

Kerri Ann Scanlon  
Celia M. Wells  
Launette Woolforde  
Aradhana Khameraj  
Jennifer Baumgarten

# Saving Lives and Reducing Harm: A CAUTI Reduction Program

## EXECUTIVE SUMMARY

- ▶ The purpose of this quality improvement project was to develop a catheter-associated urinary tract infection (CAUTI) reduction program focusing on developing best practices and transferring them across the healthcare organization.
- ▶ Quantitative measures and formative evaluation processes used to determine success of the program were by measures of standardized infection ratio, incidence, and catheter days for both North Shore University Hospital and Northwell Health in both the intensive care unit (ICU) and non-ICU areas.
- ▶ Processes such as CAUTI root cause analysis, CAUTI rounds, CAUTI ambassadors, and development of novel ideas contributed to the program's success.
- ▶ Development and autonomy of frontline staff contributed to improvement in safe quality care to patients.

KERRI ANN SCANLON, MSN, RN, is Deputy Chief Nurse Executive, Northwell Health, and Chief Nursing Officer, North Shore University Hospital, Manhasset, NY.

CELIA M. WELLS, PhD(c), RN, is Senior Director of Nursing, Mount Sinai Hospital, New York, NY; and former Assistant Director of Nursing Education and Professional Development, North Shore University Hospital, Northwell Health, Manhasset, NY.

**B**EGINNING 2015, the Centers for Medicare & Medicaid Services (CMS) altered the guidelines and reporting structures around hospital-acquired conditions (HACs) (CMS, 2016). Moreover, to move away from *volume of care* to *value of care*, CMS, under Section 3008 of the Affordable Care Act, mandated that hospitals reduce HACs not present on admission (CMS, 2016). Otherwise, hospitals scoring in the lowest-performing quartile nationally will face a 1% reduction in overall Medicare reimbursement the following year (CMS, 2016). These changes could have financially impacted the authors' hospital by more than \$2.3 million and the health system by \$9.5 million for 2015 (Healthcare Association of New York State, 2015). As such, hospitals are now faced with developing new and innovative practices to improve quality measures to meet federal regulations necessary to remain fiscally strong in today's healthcare economy.

LAUNETTE WOOLFORDE, EdD, DNP, RN-BC, is Vice President for Nursing Education and Professional Development, Northwell Health, Manhasset, NY.

ARADHANA KHAMERAJ, MSN, RN, is Infection Prevention Director, North Shore University Hospital, Northwell Health, Manhasset, NY.

JENNIFER BAUMGARTEN, MBA, is Patient Care Services Project Manager, North Shore University Hospital, Northwell Health, Manhasset, NY.

## Significance to Health Care

The CMS, Joint Commission, and other healthcare leaders identified prevention of hospital-associated infections (HAIs) as a priority patient safety issue. The Centers for Disease Control and Prevention (CDC) and the National Healthcare Safety Network (NHSN) (2013) estimate there were more than 93,300 urinary tract infections (UTIs) in acute care hospitals in 2011, accounting for 12% of acute care infections. Of these hospital-acquired UTIs, approximately 75% were related to the use of an indwelling urinary catheter, known as a catheter-associated urinary tract infection (CAUTI). CAUTIs can lead to a plethora of complications, including but not limited to gram-negative bacteremia, septic conditions, and even mortality (CDC, 2013). There are approximately 13,000 CAUTI-related deaths each year with related costs upwards of \$500 million annually (CDC, 2013).

Financial implications for hospitals are two-fold: (a) overall savings in cost avoidance by preventing CAUTIs, and (b) overall savings related to CMS reimbursement. These savings, while not totally quantifiable, can alter the treatment course associated with CAUTIs. In a systematic review of the literature, research objectives were to estimate the cost associated with the most significant and targetable HAIs (Zimlichman et al., 2013). Authors were unable to identify studies that met their criteria for estimating attributable costs associated with length of stay. According to North Shore University Hospital (NSUH) performance and financial data, the average cost for a patient with a CAUTI is estimated at \$1,642 per case. These costs are similar to findings reported by Zimlichman and associates (2013) who estimated the cost of CAUTIs as \$603-\$1,189 per case in 2012. Earlier studies included those costs and assumed a 0.5-1 day increase in hospital length of stay respectively (Bologna, Polansky, Framow, Gordon, & Whitmore, 1999; Saint, Veenstra, Sullivan, Chenoweth, & Fendrick, 2000). In addition, Umscheid and colleagues (2011) included a cost calculation of \$1,200-\$4,700 based on range estimates of studies included in their research. While cost estimates for CAUTIs are inclusive, hospitals who have improved CAUTI outcomes can expect to see the 1% Medicare penalty lifted in 2017, saving millions of dollars per year.

North Shore University Hospital is an 814-bed quaternary care, teaching hospital, which is academically affiliated with the Hofstra Northwell School of Medicine and Graduate School of Nursing. In addition, NSUH is the flagship hospital for Northwell Health, retaining a staff of more than 6,000 employees including over 1,900 registered nurses. NSUH offers advanced care in all medical specialties, including open-heart surgery, neurosurgery, orthopedic sur-

gery, urology, and maternal-fetal medicine. As the 14th largest healthcare system in the United States, it has had challenges associated with CAUTIs. Therefore, in 2013, a CAUTI reduction program was launched which focused on developing best practices transferable across Northwell Health.

### Outcome Measurements

Quantitative measures and formative evaluation processes were used to determine success of the program. Data collection for this project included measures of standardized infection ratio (SIR), incidence, and catheter days for both NSUH and Northwell Health in the intensive care (ICU) areas. The HAI data uses SIR, a summary statistic, to measure relative differences in HAI occurrence reporting during a common referent period (e.g., standard population) (CDC, 2010). In HAI data analysis, SIR compares the actual number of HAIs with the predicted number based on the reference point of the standard population, adjusting for risk factors most associated with differences in infection rates (CDC, 2010). SIR is used as an index to measure infection performance, calculated by dividing the number of observed infections by the number of expected infections (CDC & NHSN, 2013). It is very difficult to reduce the SIR as there are many factors considered in its computation. A significant infection reduction is required to impact the SIR. Incidence refers to the actual number of confirmed CAUTIs while indwelling catheter days is an ongoing number that reflects the daily count of patients with indwelling urinary catheters in a specific patient care location (CDC & NHSN, 2013).

Catheter days are important since a reduction in indwelling catheter days indicate opportunities for early removal and insertion prevention. Outcomes were directly related to a series of educational programs which focused on care for patients with ind-

welling catheters. These programs (nurse-driven algorithm, dry bag concept, perineal care practices, maintenance and insertion techniques, two RN mandate, development of CAUTI ambassadors, and use of a CAUTI acronym) provided nurses with the knowledge and support necessary to affect change at the bedside, resulting in achievement of the objectives. Most importantly, outcomes were nurse driven, directly impacting patient satisfaction, financial performance, and quality and safety, which were quantified by a reduction in infections on both the hospital and health system levels.

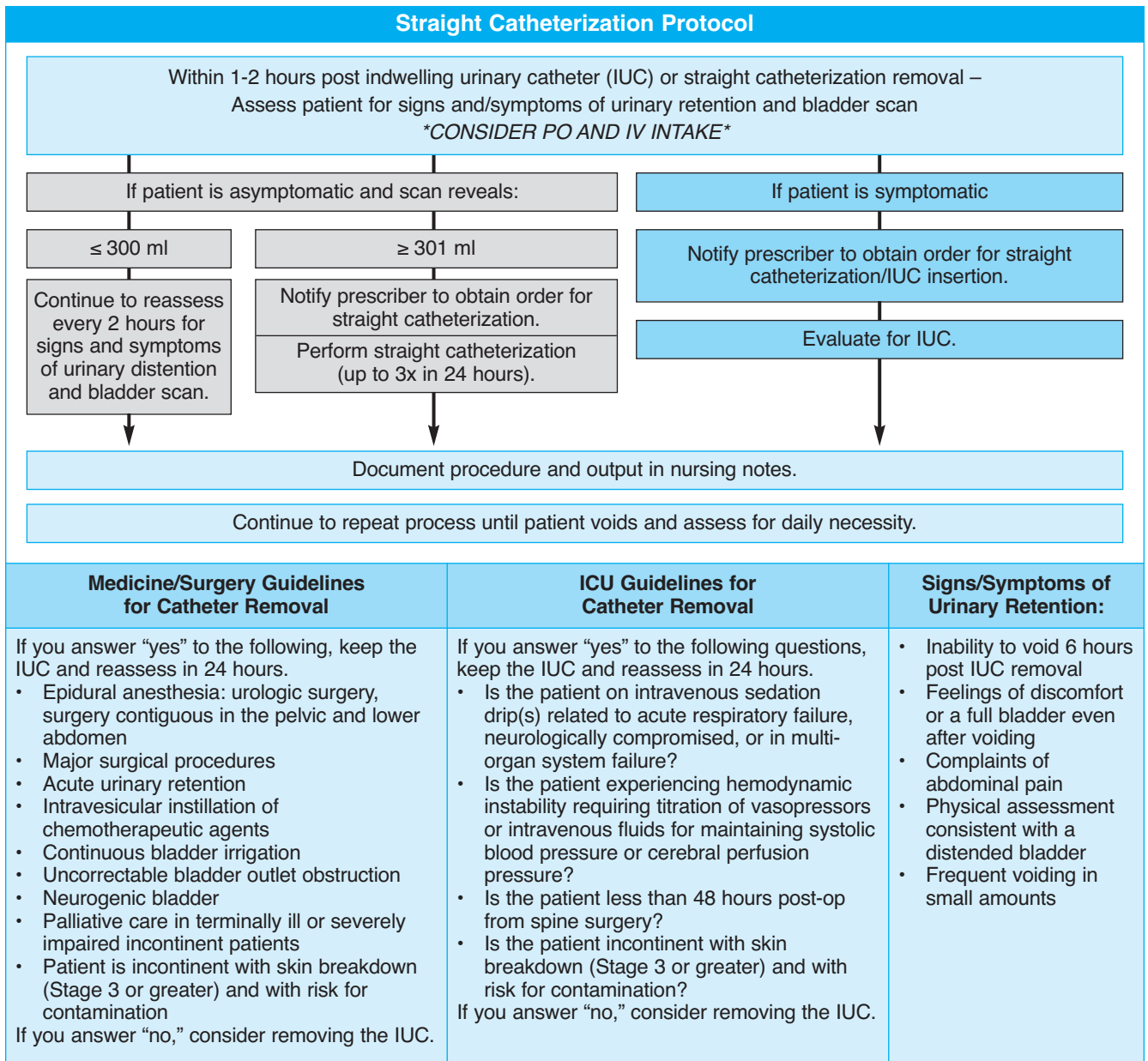
### Objectives

1. Reduce hospital ICU and Northwell Health ICU CAUTI SIR to <1 within 12 months by year-end 2014 and 0.85 within 18 months by June 30, 2015.
2. Reduce hospital ICU and Northwell Health ICU CAUTI incidence by 25% within 12 months by year-end 2014 and a stretch goal of 50% within 18 months by June 30, 2015.
3. Reduce hospital ICU and Northwell Health ICU catheter days by 25% within 12 months by year-end 2014 and a stretch goal of 50% within 18 months by June 30, 2015.
4. Measure and report financial impact for NSUH and Northwell Health related to cost avoidance associated with CAUTI reduction.

### Process Measures

The cornerstone of this program was teamwork and inclusion of the interprofessional team. While LEAN (Kimsey, 2010), Plan-Do-Study-Act (Institute for Healthcare Improvement, n.d.), and micro-systems strategies were used, experience with TeamSteps® was essential to the outcomes. It was predicted, this strategic approach would yield reductions captured in quantifiable outcomes. A SIR goal of <0.85 would correlate with Northwell Health's target to obtain

**Figure 1.**  
**Straight Catheterization Algorithm Pocket Card**



the CMS 2015 threshold. Using a priority ranking methodology, vulnerable patient entry points that were at risk for obtaining urinary catheters were identified. Target areas included the emergency department, operating room, post anesthesia care unit, and critical care.

Using tests of change, the team was compelled to develop innova-

tive ideas as the literature revealed no new recommendations to the already established CDC guidelines. Concurrently, nursing leadership identified opportunities to improve how data were reported within the hospital. Knowing this information had to be communicated in a structured, unified process, a hospital-based scorecard was developed which focused on orga-

nizational improvement to report data. Each month measures were collected at the unit-level which were then summarized into hospital-level data. Data collection included metrics about quality performance, finances, professional development, and patient satisfaction. Scorecards contrasted data from the previous year to current year-to-date totals and goals.

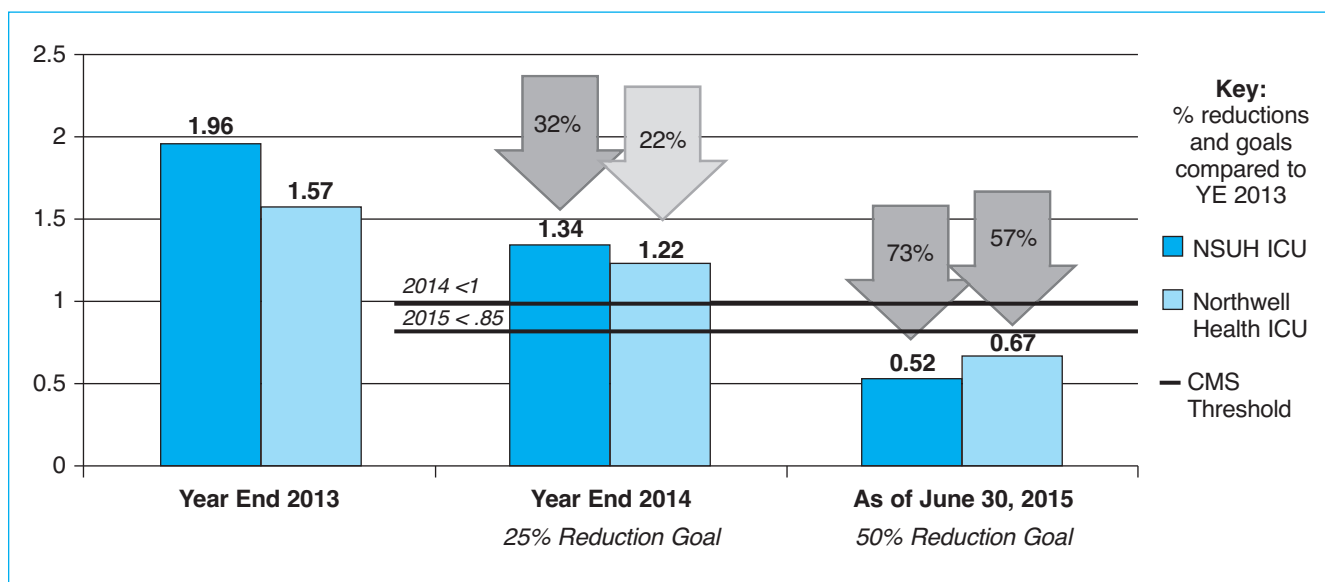
**Figure 2.**  
**CAUTI Reduction Process**

Process	Description
CAUTI Ambassadors	Identification of 188 registered nurse CAUTI ambassadors, also known as the clinical army
CAUTI Algorithm	Nurse-driven protocol
CAUTI Carnival	Educate CAUTI ambassadors and staff on best practice insertion and maintenance guidelines.
CAUTI Rounds	Interprofessional rounds on all patients with indwelling urinary catheters in real time to discuss catheter status, opportunities for removal, and learning opportunities
CAUTI Kick-off	Educational program for hospital physicians, advanced practice providers, nursing leadership, and staff to address CAUTI best practice standards
Education of Supportive Staff	Patient care assistants, technicians, physical therapists, and patient transporters educated on best practice maintenance guidelines
Root Cause Committee	Monthly analysis and evaluation of every CAUTI case to identify opportunities for improvement
CAUTI Acronym	<b>C</b> cause or indication <b>A</b> assess for necessity <b>U</b> utilize infection prevention measures <b>T</b> teach patient and family <b>I</b> informatics

Annual and stretch goals established by the Northwell Health executive leadership team were also included on the scorecard. Scorecards were presented monthly during nursing leadership, quality, and unit-level shared governance council meetings as transparency of data allowed the entire hospital to celebrate achieved outcomes or identify opportunities for improvement.

The project began with an interprofessional CAUTI task force. This group included organizational leadership and those with technical and clinical expertise to develop and strategize best practice guidelines and processes to reduce CAUTI. Team members included the hospital's chief nursing officer, chief medical officer, chief quality officer, advanced practice providers, infection prevention, nursing education, front-line nursing leadership, and clinical staff such as registered nurses, physicians, patient care associ-

**Figure 3.**  
**NSHU and Northwell Health ICU SIR Rates**



NSHU = North Shore University Hospital, CMS = Centers for Medicare & Medicaid Services, ICU = intensive care unit, SIR = standardized infection ratio



ates, physical therapists, patient transporters, and technicians.

Education then focused on frontline staff, 188 RN CAUTI ambassadors, also known as the clinical army. Each CAUTI ambassador completed education and validation on insertion techniques with return demonstration on mannequins. In addition, ambassadors received instruction about perineal care, maintenance of drainage bags below the level of bladder, the dry bag concept, StatLock® for proper securement, and two-RN mandate for insertion time out. Lastly, ambassador education included a “Train the Trainer” model to validate staff on new protocols.

Next was the development of a straight catheterization algorithm pocket card (see Figure 1). Unlike other states, scope of practice for RNs in New York is defined as executing medical regimens prescribed by a licensed physician, dentist, or other licensed health care provider (New York State Education Department Office of the Professions, 2010). This prohibits nurses from removing catheters without provider orders. Therefore, it is essential nurses drive the process for catheter removal. Guidelines for the protocol were presented to hospital physician and nursing leadership for evaluation and feasibility. Departments (emergency, medicine, surgery, urology, and critical care) evaluated the protocol and made recommendations for change based on patient population. The algorithm included (a) addressing the pathway for straight catheterization utilizing bladder scanning by nursing staff, (b) best practice guidelines for maintenance and removal, and (c) identifying signs and symptoms of urinary retention. To support the straight catheterization protocol, four bladder scanners were purchased for use in the emergency department and ICUs. The bladder scanners were used in tandem with the algorithm and provided nursing autonomy based on a decision

tree to communicate their findings and recommend next steps to providers about the patient’s plan of care.

Interprofessional participation resulted in innovations that contributed to achieving outcome measures of CAUTI SIR, incidence, catheter days, and cost impact. These innovations were identified as opportunities to educate and change current practice and included CAUTI ambassadors, CAUTI algorithm, CAUTI carnival, CAUTI rounds, CAUTI kickoff, and a CAUTI acronym (see Figure 2).

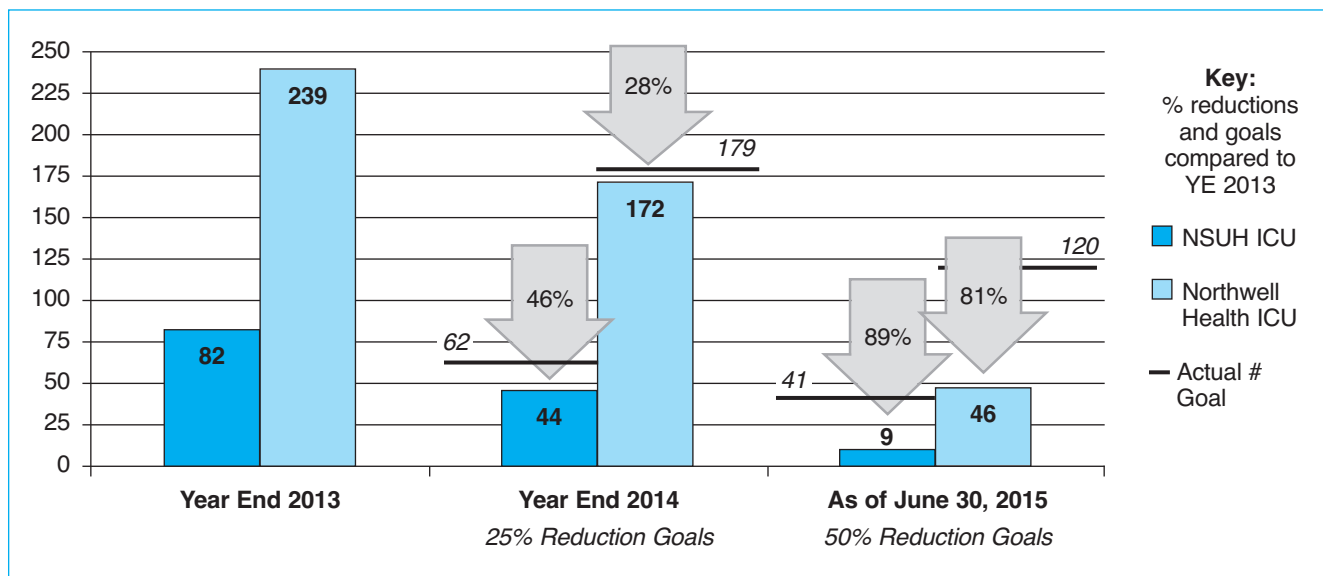
Consistent assessment and evaluation of opportunities for improvement led to the development of a monthly CAUTI root cause committee and process. The infection prevention department monitors and generates CAUTI incidence within the hospital. As CAUTI events are identified, notification is sent to senior leadership, unit leadership, and nurse educators. Meetings occur monthly to discuss and evaluate each case in detail in a nonthreatening learning environment. Information acquired during meetings has facilitated policy and procedure development, reinforcement of best practice, and contributed to ongoing CAUTI reduction success. For example, staff used a standard nonmetered collection bag on patients admitted to the emergency department, a previous standard practice. However, if the patient’s condition declined necessitating strict intake and output monitoring, a metered collection bag would be exchanged. As such, staff would “break the seal” and replace the standard nonmetered collection bag (\$8.45) for a metered-collection bag (\$13.47). This practice of “breaking the seal” can impose an increased risk of CAUTI development, as well as incur a total cost of \$21.92 per patient. Although there is an initial cost savings for use of the metered-collection bag on patients requiring its use, there is a poten-

tial cost increase for those patients not requiring a metered-collection bag. Understanding this information, senior leadership supported the decision that cost should not dictate best practice and allowed the facility to move forward with utilizing metered-collection bags for all patients throughout the hospital.

Partnership with material operations assured supplies supporting maintenance and insertion strategies were consistently available to staff such as StatLock and condom catheters. Supporting best practice at the bedside was essential to the program’s success. Therefore, when staff identified a need to have more choices of condom catheters for male patients, the task force responded immediately. Vendors were invited to the hospital so staff could trial and recommend products. Based on staff recommendations, these products were added to the inventory and are included in the maintenance guidelines.

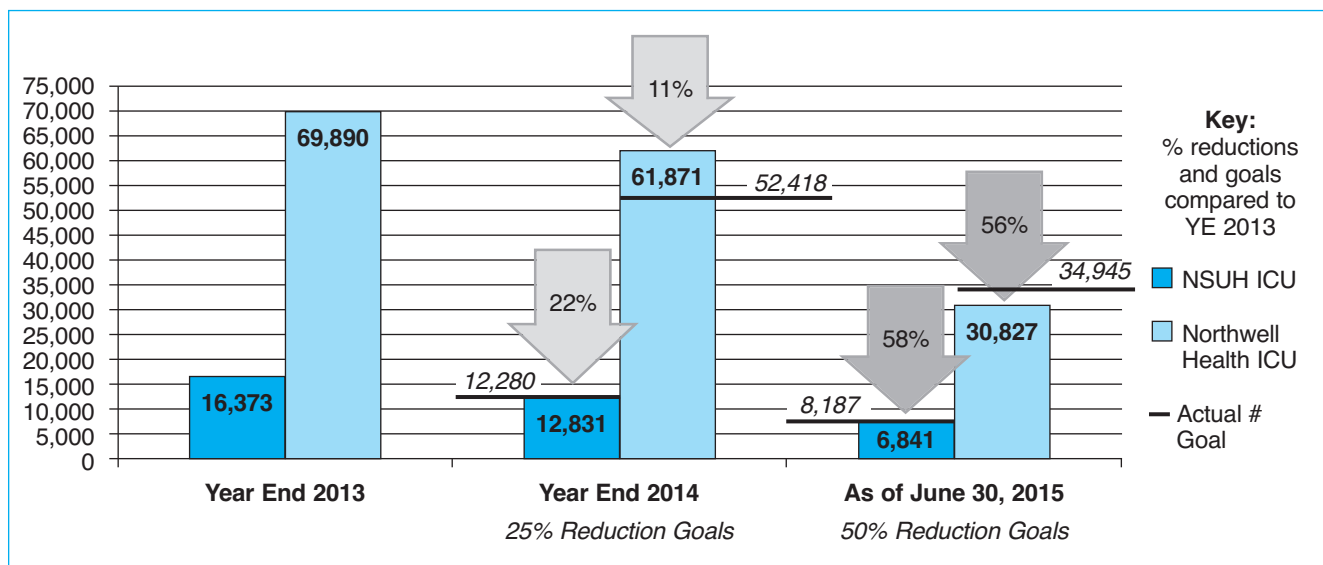
As the results became apparent, the hospital became the foundation for the Northwell Health CAUTI Steering Committee. The committee included Northwell Health’s Vice President of Nursing, Vice President, Infection Disease, and the Deputy Nurse. Beginning September 2014, the team met monthly to collaborate and share best practice successes and opportunities for improvement. The steering committee adopted and implemented system hospital best practices for CAUTI reduction across the remaining 18 hospitals in the organization. Moreover, the steering committee built on the hospital processes to develop additional learning programs. All initiatives were bundled to create a CAUTI prevention toolkit, easily accessible to all employees on the organization’s intranet. The final product resulted in an educational video, “Proceed with CAUTI on,” which is viewed by new employees during orientation. The steering commit-

**Figure 4.**  
**NSUH and Northwell Health ICU CAUTI Incidence**



CAUTI = catheter-associated urinary tract infection, NSUH = North Shore University Hospital, ICU = intensive care unit

**Figure 5.**  
**NSUH and Northwell Health Catheter Days**



NSUH = North Shore University Hospital, ICU = intensive care unit

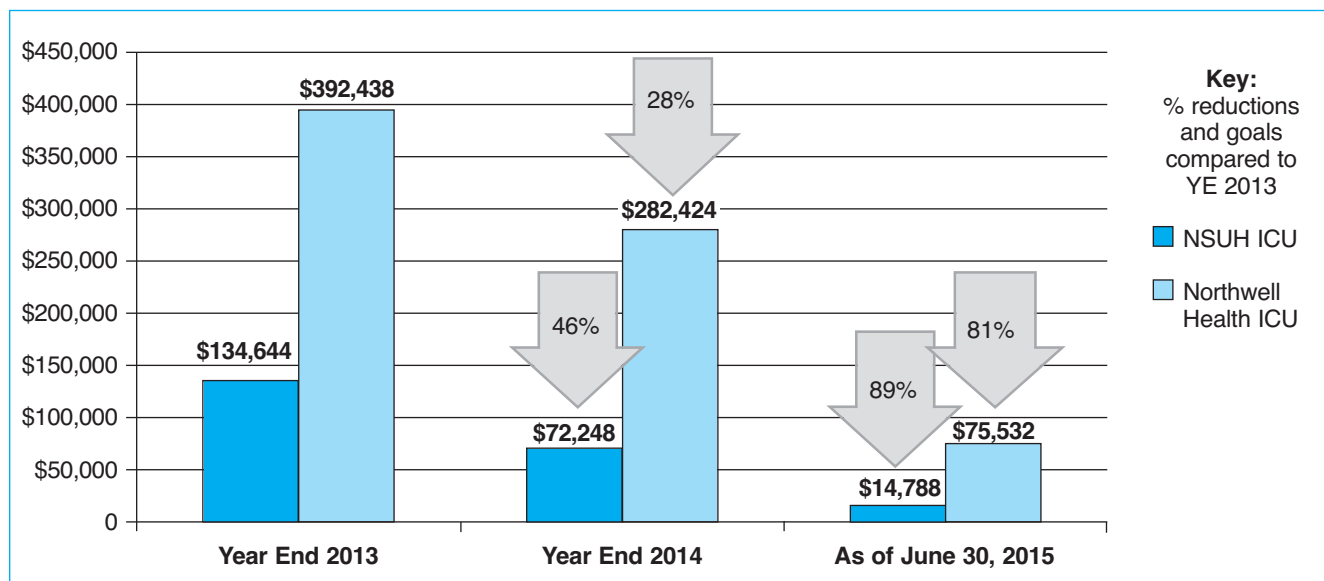
tee continues to meet quarterly to update members on hospital-specific and Northwell Health outcomes and to address any concerns.

### Outcome Measures

*Quality outcomes.* Improving data was imperative as the hospital is the largest within Northwell Health, which can significantly impact overall data by an average

25%. Both the hospital and health system demonstrated substantial reductions in ICU CAUTI measures defined as ICU CAUTI SIR, ICU CAUTI incidence, ICU catheter days, and cost impact. The project

**Figure 6.**  
**NSUH and Northwell Health ICU CAUTI Direct Cost**  
**(est. \$1,642/CAUTI)**



CAUTI = catheter-associated urinary tract infection, NSUH = North Shore University Hospital, ICU = intensive care unit

began year-end (YE) 2013 and continued through YE 2014 (12-month period) concluding June 30, 2015 (18-month period).

Over the 12-month period, hospital data demonstrated a decline in ICU SIR of 32% and in 18 months expressed a 73% reduction (see Figure 3). ICU CAUTI incidence decreased by 46% and 89%, while catheter days decreased by 22% and 58% respectively (see Figure 4). As the hospital's ICU CAUTI measures continued to decline, the health system also had similar reductions. Health system ICU SIR declined by 22% over the 12-month period and reduced by 57% over the 18-month period. ICU CAUTI incidence declined 28% and 81% respectively, while ICU catheter days dropped 11% and 56% respectively (see Figure 5).

In 2015, additional resources were deployed to hospital non-ICU units as improvement in data lagged slightly behind ICU outcomes. These resources included the purchase of additional bladder

scanners and education to both CAUTI ambassadors and staff. Non-ICU SIR declined by 10% over the 12-month period and 27% over the 18-month period. Non-ICU CAUTI incidence was reduced by 25% within 12 months and 68% in 18 months. Likewise, there was a 9% and 54% decrease in catheter days over the 12 and 18-month periods. Although, the health system non-ICU SIR increased by 16% over 12 months, by 18 months the health system demonstrated a 24% reduction. Non-ICU CAUTI incidence experienced a slight 3% increase over 12 months but decreased 63% by 18 months. Lastly, non-ICU catheter days decreased by 10% in 12 months and 53% in 18 months.

*Financial impact.* As quality care continues to remain a priority, institutions must not lose sight of the financial impact associated with CAUTIs. North Shore University Hospital demonstrated reductions in ICU CAUTIs which translate into a 46% cost savings

over a 12-month period equating to \$62,396 and an 89% savings over 18 months with a value of \$119,866. Northwell Health has reduced ICU-related CAUTI costs by 28% over 12 months equating to \$110,014 and 81% over 18 months with a value of \$316,906 (see Figure 6). These savings are necessary in the prevention of complications currently under payment reforms. As such, institutions must be ready to invest in strategies to reduce CAUTIs.

### Conclusion

In addition to the decreases in ICU CAUTI, we cannot dismiss the affect this change has had on employees. The most palpable results have been the development and autonomy of frontline staff who continue to elevate their practice while providing safe quality care to patients. Their continued leadership and dedication to improving patient care have maintained the momentum of this project. By engaging and transforming the culture of frontline

staff in CAUTI-reduction practices, staff passion and commitment for patient quality and safety have been reignited, thus driving CAUTI best practices.

This process for CAUTI reduction has proven successful in the hospital and throughout Northwell Health. These processes are transferable which can be applied to other initiatives or programs within the hospital and Northwell Health. Changing culture is imperative to the success of organizations which can be achieved through interprofessional collaboration and team development. This model has increased confidence across a diverse group of individuals and disciplines so that even small modifications in practice can impact the quality of care provided to patients. \$

#### REFERENCES

- Bologna, R.A., Polansky, M., Fraimow, H.D., Gordon, D.A., & Whitmore, K.E. (1999). Hydrogel/silver ion-coated urinary catheter reduces nosocomial urinary tract infection rates in intensive care unit patients: A multicenter study. *Urology*, 54(6), 982-987.
- Centers for Disease Control and Prevention (CDC). (2013). *Catheter associated urinary tract infections (CAUTI)*. Retrieved from [http://www.cdc.gov/HAI/ca\\_uti/uti.html](http://www.cdc.gov/HAI/ca_uti/uti.html)
- Centers for Disease Control (CDC) and Prevention and the National Healthcare Safety Network (NHSN). (2013). *Urinary tract infection (catheter-associated urinary tract infection [CAUTI] and non-catheter-associated urinary tract infection [UTI]) and other urinary system infection [USI] events*. Retrieved from <http://www.cdc.gov/nhsn/pdfs/pscmanual/7pscacaucirent.pdf>
- Centers for Disease Control and Prevention (CDC). (2010). *National and state healthcare-associated infections standardized infection ratio report: Using data reported to the National Healthcare Safety Network*. Retrieved from [http://www.cdc.gov/HAI/pdfs/SIR/national-SIR-Report\\_03\\_29\\_2012.pdf](http://www.cdc.gov/HAI/pdfs/SIR/national-SIR-Report_03_29_2012.pdf)
- Centers for Medicare & Medicaid Services (CMS). (2016). *Hospital-acquired condition reduction program (HACRP)*. Retrieved from <https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/HAC-Reduction-Program.html>
- Healthcare Association of New York State. (2015). *Impact of Medicare's quality-based payment reforms*. Rensselaer, NY: Author.
- Institute for Healthcare Improvement. (n.d.). *Plan-do-study-act (PDSA) worksheet*. Retrieved from <http://www.ihl.org/knowledge/Pages/Tools/PlanDoStudyActWorksheet.aspx>
- Kimsey, D.B. (2010). Lean methodology in health care. *AORN Journal*, 92(1), 53-60.
- New York State Education Department Office of the Professions. (2010). *Education law article 139, nursing*. Retrieved from <http://www.op.nysed.gov/prof/nurse/article139.htm>
- Saint, S., Veenstra, D.L., Sullivan, S.D., Chenoweth, C., & Fendrick, A.M. (2000). The potential clinical and economic benefits of silver alloy urinary catheters in preventing urinary tract infection. *Archives of Internal Medicine*, 160(17), 2670-2675.
- Umscheid, C.A., Mitchell, M.D., Doshi, J.A., Agarwal, R., Williams, K., & Brennan, P.J. (2011). Estimating the proportion of healthcare-associated infections that are reasonably preventable and the related mortality and costs. *Infection Control & Hospital Epidemiology*, 32(02), 101-114.
- Zimlichman, E., Henderson, D., Tamir, O., Franz, C., Song, P., Yamin, C.K., ... Bates, D.W. (2013). Health care-associated infections: A meta-analysis of costs and financial impact on the US health care system. *JAMA Internal Medicine*, 173(22), 2039-2046.



Reproduced with permission of copyright owner.  
Further reproduction prohibited without  
permission.