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Catheter-Associated Urinary Tract Infection Reduction: A Quality Improvement Project

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Catheter-Associated Urinary Tract Infection Reduction:

A Quality Improvement Project

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Abstract

Problem: Hospital-acquired infections are preventable harm that occurs to patients while in the hospital. Catheter-associated urinary tract infection (CAUTI) is a preventable hospital-acquired infection that continues to plague hospitals nationwide. The Centers for Disease Control and Prevention estimates that there are more than 13,000 CAUTI related deaths in the United States annually (Scanlon, 2017). In addition to the harm caused to patients by CAUTIs, the estimated \$500 million yearly cost for CAUTI treatment has created a fiscal burden on healthcare systems (Scanlon, 2017). Decreasing the rate of CAUTI by decreasing overall number of catheters is the goal of this performance improvement project.

Context: Within a large northern California healthcare system, at one Santa Clara, California hospital, the medical neurology unit, Department 430, is an inpatient hospital unit that provides care to a diverse patient population. This unit had 7 CAUTIs in 2017, which was the most of any unit within this hospital. A strengths, weaknesses, opportunities, and threats analysis of the unit revealed there was no daily process in which catheter necessity was discussed between the multidisciplinary team. This unit was also identified to have more catheter line days than expected by the National Healthcare Safety Network.

Intervention: The main intervention of this performance improvement project is a daily catheter rounding team, which consists of a nurse quality consultant, physician lead, department nursing leader, and infection control nurse. The rounding team reviews catheter patients daily and discusses catheter removal in real time. The catheter rounding team is expected to decrease the overall number of line days and, therefore, decrease infection rates.

Measures: During project development, a family of measures was identified to help track project goals and to identify if the project made a change. The specific outcome measures for this project

will be a 30% reduction in catheter line days and a 30% reduction in the unit's CAUTI rate per 1,000-line days from the project initiation. The two process measures that will evaluate the success of the project's outcome metric are number of catheters removed during rounds and the percent of patients who have a catheter correctly placed using the bladder scanning protocol. A balancing measure of patient falls will also be tracked to ensure that there is no correlation between catheter removal and patients falling when using the toilet.

Results: After implementation of the main intervention of the catheter rounding team, the unit saw an overall decrease in line days by 31.4% from the same period the previous year. In addition to line day reduction, the CAUTI rate per 1,000-line days decrease by 36.4% from the start of the project.

Conclusions: The introduction of the catheter rounding team was successful at decreasing the overall number of line days, as well as the CAUTI rate. The introduction of tools for the frontline staff to utilize when making decisions to contact the physicians regarding line necessity were suspected of spreading an increased overall awareness of daily catheter necessity evaluation. Without full-time equivalents to continue the rounding team, the unit leadership and physician lead will be crucial in the sustainability of the unit's CAUTI reduction success. In conclusion, the implications for practice based on this project include the introduction of a catheter rounding team to increase awareness of catheters that are in place, decrease the overall catheter line days and CAUTI rate, and reduce unnecessary harm to patients.

Section II: Introduction

Catheter-associated urinary tract infection (CAUTI) is a preventable hospital-acquired infection (HAI) that continues to plague hospitals nationwide. The Centers for Disease Control and Prevention (CDC) estimates that there are more than 13,000 CAUTI related deaths in the United States annually (Scanlon, 2017). In addition to the harm caused to patients by CAUTI, the estimated \$500 million yearly cost for CAUTI treatment has created a fiscal burden on healthcare systems (Scanlon, 2017). In 2008, the financial impact increased when the Centers for Medicare and Medicaid Services limited hospital reimbursement for CAUTIs (Kawai et al., 2015).

One of the largest not-for-profit healthcare delivery systems in the United States was selected for analysis of their CAUTI rates. The organization, based out of northern California, strives to deliver high-quality, affordable healthcare to its members. Catheter-associated urinary tract infections not only harm patients within this system, but they also contribute to an increased cost of healthcare-related expenses, which in turn increase health plan costs (Hollenbeak & Schilling, 2018). A CAUTI is also a reportable event that contributes to the organization's overall infection rates. Catheter-associated urinary tract infection rates are available to the public and can be useful to patients when seeking a highly reliable organization for their healthcare.

The impact of CAUTIs on this healthcare system has been acknowledged by leadership throughout the northern California region. Catheter-associated urinary tract infections are attributed to increased lengths of stay, which affect bed availability in any acute care facility. Quality, people, and service are the organizational drivers within this organization. The organization monitors total harm to their patients under the quality driver, which is where

CAUTIs make the biggest organizational impact. The reduction of CAUTIs throughout the system has become a key focus within the organization.

Problem Description

Within a large northern California healthcare system, at one Santa Clara, California hospital, the medical neurology unit, Department 430, is an inpatient hospital unit that provides care to a diverse patient population. The unit is formally designated as a neurology unit, but the beds are regularly occupied by patients from every medical service. The unit strives to meet the needs of patients with chronic conditions requiring longer than average hospital stays. A microsystem assessment of the department was conducted using the Dartmouth Institute (2005) microsystem assessment tool. The microsystem assessment revealed that CAUTI is one of the metrics that matter in which the department is striving to improve.

The medical-surgical Department 430 microsystem at this hospital had seven CAUTIs in the 2017 performance year. The medical center has an accurate system to track and report the data associated with CAUTI. Foley line days per unit, the standardized infection ratio (SIR), and the total number of CAUTI infections per unit are the metrics that matter to the organization's patients and leadership. The organization tracks each of its facility's SIR for CAUTI, which is calculated by comparing the number of observed infections to the number of predicted infections based on the National Healthcare Safety Network criteria (NHSN, 2017).

In 2017, the medical-surgical Department 430 had a SIR value of 2.4, which reflects seven CAUTIs from January 2017 to December 2017 (see Appendix A). Reducing the SIR and, therefore, the total number of CAUTI infections is the global aim of this microsystem improvement project. The standardized utilization ration (SUR) is a value calculated by the NHSN (2017) by comparing the total number of actual line days to the total number of predicted

line days. In 2017, Department 430 had a rolling month-to-month SUR above the NHSN expected value (see Appendix B). Evidenced-based practice has shown that a decrease in Foley catheter line days is directly correlated with a decrease in CAUTIs (Strosahl, 2014). Decreasing the total number of line days in Department 430 will be the specific aim of this project.

Available Knowledge

Reducing CAUTI rates is a national healthcare initiative supported by many research and non-research journals. The PICO statements guide literature searches by identifying the primary patient problem, the intervention, the comparisons or controls, and the outcomes (Polit & Beck, 2013). To narrow the CAUTI literature results, a PICO search of the CINAHL and Cochrane databases was conducted.

The PICO statement: In Foley catheter patients, do Foley rounding teams and nurse-driven removal protocols lower the rates of CAUTI? The PICO statement was used to search the evidence, using these key words. Six articles were chosen to support the rationale of this project, and each was rated using the Johns Hopkins Nursing Evidenced-Based Practice Appraisal Tool (see Appendix C).

Medical staff and patient education is a critical step in decreasing the rates of CAUTI. In a quality improvement initiative, rated Level V, Pashnik, Creta, and Alberti (2017) utilized the peer-to-peer teaching approach to help educate staff about urinary catheter and CAUTI prevention. Nurses teaching other nurses is an effective way to deliver content in a way that is understood by both the teacher and the learner. In their improvement initiative, Pashnik et al. targeted 854 nursing staff members in a nursing peer-to-peer competency skills day. The frontline staff were educated about CAUTI prevention components, catheter insertion and removal techniques, proper specimen collection, and return demonstration on proper bladder

scanning techniques. Post-education validation was completed collecting post-test surveys from 87% of those educated (Pashnik et al., 2017). The success of peer-to-peer education was evident when the infection control department reported that CAUTI bundle compliance audits yielded an increase from 79.6% compliance to 88% compliant from 2015 to 2016. In that same year, the CAUTI infection rate dropped from a pre-implementation level of 1.3 CAUTI per 1,000 catheter days to 0.91 per 1,000 catheter days. This reduction in CAUTI was driven by frontline staff with CAUTI expertise, referred to by the facility as *frontline champions* (Pashnik et al., 2017).

Department 430 will develop a CAUTI champion team that will be crucial in reducing infection rates.

Skills and competency days can be useful to educate large groups of medical staff. Ongoing education is also vital to the sustainability of any performance improvement project. Parker et al. (2017) led a mixed method Level III B exploratory study that tested and evaluated the use of a *No CAUTI* bundle across four acute care hospitals. The *No CAUTI* acronym focused around not only educating nursing staff, but also educating physicians and ancillary staff in initial and ongoing phases. While the study did not report CAUTI rates, the pilot study yielded a 50% reduction in catheter insertion rates (Parker et al., 2017). Given that Department 430 has a high line day utilization, a reduction in overall insertion is expected to yield a decreased line day rate and a decrease in overall infections.

Education alone is not enough to combat CAUTI rates. The 2008 Medicare revision that stopped repayment of CAUTI related expenses placed mounting pressure on hospitals to implement additional CAUTI reducing strategies (Yi, Baggs, Gould, Scott, & Jernigan, 2014). A Level III, non-experimental, retrospective cohort descriptive study conducted by Yi et al. (2014) retrospectively analyzed Medicare payout information on 894 patients with CAUTIs. Yi et al.

concluded that CAUTI patients stayed 8.1 days longer in intensive care and 3.6 days longer in non-intensive care. An increased length of stay leads to less available beds and an increased cost to the healthcare system. These statistics will be the financial driver for Department 430's CAUTI reduction initiative.

The financial impacts of CAUTI reduction can be seen across the literature. In a Level V quality initiative by Scanlon (2017), decreasing SIR by 73% lowered the direct cost of CAUTI 89% over a two-year period. Scanlon developed a catheter rounding team that assessed all indwelling catheters daily for necessity and bundle compliance. The development of a nurse-driven catheter removal protocol was also key to the initiative's success. The effectiveness of nurse-driven removal protocols is not unique to Scanlon's study. In their Level V quality improvement initiative, Alexaitis & Broome (2014) developed a nurse-driven catheter removal protocol in an intensive care unit. Of the 322 patients assessed, the protocol dropped the average length of time the catheter was in place by 2.5 days, and the unit's CAUTI rate decreased by 20.5% per 1,000 catheter days (Alexaitis & Broome, 2014).

The development of a CAUTI rounding team and nurse-driven removal criteria will be critical to this project's success. Richards (2017), in a Level V quality initiative, developed a nursing CAUTI arrest team that reduced the CAUTI SIR in the neurologic intensive care unit from 38 infections to 15 infections in one year. The CAUTI arrest team educated nursing staff, rounded on catheter patients, and provided non-punitive feedback to frontline staff (Richards, 2017). The development of the catheter rounding team in Department 430 is expected to have comparative results to the Richard's study.

Rationale

Lewin's force field model of change will be utilized to guide this project. Lewin's model identifies driving forces of change and the forces that restrain it (Finkleman, 2012). The driving forces must overcome the restraining forces for change to occur. The application of Lewin's model will occur in Department 430 in three stages.

The first stage in applying Lewin's model is the unfreezing stage. The unfreezing stage is critical and is when stakeholders acknowledge that change is necessary. Once an acknowledgement of the need for change occurs, staff will begin to step outside of their comfort zone, while taking risks that promote acceptance of the change. The second stage, the moving stage, is the phase in which the change commences. During this phase, staff adhere to newly learned practices, and patient care becomes safer. The final stage, the refreezing stage, occurs when the change becomes the new normal. After this stage, sustainment of the improvement work will begin.

Lewin's change model will provide framework and guidance throughout the duration of this project. The unfreezing stage occurred when hospital leadership determined that CAUTIs were harming the hospital's patients, specifically in Department 430. The moving phase of the project will be the phase where change begins to occur. This phase will start with staff education on the project's nurse-driven Foley removal protocol. The plan-do-study-act (PDSA) cycles will be run to revise and adapt the tools for change and to assess their effectiveness. Once the PDSA cycles have completed and a change has occurred, the refreezing stage will ensure that staff adhere to the newly developed processes that have been vetted through the project's PDSA cycles.

Specific Project Aim

The specific aim of this project is to reduce the number of catheter line days by 30%, from a baseline of 351 lines days in Quarter 3, 2017 to 246 total line days in Quarter 3, 2018 by October 1, 2018. The SUR will be tracked throughout the project using monthly values provided by the NHSN. The weekly line day data will also be tracked to observe for drift in practice and to monitor adherence to the project interventions.

Section III. Methods

Context

Using the Dartmouth Institute (2005) microsystem assessment tool, the culture and department missions were assessed. According to Department 430 leadership, the medical neurology department addresses physical, psychological, social, and spiritual needs of medical and neurology populations. According to the unit manager, patients may have an extended length of stay in the department prior to discharge. Extended stay patients develop a close connection with the medical staff and the leadership team.

Demographical information was obtained from Department 430 leadership team and the finance department. The data are current through the 2018 fiscal year, which runs October 1, 2017 through September 30, 2018. The age distribution of Department 430 varies based on census, but a more senior population is consistently observed. Patients in the 19 to 50 year age range make up approximately 21% of the population, with approximately 21% of the population ages of 51 to 65 years, 8% of the population ages of 66 to 75 years, and 50% of the population over 75 years. Gender distribution across the unit also varies on the census, but approximately 60% of the population is female, while only 40% identify as male.

The most common medical diagnosis across the unit is related to respiratory diseases. This is not surprising, as the unit cares for patients with neurologic disorders—a population prone to aspiration pneumonia and poor airway clearance. The average length of stay for Department 430 is approximately 5.2 calendar days. This value is slightly higher than the hospital average, which is currently approximately three days. The readmission rate of patients discharged from Department 430 is also higher than the aggregate hospital rate, 28% and 16.8% respectively.

Unit Staffing Mix

Department 430 has 22 full-time equivalent (FTE) frontline nursing positions. In addition to these FTEs, per-diem and travel staff are utilized to fill staffing gaps during the peak census months. There are no physician or ancillary FTEs dedicated to this unit, which is related to the fiscal makeup of the unit. Physicians are allocated to specific hospitalist-based teams, and patients are then assigned to these teams based on their care needs and diagnosis. Ancillary services, such as dietary, social work, and physical therapy, consult patients with orders, but their FTEs are not directly assigned to the unit.

As with every medical team, effective leadership is crucial to patient care success. Department 430 has 5.2 dedicated FTEs for leadership. This allows for one 8-hour position Monday through Friday for each shift. The additional weekend coverage is handled by two 0.6 FTEs. This allows for 24-hour-a-day coverage in leadership. Around-the-clock leadership support is necessary on a 24-hour hospital unit to ensure quality sustainability. It is important to note that the department is not currently staffed for 24-hour-a-day leadership support, which is related to lack of experienced leaders in the area. The lack of consistent leadership oversight further supports a catheter rounding team, which is the main intervention of this project.

Unit Level SWOT

A strengths, weakness, opportunities, and threats (SWOT) analysis of the Department 430 microsystem provided further rationale for change (see Appendix D). It was identified that the unit lacks clear catheter removal criteria and poor physician and nurse communication of catheter necessity. The residency program at the facility was identified as a potential weakness, as frontline nursing reported that residents were more reluctant to remove the catheters. The

SWOT analysis also revealed that the staff and unit leadership are driven and enthusiastic about improvement.

An additional SWOT analysis was completed to examine the external threats to the microsystem (see Appendix E). The strengths of the organization include a motivated leadership team and a strong nursing union dedicated to patient safety. External threats to the microsystem project include financial support for the catheter rounding team and lack of policies relating to standardization of catheter removal and necessity within the organization. The cost of the project will be justified using a cost avoidance budget that outlines project expenses and profits.

Fishbone Analysis

To help understand the specific causes of CAUTI on Department 430, a fishbone diagram was utilized (see Appendix F). The four areas of focus found to have the most risk in a patient acquiring a CAUTI were insertion, removal, patient condition, and maintenance of the catheter. These four areas of focus facilitated in the decision to develop a catheter rounding team as the primary intervention of this project. All four of these areas can be evaluated daily by the rounding team. Improved awareness on the four focus areas daily during rounds is expected to decrease catheter line days.

Unit level awareness of Foley line necessity triggers staff to critically assess whether the catheter is necessary. Implementation of a CAUTI bundle in the medical-surgical microsystem is expected to decrease the rate of CAUTI. A decrease in infections will achieve a cost avoidance for the facility by decreasing the average length of stay and eliminating the estimated \$20,000 per infection treatment cost (CDC, 2014).

Financial Analysis

A financial analysis of this improvement project was completed using the most current hospital financial data. The average cost of a CAUTI infection is \$20,000 per infection (CDC, 2014). Department 430 had seven infections in 2017, which cost the facility approximately \$140,000. This cost was only calculated for Department 430, as this department had the highest number of CAUTIs in 2017. If all units were included in this financial analysis, the expense of CAUTIs would be even larger. The goal for this project is to eliminate CAUTI by decreasing the number of catheter line days by 30%. This is expected to reduce the overall CAUTI rate. If the CAUTI rate of Department 430 is decreased by just two infections per year, this would yield a \$13,628 cost avoidance in the first year for the facility (see Appendix G). The cost avoidance could be potentially higher if the rate is reduced further or if best practices are spread to the other units.

This project was developed utilizing staff and tools that are already available to the facility, which helps to eliminate the financial needs of the project. The major expenses are adding 0.1 FTE of quality nursing for the rounds and one hour of frontline participation per week at the champion meetings. Simply not doing anything will cause the CAUTI rates to remain high, increasing the financial impact on the facility.

Intervention

A Foley catheter rounding team will be the main intervention for this project. The catheter rounding team is expected to decrease the overall number of line days and, therefore, decrease infection rates. A bundle of interventions was developed to be utilized by the rounding team to evaluate daily Foley necessity, to educate and guide the nursing staff on catheter removal and insertion, and to increase overall awareness of a catheters on the unit. A nurse-driven

catheter removal algorithm was adapted from the intensive care unit to assist Department 430 nursing staff on criteria for catheter removal (see Appendix H). Department 430 frequently has acute and chronic retention patients. A removal algorithm was created with assistance from urology to assist nursing staff and physicians on how to manage the catheters of these patients (see Appendix I). Staff were educated on the current bladder scanning protocol used in the hospital. Bladder scanning and proper insertion per the protocol will also be a focus of the rounding team to prevent unnecessary catheter placement (see Appendix J).

The function of the rounding team will be to round on all catheter patients daily to determine necessity and to ensure adherence to all CAUTI removal bundle algorithms. The team will be composed of the unit physician leader, unit manager, patient care technician, quality nurse, quality specialist, and any other member of the team available to join for rounding. During rounds, the team will collect data on line necessity validation and nurse documentation, proper use of the bladder scanning protocol, and line day data.

The CAUTI line day data collected by the team will be displayed on the unit and reviewed in shift huddles with staff. Staff knowledge of line days will increase overall awareness, which will contribute to line day reduction. A secondary benefit of the rounding team will be in-the-moment staff education, overall awareness of high risk catheter patients, and assurance that daily catheter care is completed. The overall CAUTI infection rates will also be shared with staff. Creating a culture of friendly competition will occur when Department 430 staff recognize that their peers are all aligned in the goal to reduce the number of catheters on the unit.

Study of the Intervention

A measurement strategy was developed to organize the goals of the project and to develop a plan to measure the project's success. The success of the project will be tracked monthly using line day rates. Line days will be tracked by this author and will be entered in the electronic rounding tool, as obtained from the NHSN and local infection control department. If the project is successful, the number of line days will trend downward, and the number of CAUTI per 1,000-line days will decrease from the project start.

There is potential that line days do not decrease, but CAUTIs do decrease. This will be considered a success of the project as well, as the global aim is to decrease the overall infection rates. In patients with chronic catheters, staff compliance to catheter care may increase as overall unit awareness increases. This may also lead to a reduction in infection rates, but may not decrease the number of overall line days.

In addition to tracking line day data, daily line day necessity documentation, correct use of the bladder scanning protocol, and the number of catheters discontinued by the team during rounding will be tracked. This information will be reviewed with staff weekly at huddles to increase knowledge of project goals, while also increasing unit level awareness of the issues identified. Data definitions and measurement strategies will be shared with the frontline staff, physician lead, and unit leadership team (see Appendix L).

The project manager, this author, will be responsible for monitoring all data collection for accuracy and completeness. The electronic rounding tool will assist in ensuring data collection is done in real time during rounds. Data that cannot be validated by rounding will not be reported for the outcomes of this project. Inaccurate data collection could occur should the project manager be out of office and unable to round with the team. In the absence of the project

manager, a quality specialist will be designated to ensure the integrity of rounding data collected remains intact.

Measures

Catheter-associated urinary tract infection is a complex infection with many process measures that can be tracked. For the purposes of this project, the high impact measures identified during the unit SWOT and Fishbone analyses will be tracked to evaluate project success. The main outcome measures of the project are the number of catheter line days and the CAUTI rate per 1,000-line days. These will be the overall focus of the catheter rounding team.

The two process measures that will evaluate the success of the project's outcome metrics are number of catheters removed during rounds and the percent of patients who have a catheter correctly placed using the bladder scanning protocol (see Appendix M). The balancing measure tracked for the project will be the total number of patient falls. This measure considers potential unintended consequences of the project. It is possible that if the team increasingly removes catheters, patients may try to use the bathroom without assistance, resulting in an increased fall rate. The number of catheter reinsertions will also be monitored, but due to data collection challenges, this will not be reported as a formal process measure.

Ethical Considerations

There have been no ethical issues identified in association with this project. The catheter rounding team was approved by the director of nursing, the physician unit lead, and department leadership. All patient medical information collected will be stored in password-protected and encrypted electronic files. No external financial support has been provided for the basis of this project.

Removing catheters when no longer needed is nursing patient advocacy outlined by the nursing code of ethics (American Nurses Association [ANA], 2016). Provision 4 of the code of ethics for nursing states, “The nurse has authority, accountability and responsibility for nursing practice; makes decisions; and takes action consistent with the obligation to promote health and to provide optimal care” (ANA, 2015, p. 31). The promotion of health in the code of ethics includes removal of unnecessary devices that can cause harm to patients. This ethical code aligns the catheter removal practice with the nursing code of ethics as outlined by the ANA. In addition, this project has been approved as a quality improvement project by faculty using quality improvement review guidelines and does not require IRB approval.

Section IV. Results

After implementing the main intervention of the catheter rounding team, the unit saw an overall decrease in line days by 31.4% from the same period in the previous year (see Appendix N). The actual catheter line days during the project were consistently below the NHSN predicted line days (see Appendix O). In addition to line day reduction, the CAUTI rate per 1,000-line days decreased by 36.4% from the start of the project (see Appendix P). The reduction of both line days and CAUTI rate by greater than 30% is considered successful for this project. The total line day reduction was expected to decrease the CAUTI rate, which was the observed result of this project.

Section V: Discussion

The catheter rounding team was a successful intervention in reducing both line days and CAUTI rates in Department 430. In 2017, the department had seven CAUTIs, which has been significantly reduced to two CAUTIs in 2018. The introduction of the nurse removal guidelines, the retention patient removal guidelines, education on bladder scanning an insertion, and overall increased unit awareness all contributed to an improved state on Department 430. The unit now has processes in place to ensure continued reduction of line days and infection rates, assuming the frontline staff and unit leadership adhere to the introduced improvement state flowchart (see Appendix Q). Daily rounding on catheter patients identified additional issues with CAUTI that were previously unknown to the committee.

Many lessons were learned during this performance improvement project. Frontline staff often do not uniformly receive information regarding CAUTI improvement work. It is crucial to have frontline staff on the CAUTI hospital team. Assistance from the hospital performance improvement (PI) consultants and hospital leadership in coordinating frontline staff involvement in the PI work would have been beneficial to the project. Weekly CAUTI team meetings were crucial in keeping process measure adherence at a unit level. Having an active and motivated physician and unit leadership is central to the success of hospital-based PI projects.

Conclusion

The introduction of the catheter rounding team was successful at decreasing the overall number of line days, as well as reducing the CAUTI rate. The introduction of tools for the frontline staff to utilize when making decisions to contact the physicians regarding line necessity created an increased importance of daily evaluation of catheter necessity. Without FTEs to

continue the rounding team, the unit leadership and physician lead will be crucial in the sustainability of the unit's CAUTI reduction success.

Sustainability of improvement work is always a challenge in the healthcare setting. Unit leadership turnover, new hire frontline staff, and continued physician education are all factors that contribute to a drift in practice. Upon completion of the project, the sustainability plan and stakeholder analysis were reviewed with the rounding team (see Appendix R). The project is expected to continue through the end of 2018 with support from the quality department. The next steps for reducing CAUTI rates is to introduce the tools used in this project to additional hospital units. The spread of the performance improvement work will only be successful with high level leadership oversight. Highly reliable healthcare organizations provide uniform quality care across all hospital units, and spread of this project will align with this mission.

Department 430 is not the only unit with high CAUTI rates. If this project were to be implemented and sustained hospital wide, the long-term implications would result in decreased patient harm, cost savings for the hospital, and potentially greater patient and staff satisfaction. Frontline staff are motivated when they observe their improvement work reducing harm to patients. The impact on nursing practice, as it relates to CAUTI, was directly observed by reduced CAUTI rates on Department 430 post project implementation. Nurses on the unit are more aware of catheter removal and insertion, as well as the importance of reducing CAUTI and avoidable patient harm. As an educator, leader, and patient advocate, introduction of a clinical nurse leader into the microsystem would positively impact the sustainability of the CAUTI reduction improved state.

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Strosahl, J. K. (2014). Using a central line and Foley catheter daily to decrease central-line

associated blood stream and catheter-associated urinary tract infections. *American Journal*

of Infection Control, *42*(6), s48. doi:10.1016/j.ajic.2014.03.125

Yi, S. H., Baggs, J., Gould, C. V., Scott, R. D., & Jernigan, J. A. (2014). Medicare reimbursement

attributable to catheter-associated urinary tract infection in the inpatient setting: A

retrospective cohort analysis. *Medical Care*, *52*(6), 469-478.

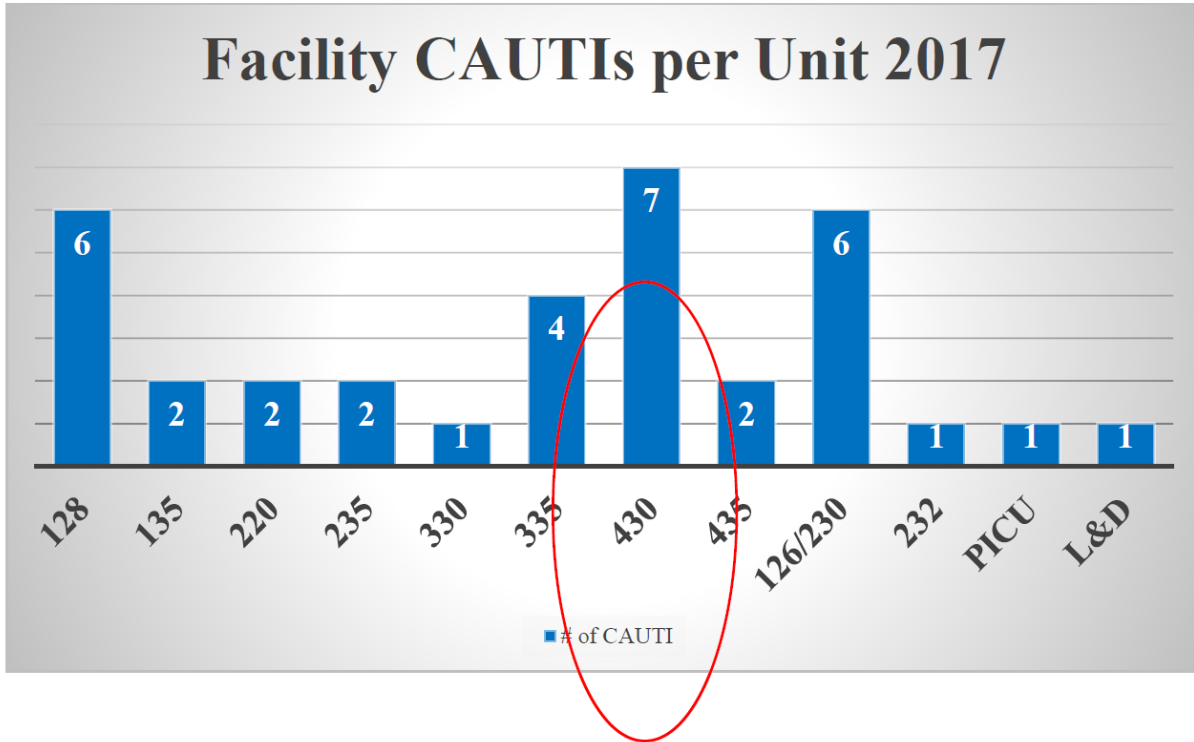
doi:10.1097/MLR.000000000000106

VII. Appendices

Appendix A

CAUTI Rate 2017

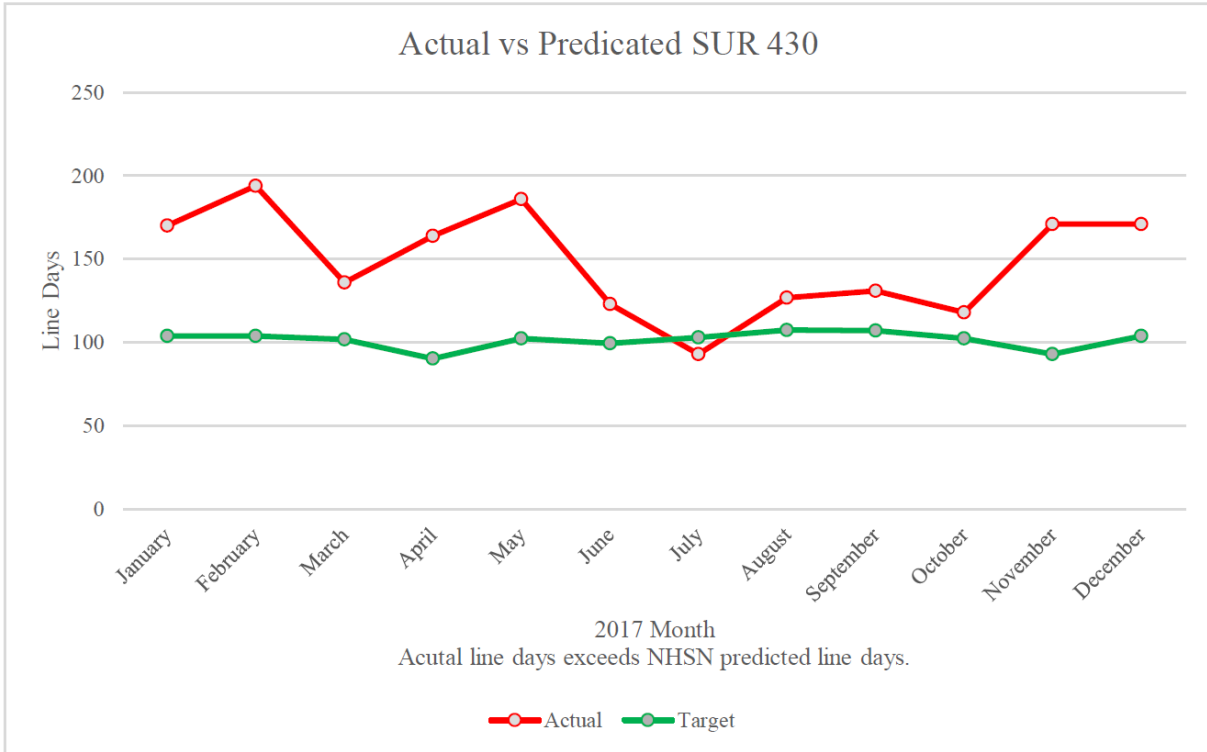
Organizational Internal Quality Data 2017



Appendix B

Department 430 Standardized Utilization Ratio for 2017

Organizational Internal Data, 2017



Appendix C

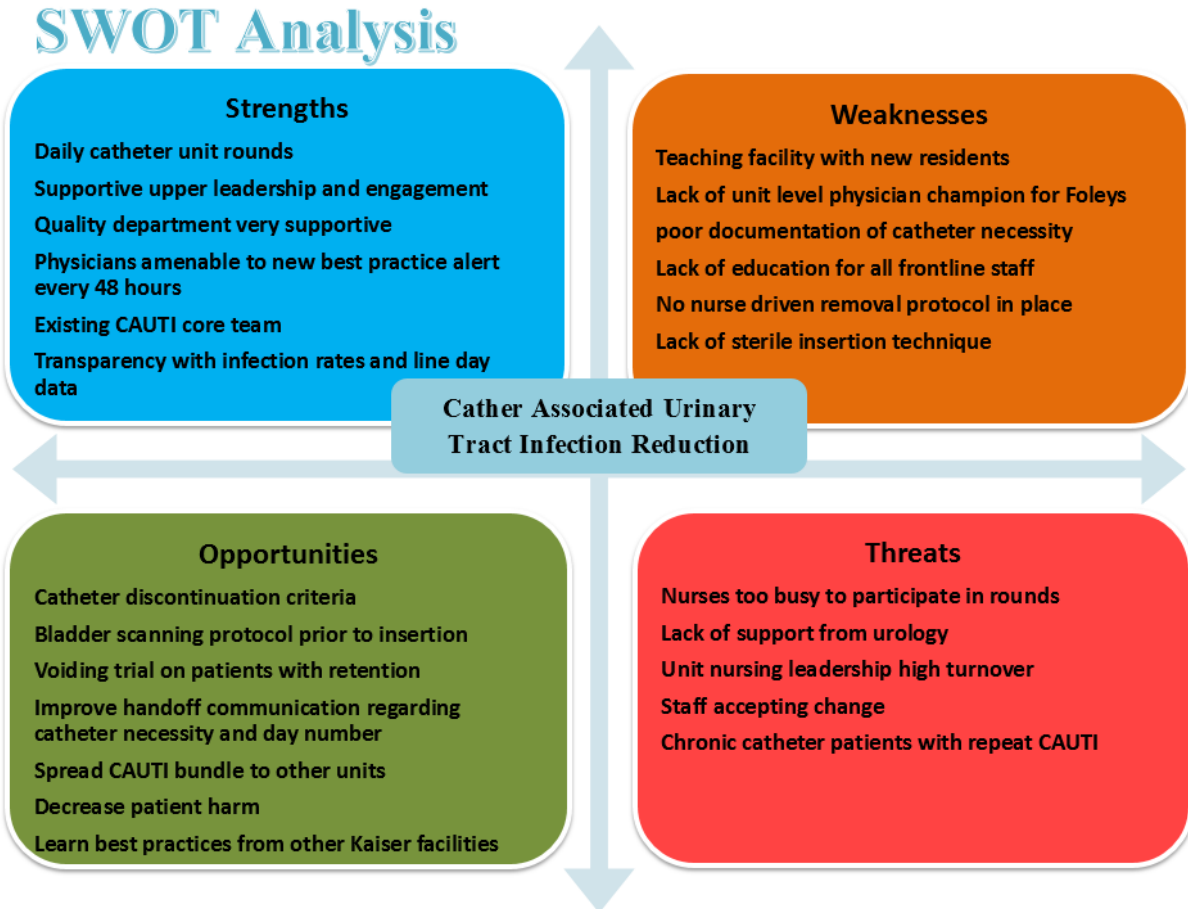
Evaluation Table

Study	Design	Sample	Outcome/Feasibility	Evidence rating
<p>Effectiveness of a Nurse-Led Initiative, Peer-to-Peer Teaching, on Organizational CAUTI Rates and Related Costs</p> <p>Pashnik, B., Creta, A., & Alberti, L. (2017). Effectiveness of a nurse-led initiative, peer-to-peer teaching, on organizational CAUTI rates and related costs. <i>Journal of Nursing Care Quality</i>, 32(4), 324-330.</p>	Quality Improvement Initiative	854 nursing staff	<p>Provides guidelines for staff education and engagement, as well as infection control chart audits</p> <p>Useful for organizations who identified staff education and CAUTI relationship</p>	L V-QI
<p>Avoiding inappropriate urinary catheter use and catheter-associated urinary tract infection (CAUTI): a pre-post control intervention study</p> <p>Parker, V., Giles, M., Graham, L., Suthers, B., Watts, W., O'Brien, T., & Searles, A. (2017). Avoiding inappropriate urinary catheter use and catheter-associated urinary tract infection (CAUTI): A pre-post control intervention study. <i>BMC Health Services Research</i>, 17, 1-9.</p>	Mixed Methods	Exact number not listed	Gives guidelines for appropriateness of urinary catheter usage and removal	L III B Exploratory
<p>Implementation of a Nurse-Driven Protocol to Prevent Catheter-Associated Urinary Tract Infections.</p> <p>Alexaitis, I., & Broome, B. (2014). Implementation of a nurse-driven protocol to prevent catheter-associated urinary tract infections. <i>Journal of Nursing Care Quality</i>, 29(3), 245-252.</p>	Quality Improvement Initiative	183 patients and 107 nurses	<p>Provides evidence for a nurse driven removal protocol</p> <p>Useful for organizations without</p>	L V-QI

<p>Medicare Reimbursement Attributable to Catheter-associated Urinary Tract Infection in the Inpatient Setting: A Retrospective Cohort Analysis.</p> <p>Yi, S. H., Baggs, J., Gould, C. V., Scott 2nd, R., D., & Jernigan, J. A. (2014). Medicare reimbursement attributable to catheter-associated urinary tract infection in the inpatient setting: A retrospective cohort analysis. <i>Medical Care</i>, 52(6), 469-478.</p>	Non-Experimental descriptive design with a retrospective cohort	3923 patients with eligible CAUTI	<p>Reimbursement rates based on CAUTI infection from 2009 data</p> <p>Gives Idea of cost and why Medicare no longer reimburses for HAI</p>	L III
<p>Saving Lives and Reducing Harm: A CAUTI Reduction Program</p> <p>Scanlon, K. A. (2017). Saving lives and reducing harm: A CAUTI reduction program. <i>Nursing Economic\$, 35(3)</i>, 134-141.</p>	Quality Improvement Initiative	None	Nurse driven Foley removal protocol, education on CAUTI prevention to frontline staff	LV
<p>Decreasing Catheter-Associated Urinary Tract Infections in the Neurological Intensive Care Unit: One Unit's Success</p> <p>Richards, B. (2017). Decreasing catheter-associated urinary tract infections in the neurological intensive care unit: One unit's success. <i>Critical Care Nurse</i>, 37(3), 42-49.</p>	Quality Improvement Initiative	Number not listed, but all patients with a Foley in ICU	Chart audits, RCIs for all CAUTI, alternatives to Foley catheters utilized in this study	LV

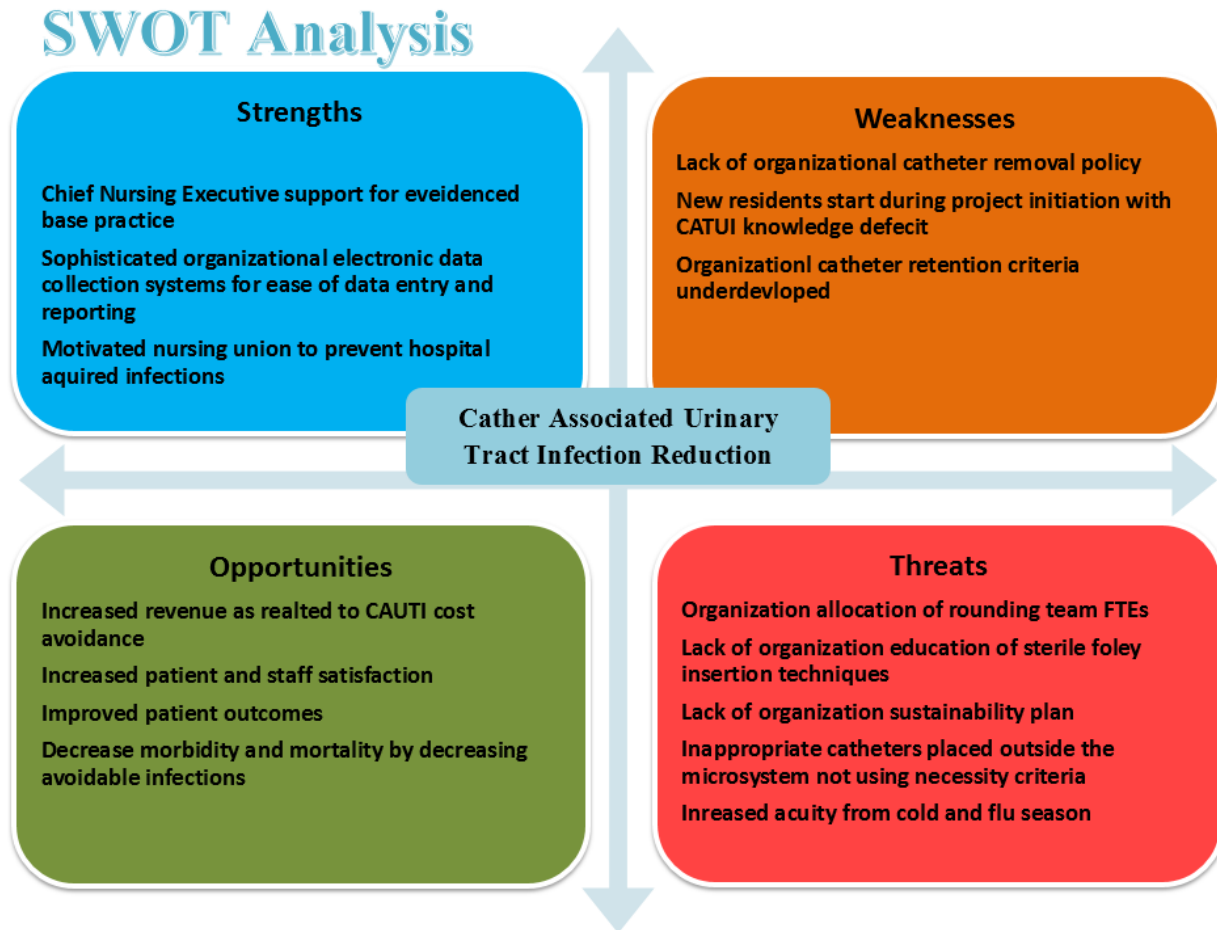
Appendix D

Microsystem SWOT Analysis of Department 430



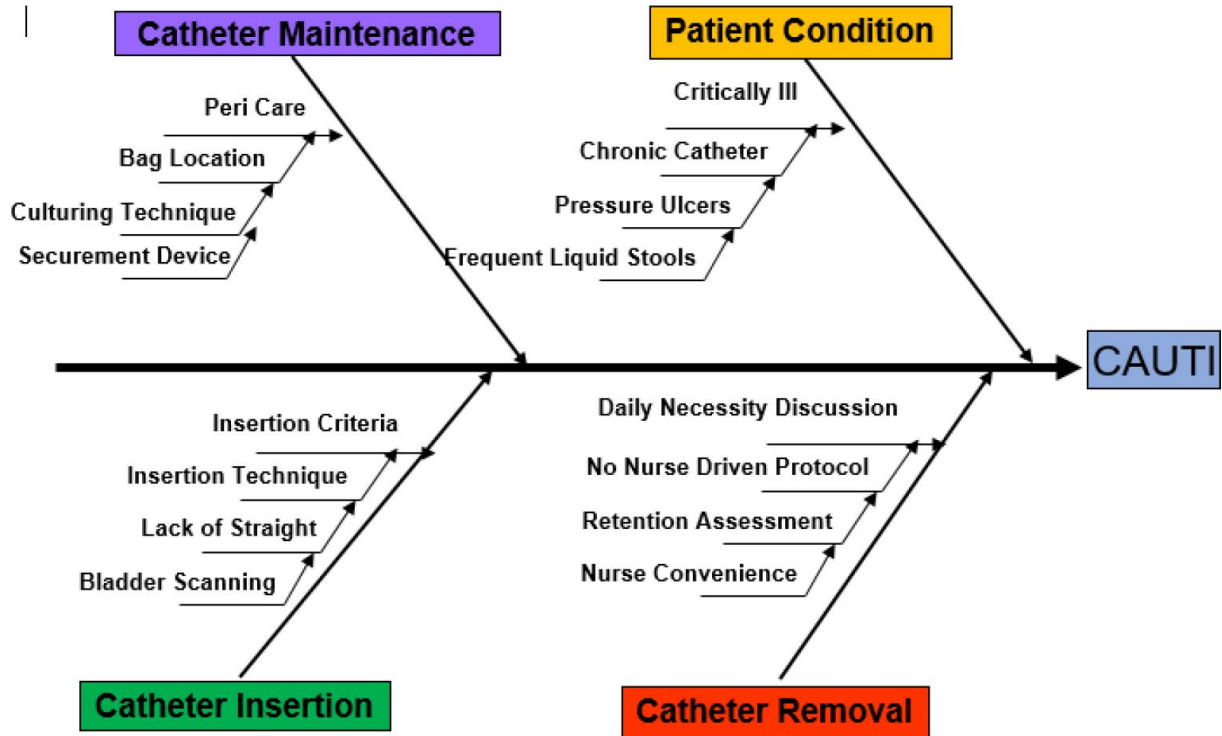
Appendix E

External SWOT Analysis



Appendix F

Fishbone Diagram of Department 430



Appendix G

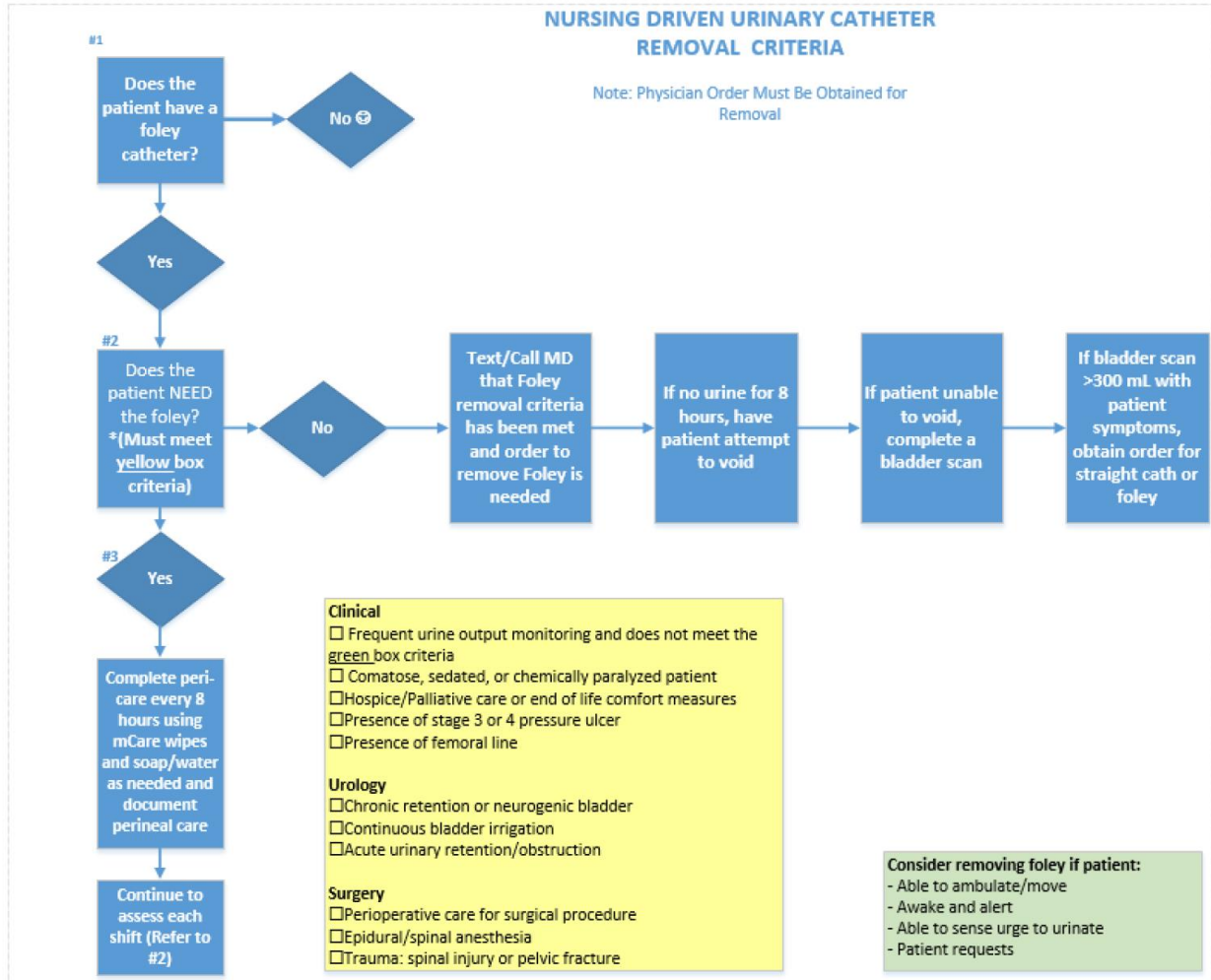
Project Budget

Department 430 CAUTI Project Year 1 Budget

Improvement Costs			
Item	Cost	Quantity	Total
Quality Nursing FTE With Benefits for Daily Rounding	\$210,000 annually for 1.0 FTE	0.1 FTE annually	\$21,000
Average Bedside RN Rate with Benefits	\$91/hour	52 hours annually to attend weekly CAUTI meeting	\$4,732
Office Supplies Cost	\$1,000	4	\$1,000
Total Project Cost Annually:			\$26,372
CAUTI	\$20,000 per infection	Reduction of 2 (30%) annually	(\$40,000)
Cost Avoidance Year One			\$13,628

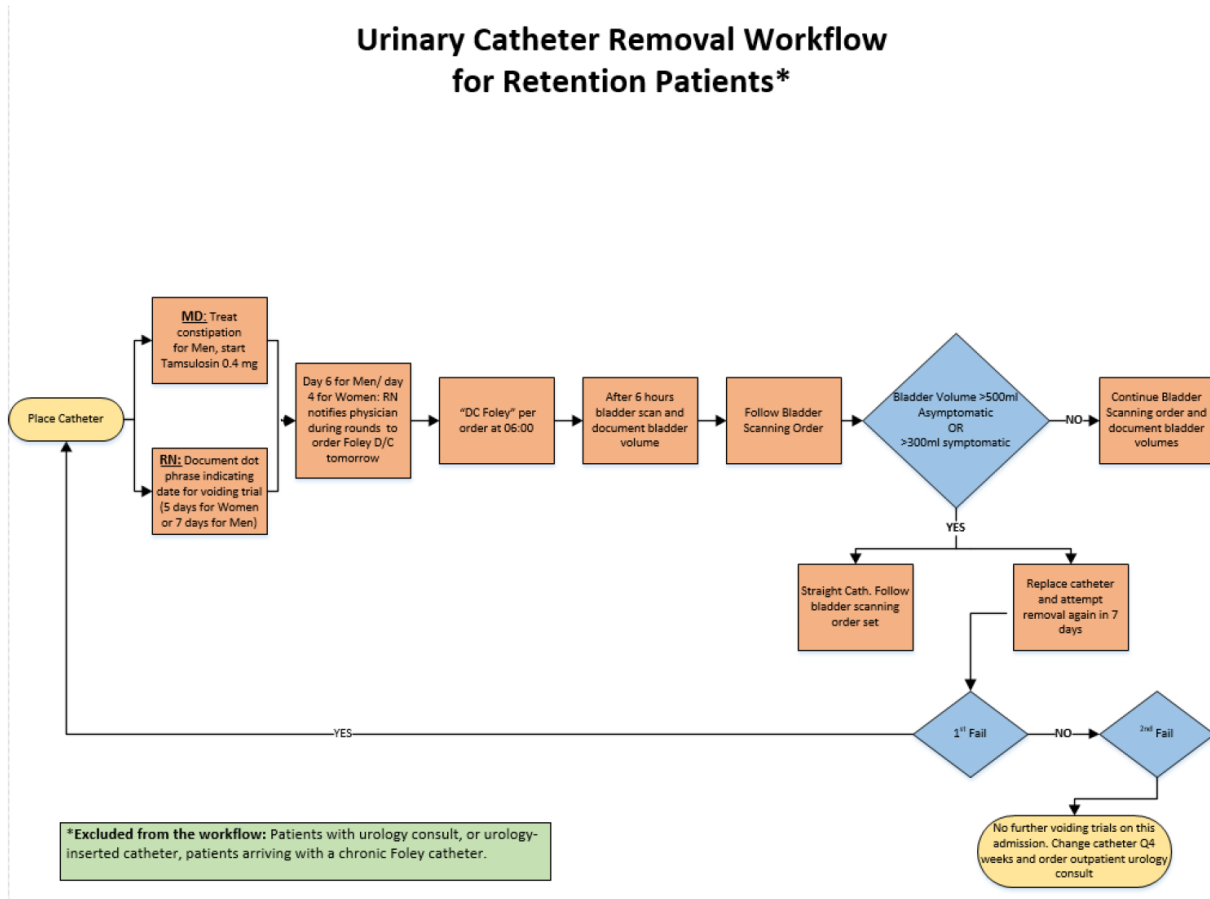
Appendix H

Nurse-Driven Catheter Removal Tool



Appendix I

Catheter Removal Workflow for Retention Patients



Appendix J

Existing Hospital Bladder Scanning Algorithm

For surgical patients, the bladder scan options below apply AFTER the existing catheter has been removed

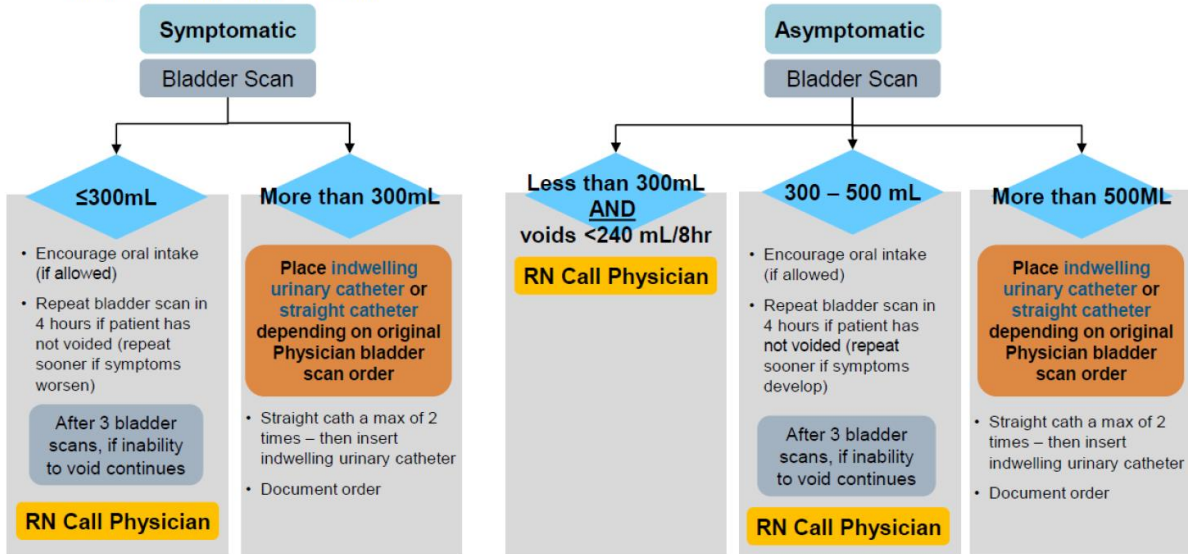
Perform bladder scan if patient has any of the following:

Symptomatic

- Urge to void but unable
- Bladder distention
- Incontinence
- Bladder discomfort and unable to void

Asymptomatic, and:

- Unable to void within 6 hours post catheter removal
- Voids less than 240 ml in past 8 hours



Appendix K

Daily Catheter Rounding Team Electronic Audit Tool

Foley Catheter Rounding... Save

Was the foley inserted appropriately per Bladder Scanning Protocol? *

Yes	No	N/A
-----	----	-----

Was removal decision made during foley catheter rounds? *

Yes	No
-----	----

Comments

Done

Appendix L

Project Measurement Strategy

Data Collection Method: Daily rounding will occur on all catheter patients who are on Department 430. During the rounding, daily line day documentation will be collected. Overall CAUTI rate and line day data will be collected using a monthly report from infection control. Number of falls data will be collected monthly from risk management as a balancing measure.

Data Definitions

Data Element	Definition
CAUTI	Patient infection as a result of a urinary catheter, as outlined by the CDC criteria.
SUR	Standardized utilization ratio. Number. Actual number of line days over the number of predicted.
Bladder Scanning Protocol	The process of scanning a patient's bladder per protocol order and inserting a Foley, if conditions are met (see Appendix A).
Line Day	Aggregate number of catheter in per day.

Measure Description

Measure	Measure Definition	Data Collection Source	Goal
Outcome: Number of CAUTI infections	Number of positive Foley patients with infection based on CDC criteria	NHSN/local infection control	Decrease by 2 per calendar year
Outcome: Line days	Total number of catheters in place during rounds	Health Connect	Decrease by 30%
# of indwelling urinary catheters removed during rounds	Rounding tool	Collected during catheter rounds	Remove 1 per week
Process: % of Foley catheter patients assessed for line removal documented	N = # of Foley patients assessed for removal D = # Total number of Foley patients	Daily Health Connect chart review	100%
Process: % of patients with catheter inserted using the correct protocol process	N = patients with catheter placed by protocol D = correct protocol used for insertion	Manual data extraction from Health Connect	90%

Balancing: Number of falls on Department 430	Total number of falls post project implementation compared to same period in previous year	Risk management report	0% increase from previous year
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Appendix M

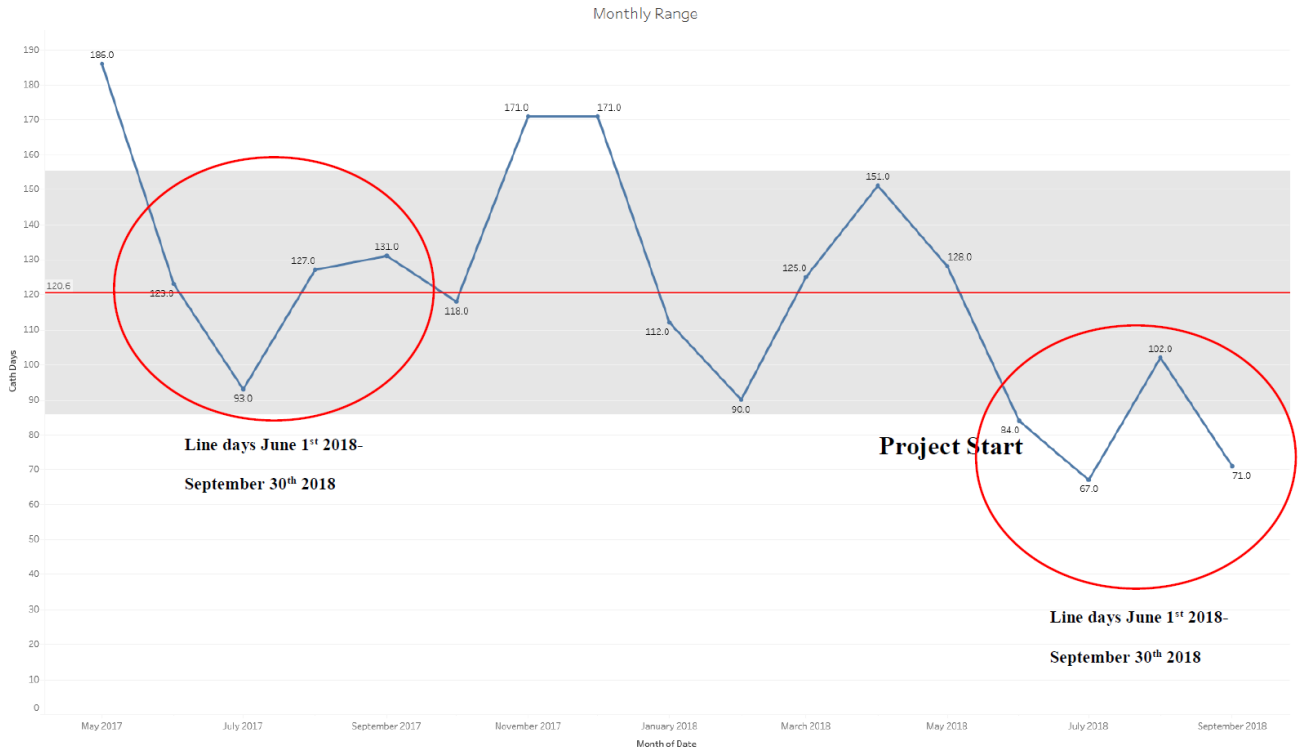
Family of Measures

Measure	Data Source	Target
Outcome		
CAUTI rate per 1,000-line days	Local infection control dept.	Decrease by 30% (2 infections) for performance year 2018
Total number of line days	Local infection control dept.	Decrease by 30%
Process		
# of indwelling urinary catheters removed during rounds	Rounding tool	1 per week
Daily Documentation of Foley Necessity	Nursing Health Connect Documentation Compliance	100%
Patients with Foley inserted using the correct bladder scanning protocol	Health Connect manual data extraction	100%
Balancing		
Number of Falls	Local quality report	0

Appendix N

Department 430 Line Days May 2017 – October 1, 2018

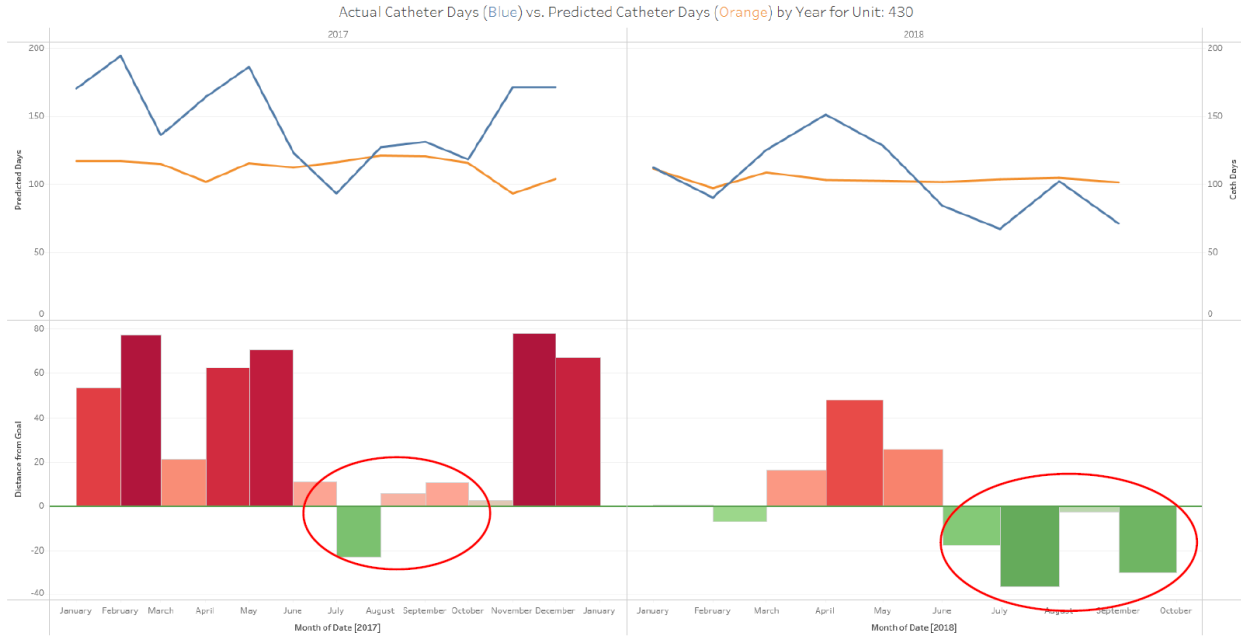
31.4% reduction in aggregate line days June 1, 2018 – September 30, 2018 from same time previous year.



Appendix O

Actual versus Predicted Line Days

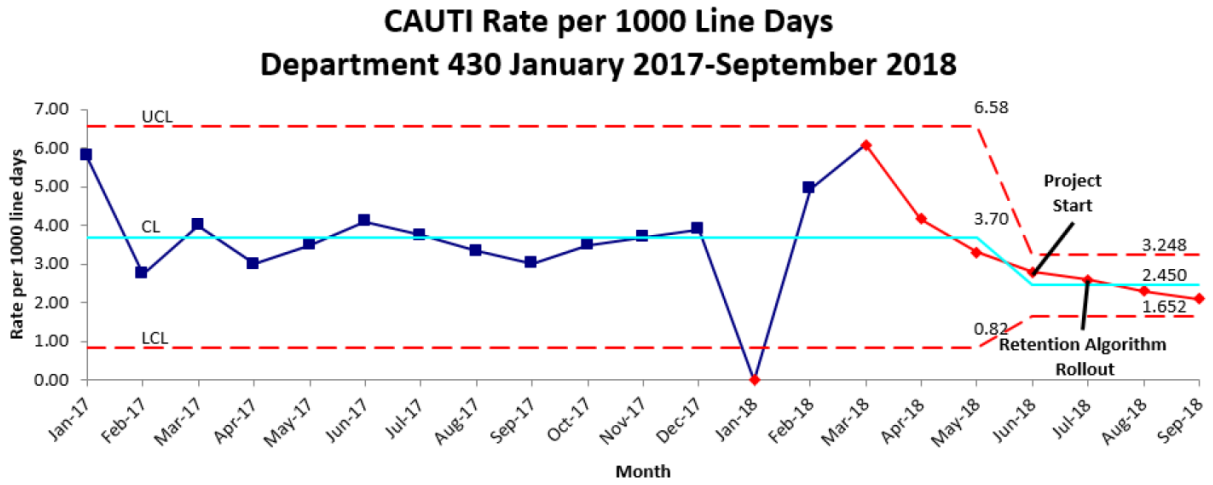
Below predicted line days for entire duration of project when compared to same time in previous year.



Appendix P

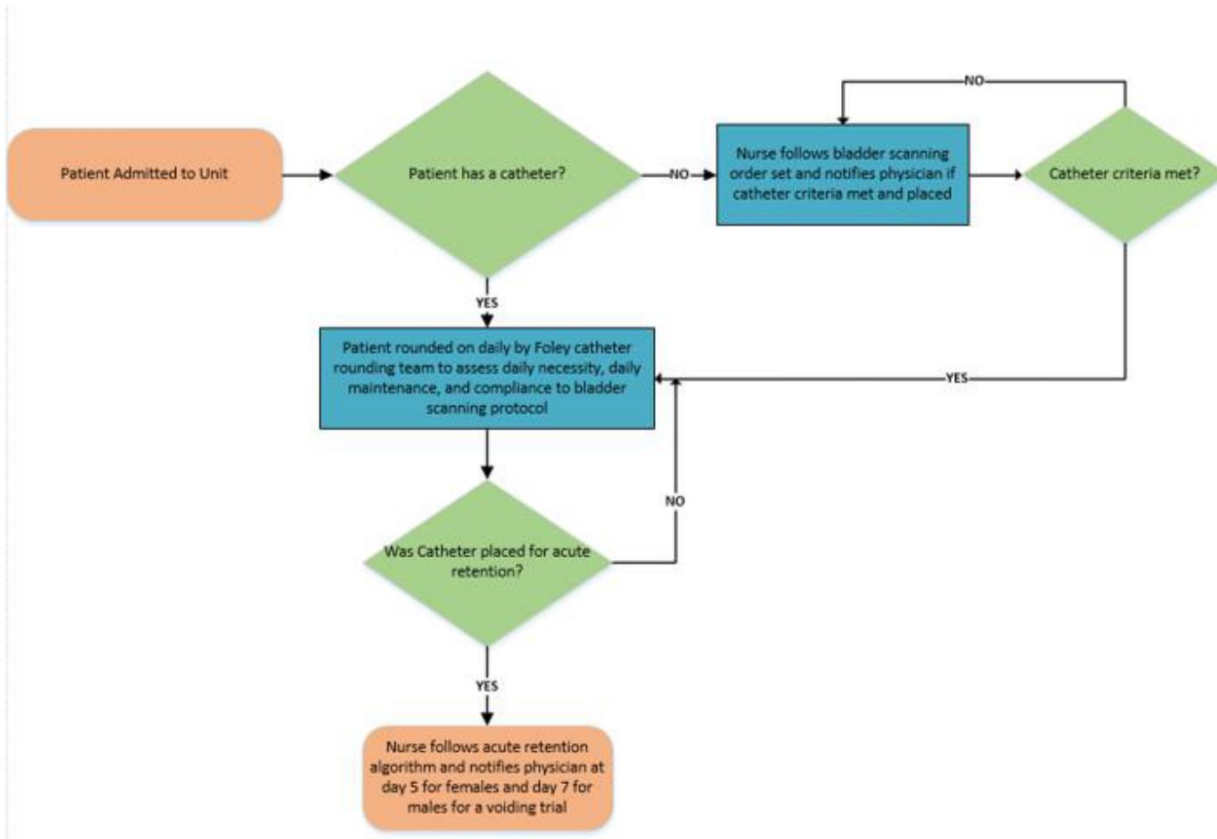
Reduction of CAUTI Rate

Reduction of the CAUTI rate by 35.4% post project implementation.



Appendix Q

Improved State Process Map Department 430



Appendix R

Stakeholder Analysis Department 430

Stakeholder	Objective	Role in the change effort	Degree of Influence	Owner	Change Required / Known Impact	WIIFM / Benefits	Issues / Concerns
Quality RN	Project Lead	Project oversight	High	Self	Project Sustainability	NA	Conflicting job functions
Department Nurse Manager	Facilitation	Facilitate daily rounding, conduct unit based huddles, disseminate information to front line staff	High	Department Manager	Overall Unit Oversight	Consistency with rounding when team is not available, information makes it to staff	Unit manager is off duty weekends and holidays
Department Physician Lead	Clinical Oversight	Conduct daily rounding with department manager, facilitate communication on catheter removal to HBS teams, conduct Foley removal education with physicians	High	Physician Lead	Physician Oversight	Identifies physician level issues and process improvement	One physician lead and does not work 7 days a week
Assistant Department Nurse Manager	Quality Control	Complete daily rounding audits entered into <u>irounds</u>	Medium	Assistant Manager	Frontline oversight and data collection	Ensures audits are completed for trending of success	ANM turnover/conflicting responsibilities
Infection Control RN	Data Compilation	Submits data to NHSN on line days and compiles report for project leader	Medium	Infection Control	Data transparency	Standardized and accurate data collation process	

Appendix S

Project Charter

Project Charter:

Catheter-Associated Urinary Tract Infection Reduction in the Medical-Surgical Unit

Global Aim:

To reduce the CAUTI rate per 1,000 line days by 30% from a baseline rate of 3.3 pre-implementation to 2.3 by 10/1/2018.

Specific Aim:

To develop and implement a nurse-driven indwelling urinary catheter bundle that will reduce the number of catheter line days on Department 430 30% from 474 days to 332 by 10/1/2018.

Background:

Catheter-associated urinary tract infection (CAUTI) is a preventable hospital-acquired infection (HAI) that continues to plague hospitals nationwide. The Centers for Disease Control and Prevention (CDC) estimates that there are more than 13,000 CAUTI related deaths in the United States yearly (Scanlon, 2017). In addition to the harm caused to patients by CAUTI, the more than \$500 million yearly price tag for their treatment has created a financial burden on healthcare systems (Scanlon, 2017). In the medical-surgical microsystem at a Santa Clara Medical Center, the harmful effects of CAUTI have been observed by this author. Implementation of a CAUTI bundle in the medical-surgical microsystem is expected to decrease rate of CAUTI. A decrease in CAUTI is expected to achieve a cost avoidance for the facility by decreasing in the average length of stay and eliminate the estimated \$21,368 per infection treatment cost for CAUTI patients (CDC, 2014).

CAUTI is a complex infection that has many moving pieces of data that are useful when tracked. At the medical center, the number of Foley line days per unit, the standardized infection ratio (SIR), and total number of CAUTI infections per unit are tracked monthly. Evidenced-based practice has shown that a decrease in Foley catheter line days directly correlates with a decreased number of CAUTIs (Strosahl, 2014). Unit level awareness of Foley line necessity triggers staff to critically assess whether the catheter is necessary.

The Department 430 medical neurology unit at a Santa Clara Medical Center is an inpatient hospital unit that provides care to a diverse patient population. The unit is formerly designated as a neurology unit, but the beds are regularly occupied by patients from every medical service. The unit strives to meet the needs of patients with chronic conditions requiring longer than average hospital stays. A microsystem assessment of Department 430 was conducted using the Dartmouth Microsystem Assessment Tool (Dartmouth, 2005). The microsystem assessment revealed that CAUTI is one of the metrics that matter in which the department is striving to improve.

As an integrated delivery system in northern California, generates regional oversight for local metrics that matter for each of its medical center. Hospital-acquired infection rates are metrics that are tracked within the 430 microsystems and reported out monthly. In the 2018 fiscal year, which runs from October 2017 through September 2018, Department 430 had seven CAUTI infections. This infection rate has raised concerns by hospital leaders.

Sponsors:

Director of Medical-Surgical Nursing	Elaine Ware
Chief Nursing Executive	Lori Armstrong
Quality and Risk Management Director	Asia Plahar

Goals:

The reduction of CAUTI reduces avoidable harm to patients and decreases the financial implications associated with infection treatment. In addition to decreasing the avoidable harm to patients by reducing the overall incidence of CAUTI, the interventions that support the CAUTI reduction bundle involve:

1. Increased awareness and daily discussion of Foley catheter necessity within the multidisciplinary team.
2. Development of components of a nurse-driven urinary catheter removal bundle.
3. Implementation and education on a nurse-driven bladder scanning protocol to reduce unnecessary Foley placement.
4. Implementation of a standardized CAUTI drilldown tool after each CAUTI to promote learnings.

Measures:

Measure	Data Source	Target
Outcome		
Total number of CAUTI per 1,000 line days	Local infection control dept.	Decrease by 30% (2 infections) performance year 2018
Total number of line days	Local infection control dept.	Decrease by 30%
Process		
# of indwelling urinary catheters removed during rounds	Rounding tool	1 per week
Daily Documentation of Foley Necessity	Nursing Health Connect compliance	100%
Patients with Foley inserted using the correct bladder scanning protocol	Health Connect manual data extraction	100%
Balancing		
Number of Falls	Local quality report	0

Working Team:

MD Co lead	
Unit Nurse Manager	EC
Assistant Nurse Manager	EG
Nurse Educator	KF
Staff nurse champions	Frontline team

Consulting Team:

Infection Control	EM
Quality Specialist	SK
Quality Lead	AG
CAUTI Team	Core members

References

- American Association of Colleges of Nursing. (2007). *AACN white paper on the education and role of the clinical nurse leader*. Retrieved from <http://aacn.nche.edu/publications/whitepapers/clinicalnurseleader>
- Centers for Disease Control and Prevention. (2014). *Hospital acquired infections data and statistics*. Retrieved from <https://www.cdc.gov/hai/surveillance/index.html>
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Appendix S Appendices

Appendix A

Measurement Strategy

Background (Global Aim): To develop and implement a daily urinary catheter rounding team bundle that will reduce the overall incidence of catheter-associated urinary tract infections (CAUTI).

Population Criteria: All patients admitted to Department 430

Data Collection Method: Daily rounding will occur on all catheter patients on Department 430. During the rounding, daily line day documentation will be collected. Overall CAUTI rate and line day data will be collected using a monthly report from infection control. Fall data will be collected monthly from risk management.

Data Definitions

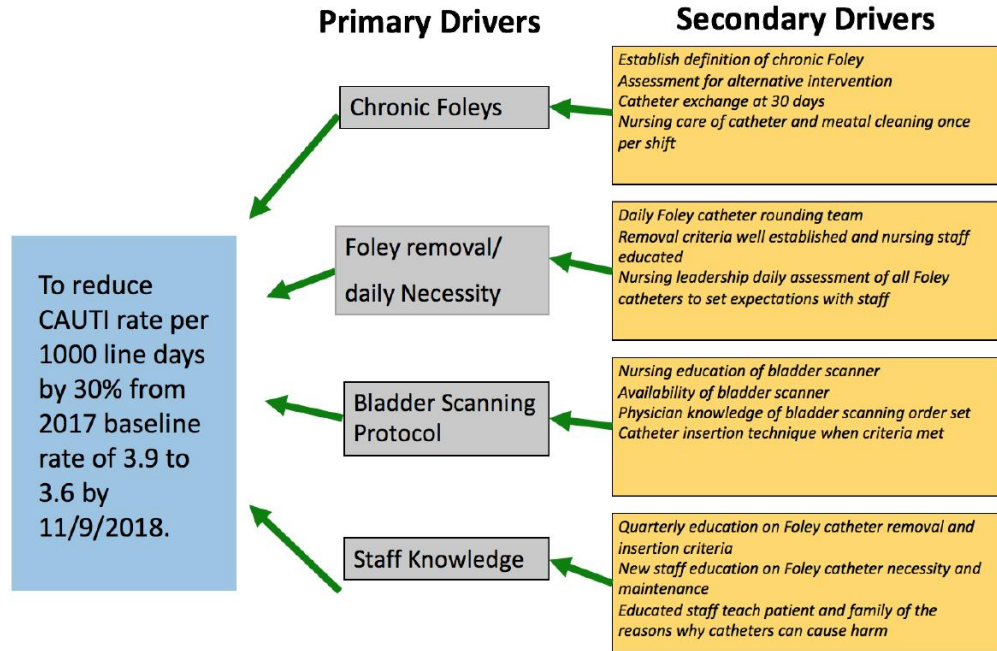
Data Element	Definition
CAUTI	Patient infection as a result of a urinary catheter as outlined by the CDC criteria.
SUR	Standardized Utilization Ratio. Number. Actual number of line days over the number of predicted.
SIR	Standardized Infection Ratio. Number of actual CAUTI infections over number predicted.
Bladder Scanning Protocol	The process of scanning a patient's bladder per protocol order, and inserting a Foley if conditions are met (see Appendix A).

Measure Description

Measure	Measure Definition	Data Collection Source	Goal
Foley Rounding Team	Team comprised of project lead, unit physician lead, unit manager	Daily rounds entered into iRounding tool	100% compliance on all catheter patients
Catheter Line Days	Aggregate number of total unit catheter line days	Health Connect	Decrease by 30%
% of Foley catheter patients assessed for line removal documented	N = # of Foley patients assessed for removal D = # Total number of Foley patients	Daily Health Connect Chart review	100%
% of patients whose catheter was inserted using the correct protocol	N = patients with catheter D = correct protocol used for insertion	Manual Data Extraction from Health Connect	100%
Number of falls on Department 430	Total number of falls post project implementation compared to previous year	Risk Management report	0% increase

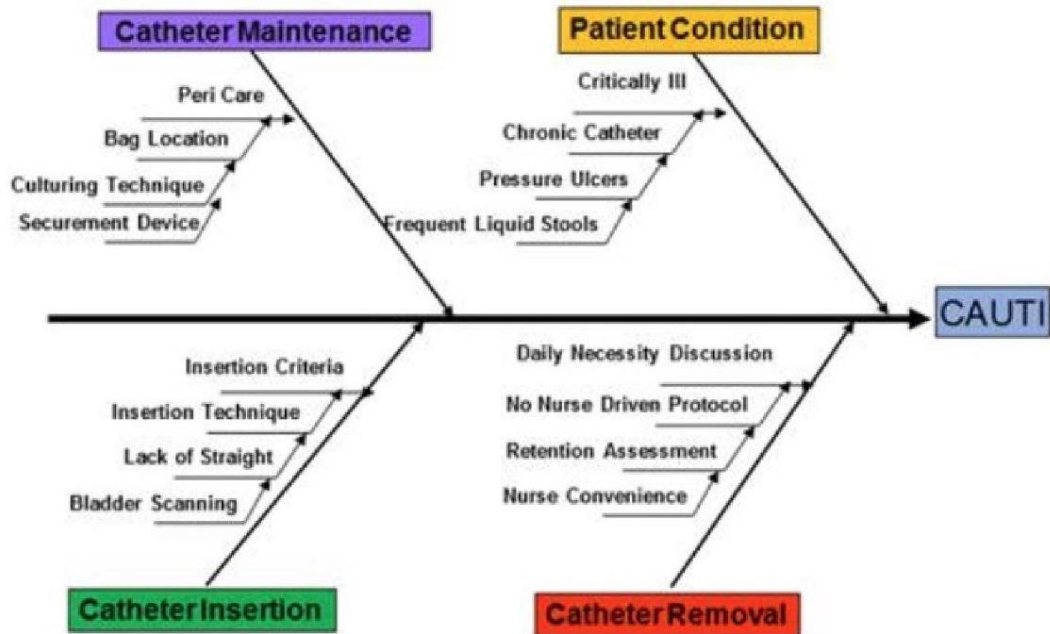
Appendix B

Driver Diagram



Appendix C

Fishbone Diagram



Appendix D

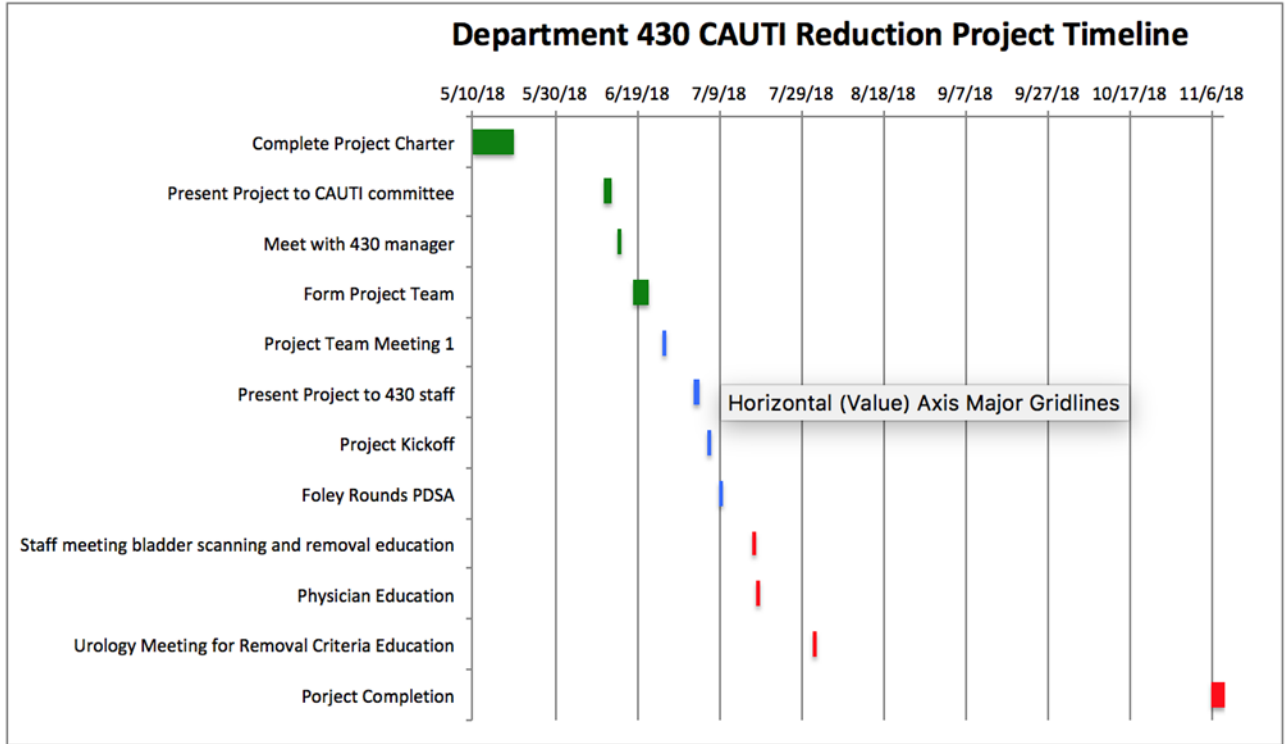
Tests of Change

Decreasing the total number of CAUTI infections on a hospital unit is dependent on several factors. Prevention of CAUTI is most effective when Foley catheters are not placed. According to evidenced-based literature, if a Foley must be present, the most effective way to prevent infections is early removal of the catheter (Strosahl, 2014). Lack of a standardized process for determining when a Foley should be placed and guidance on when a Foley should be removed are two of the main process measures this project will track. The tracking will be made possible through the assembly of a Foley catheter rounding team that will round daily on each Foley patient on Department 430.

In addition to Foley removal and placement, inappropriate culturing of patients can lead to positive culture results without active CAUTI infections. Ensuring the appropriateness of urine culturing using the correct urine culture order can help to eliminate unnecessary testing of patients without clinical signs of infection.

Appendix E

Project Timeline



Appendix F

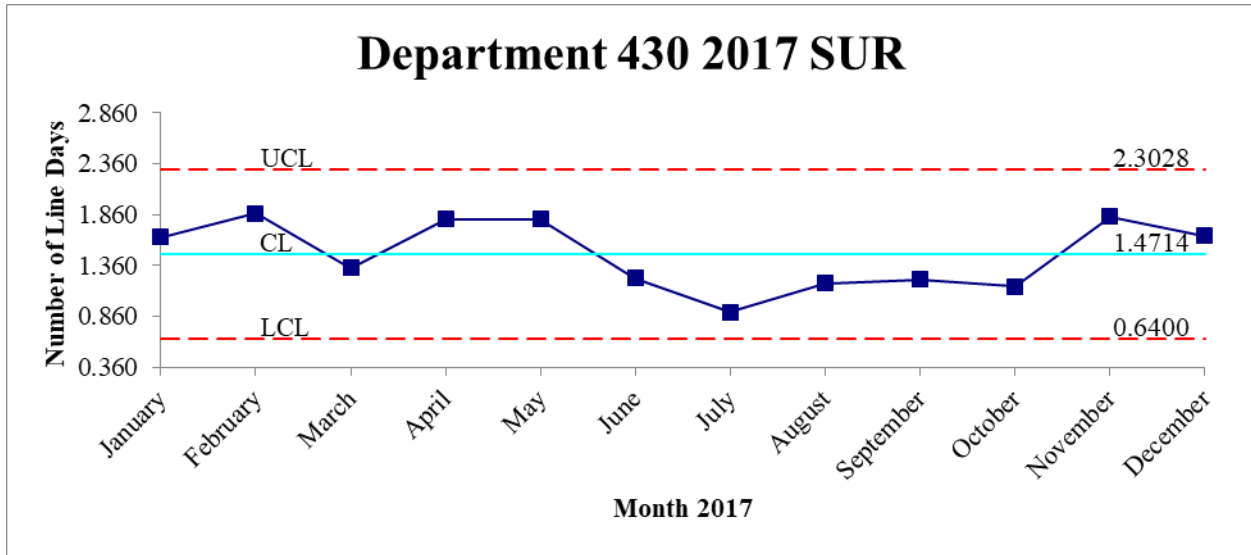
CNL Competencies

The CNL works from within the microsystem to improve patient outcomes using evidenced-based practice. Functioning in the roles of a CNL, as outlined by the American Association of Colleges of Nursing (AACN, 2007), will be the primary function of this author. For the scope of this project, the CNL within the medical-surgical microsystem will function in the roles of team manager, outcomes manager, educator, and patient advocate. The activities related to each of these roles include the following:

- Improving patient outcomes by leading the performance improvement project from within the microsystem.
- Educating frontline nurses and physicians on the importance of improving patient outcomes and care.
- Monitoring the success of the improvement project from within the microsystem and implementing the model for improvement strategies, as outlined by the Institutes for Healthcare Improvement.
- Maintaining the safety of patients within the microsystem by advocating frontline adherence to policies and procedures, as outlined by the intuition.

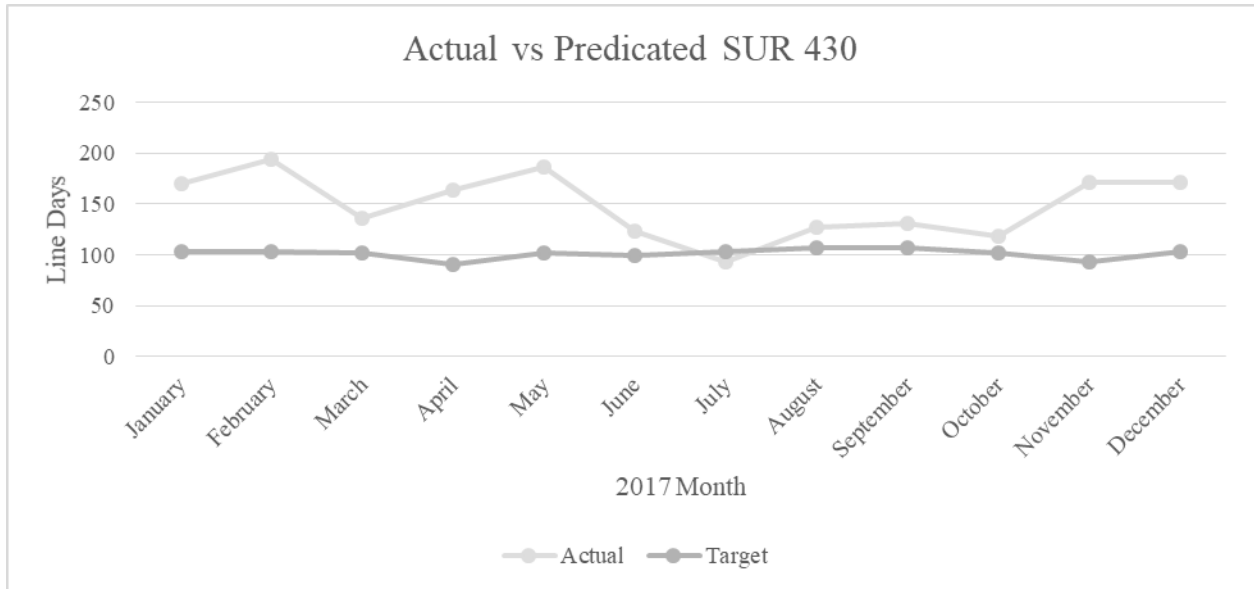
Appendix G

2017 Department 430 Standardized Utilization Ratio from Infection Control (2017)



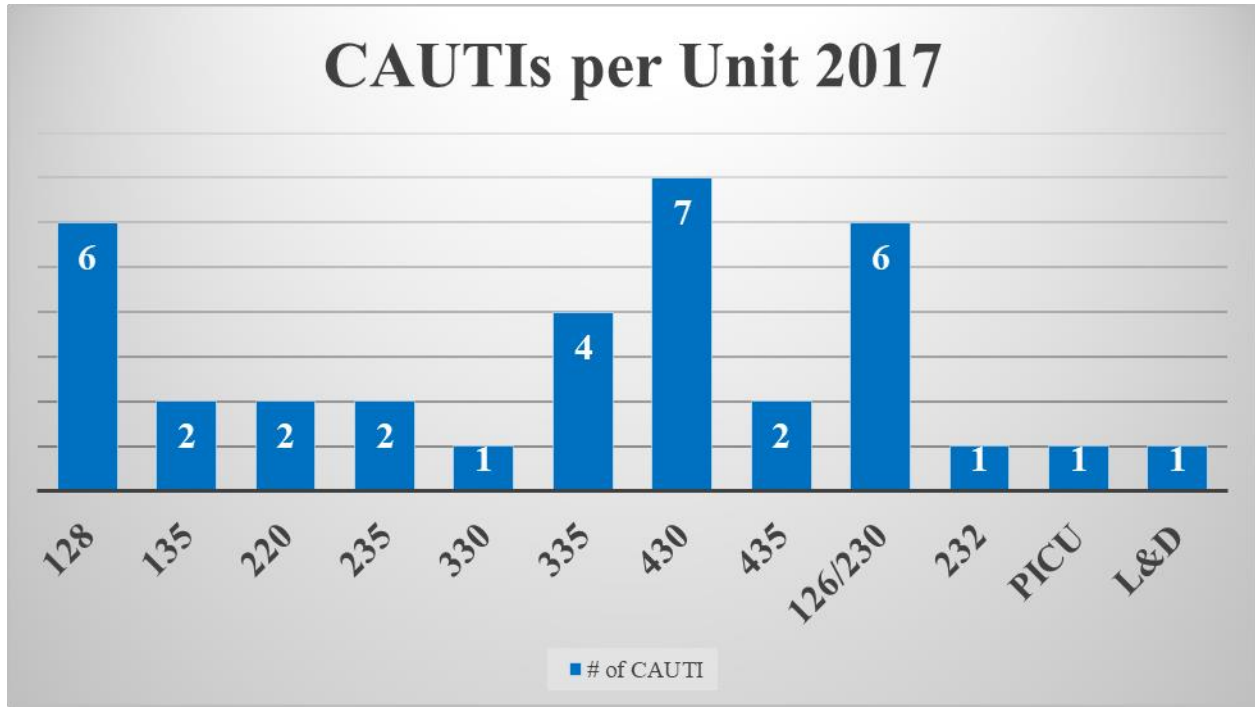
Appendix H

2017 Department 430 Actual Versus Predicted Number of Line Days from Infection Control



Appendix I

2017 Total Number of CAUTI Medical Center from Local Infection Control



Appendix J

Statement of Non-Research Determination Form

**CNL Project: Statement of Non-Research Determination Form****Student Name: Wallace Kramm****Title of Project:**

Catheter Associated Urinary Tract Infection Prevention in the Medical Surgical Unit

Brief Description of Project:

To develop and implement a nurse driven indwelling urinary catheter bundle that will reduce the overall incidence of catheter associated urinary tract infections.

A) Aim Statement:

To decrease the overall CAUTI rate on the medical surgical telemetry unit by 30% by December 31st, 2018.

B) Description of Intervention:

An indwelling urinary catheter rounding group will be developed to round daily on all catheters in the specified unit. A nurse driven removal and placement tool will be created to streamline the care of indwelling catheters.

C) How will this intervention change practice?

Providing the frontline nursing staff, the autonomy to place and remove catheters when specified criteria are met will lead to the reduction in catheter line days. With a decrease in line days the associated CAUTI rate should also decrease.

D) Outcome measurements:

Outcome: Days between CAUTI infection (total infections)

Process: Measurement of line days

Balancing: Reinsertion rate of removed catheters



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To qualify as an Evidence-based Change in Practice Project, rather than a Research Project, the criteria outlined in federal guidelines will be used:
(<http://answers.hhs.gov/ohrp/categories/1569>)

This project meets the guidelines for an Evidence-based Change in Practice Project as outlined in the Project Checklist (attached). Student may proceed with implementation.

This project involves research with human subjects and must be submitted for IRB approval before project activity can commence.

Comments:

EVIDENCE-BASED CHANGE OF PRACTICE PROJECT CHECKLIST *

Instructions: Answer YES or NO to each of the following statements:

Project Title:	YES	NO
The aim of the project is to improve the process or delivery of care with established/ accepted standards, or to implement evidence-based change. There is no intention of using the data for research purposes.	x	
The specific aim is to improve performance on a specific service or program and is a part of usual care. ALL participants will receive standard of care.	x	
The project is NOT designed to follow a research design, e.g., hypothesis testing or group comparison, randomization, control groups, prospective comparison groups, cross-sectional, case control). The project does NOT follow a protocol that overrides clinical decision-making.	x	
The project involves implementation of established and tested quality standards and/or systematic monitoring, assessment or evaluation of the organization to ensure that existing quality standards are being met. The project does NOT develop paradigms or untested methods or new untested standards.	x	
The project involves implementation of care practices and interventions that are consensus-based or evidence-based. The project does NOT seek to test an intervention that is beyond current science and experience.	x	
The project is conducted by staff where the project will take place and involves staff who are working at an agency that has an agreement with USF SONHP.	x	
The project has NO funding from federal agencies or research-focused organizations and is not receiving funding for implementation research.	x	
The agency or clinical practice unit agrees that this is a project that will be implemented to improve the process or delivery of care, i.e., not a personal research project that is dependent upon the voluntary participation of colleagues, students and/ or patients.	x	
If there is an intent to, or possibility of publishing your work, you and supervising faculty and the agency oversight committee are comfortable with the following statement in your methods section: "This project was undertaken as an Evidence-based change of practice project at X hospital or agency and as such was not	x	



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formally supervised by the Institutional Review Board."

ANSWER KEY: If the answer to **ALL** of these items is yes, the project can be considered an Evidence-based activity that does **NOT** meet the definition of research. **IRB review is not required. Keep a copy of this checklist in your files.** If the answer to **ANY** of these questions is **NO**, you must submit for IRB approval.

*Adapted with permission of Elizabeth L. Hohmann, MD, Director and Chair, Partners Human Research Committee, Partners Health System, Boston, MA.

STUDENT NAME (Please print):

WAGLE KRAMM

Signature of Student:

[Handwritten Signature]

DATE 5-25-2018

SUPERVISING FACULTY MEMBER NAME (Please print):

Signature of Supervising Faculty Member

DATE 5-25-2018