulcer Prevention. 2015. Accessed Jul 16, 2015 (internal document). <http://vawww.va.gov/nursing/pup.asp>.

45. Mills PD, Weeks WB. Characteristics of successful quality improvement teams: Lessons from five collaborative projects in the VHA. *Jt Comm J Qual Saf.* 2004;30:152–162.

46. Trautner BW, et al. Effectiveness of an antimicrobial stewardship approach for urinary catheter-associated asymptomatic bacteriuria. *JAMA Intern Med.* 2015 Jul 1;175:1120–1127.

47. Fakih MG, 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;40:359–364.

48. Mills PD, et al. Reducing falls and fall-related injuries in the VA system. *Journal of Healthcare Safety Quarterly.* 2003;1:25–33.

49. Mills PD, et al. Improving the bar-coded medication administration system at the Department of Veterans Affairs. *Am J Health Syst Pharm.* 2006 Aug 1;63:1442–1447.

Interim Quality Director Services



Stay on track during challenging times

Whether you have a position vacancy or just need additional staff to manage an increased workload, let our Interim Quality Director Services help you achieve and maintain high performance in delivering quality, patient-focused care.



For more information on our Interim Quality Director Services, please visit jcrinc.com/consulting.

Joint Commission Resources, Inc. (JCR), a wholly controlled, not-for-profit affiliate of The Joint Commission, is the official publisher and educator of The Joint Commission. JCR is an expert resource for health care organizations, providing consulting services, educational services, publications and software to assist in improving quality and safety and to help in meeting the accreditation standards of The Joint Commission. JCR provides consulting services independently from The Joint Commission and in a fully confidential manner. Please visit www.jcrinc.com for more information.

Appendix 1. Team Questionnaire: Baseline and Follow Up

This BASELINE questionnaire is voluntary; please complete one per team. Please do not identify any individual by name; this is confidential as to individuals.

Facility Name: _____ Hospital Unit: _____

Please check the box that best answers the question.

	Strongly Agree				Strongly Disagree			
1. The current collaborative is backed up by a mandate from Senior Leadership.	7	6	5	4	3	2	1	
2. The current collaborative is part of our organization's key strategic goals.	7	6	5	4	3	2	1	
3. Our health care facility has a nonpunitive method of investigating medical adverse events or close calls.	7	6	5	4	3	2	1	
4. Our TEAM has sufficient resources (support services, computer access, and data management) to meet our aims in the collaborative.	7	6	5	4	3	2	1	
5. Our TEAM has sufficient time to meet our aims in the collaborative.	7	6	5	4	3	2	1	
6. Our current information systems provide useful data to help us meet our aims in this collaborative.	7	6	5	4	3	2	1	
7. The changes we are making are supported by the frontline staff on our Hospital unit.	7	6	5	4	3	2	1	
8. A physician is an active participant on our TEAM .	7	6	5	4	3	2	1	
9. Our TEAM has strong leadership with the clout to make changes happen.	7	6	5	4	3	2	1	
10. Our TEAM has worked together as a team before this collaborative.	7	6	5	4	3	2	1	
11. Our TEAM has worked on improvement projects before.	7	6	5	4	3	2	1	
12. Our TEAM is familiar with measuring clinical process improvements.	7	6	5	4	3	2	1	
13. TEAM members understand each other's strengths and weaknesses.	7	6	5	4	3	2	1	
14. There is mutual respect among TEAM members.	7	6	5	4	3	2	1	
15. The TEAM views problems as everyone's responsibility rather than "someone's fault."	7	6	5	4	3	2	1	
16. The TEAM has a shared vision of how to improve.	7	6	5	4	3	2	1	
17. The TEAM has a good way of solving conflicts between team members.	7	6	5	4	3	2	1	
18. Everyone on the TEAM feels comfortable expressing his or her opinion.	7	6	5	4	3	2	1	
19. The TEAM gathers data from patients about ways to continue to improve.	7	6	5	4	3	2	1	
20. Our TEAM has a specific plan to spread the information learned in this collaborative to other parts of our health care system.	7	6	5	4	3	2	1	

Thank you for completing this questionnaire. The results will be aggregated for the sites participating in this Breakthrough Series. Your team can also use your results to assess your baseline team function and plan your actions.

(continued on page AP2)

Online Only Content

Appendix 1. Team Questionnaire: Baseline and Follow Up (continued)

This FOLLOW-UP questionnaire is voluntary; please complete one per team. Please do not identify any individual by name; this is confidential as to individuals.

Facility Name: _____ Hospital Unit: _____

Please check the box that best answers the question.

	Strongly Agree				Strongly Disagree		
1. The current collaborative is backed up by a mandate from Senior Leadership.	7	6	5	4	3	2	1
2. The current collaborative is part of our organization's key strategic goals.	7	6	5	4	3	2	1
3. Our health care facility has a nonpunitive method of investigating medical adverse events or close calls.	7	6	5	4	3	2	1
4. Our TEAM has sufficient resources (support services, computer access, and data management) to meet our aims in the collaborative.	7	6	5	4	3	2	1
5. Our TEAM has sufficient time to meet our aims in the collaborative.	7	6	5	4	3	2	1
6. Our current information systems provide useful data to help us meet our aims in this collaborative.	7	6	5	4	3	2	1
7. The changes we are making are supported by the frontline staff on our Hospital unit.	7	6	5	4	3	2	1
8. A physician is an active participant on our TEAM .	7	6	5	4	3	2	1
9. Our TEAM has strong leadership with the clout to make changes happen.	7	6	5	4	3	2	1
10. Our TEAM has worked together as a team before this collaborative.	7	6	5	4	3	2	1
11. Our TEAM has worked on improvement projects before.	7	6	5	4	3	2	1
12. Our TEAM is familiar with measuring clinical process improvements.	7	6	5	4	3	2	1
13. TEAM members understand each other's strengths and weaknesses.	7	6	5	4	3	2	1
14. There is mutual respect among TEAM members.	7	6	5	4	3	2	1
15. The TEAM views problems as everyone's responsibility rather than "someone's fault."	7	6	5	4	3	2	1
16. The TEAM has a shared vision of how to improve.	7	6	5	4	3	2	1
17. The TEAM has a good way of solving conflicts between team members.	7	6	5	4	3	2	1
18. Everyone on the TEAM feels comfortable expressing his or her opinion.	7	6	5	4	3	2	1
19. The TEAM gathers data from patients about ways to continue to improve.	7	6	5	4	3	2	1
20. Our TEAM has a specific plan to spread the information learned in this collaborative to other parts of our health care system.	7	6	5	4	3	2	1

Thank you for completing this questionnaire. The results will be aggregated for the sites participating in this Breakthrough Series. Your team can also use your results to assess your baseline team function and plan your actions.