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Data Quality: Integral to CAUTI Surveillance and Improvement in Non-Critical Care Units

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Abstract

Background: Urinary tract infections (UTIs) are the most common type of healthcare-acquired infection (HAI), with 75% approximately associated with urinary catheter use. The key to preventing UTIs is to avoid the use of indwelling urinary catheters (IUCs). This study explores denominator data extract logic modifications to increase IUC data capture and accuracy. It is set in a 249-bed acute care, teaching hospital in the Diablo Service Area in Northern California.

Problem: The electronic system used to extract the CAUTI denominator data is inconsistently capturing the IUC device days from the electronic medical record (EMR). This has regulatory reporting ramifications and negatively impacts CAUTI metrics, specifically the Standardized Infection Ratio (SIR) and the Urinary Catheter Standardized Utilization Ratio (SUR).

Interventions: Enhancing the Infoview Foley Days report aims to maximize device capture and increase data accuracy. The three-pronged approach involves modifying the extract logic to focus on individual inpatient encounters, applying inpatient admission status as the date of admission, and modifying the data extract time.

Outcome Measures: Two hundred forty Infoview cases validated against the EMR from January to June 2023 yielded 100% data capture and accuracy, exceeding intervention targets.

Results: Data extract logic modification using the set criteria and applying additional exclusion criteria improved the CAUTI denominator data quality by 40%.

Conclusion: Infoview modification increased the data quality for CAUTI surveillance and reporting, also improving the CAUTI SUR. The improved SUR is utilized as an adjunct to the CAUTI SIR for tailored data-driven infection prevention initiatives. The project's success led to the implementation of the revised logic across the Northern California hospital system and will be rolled out as the enterprise-wide model for standardized CAUTI denominator data extract.

Keywords*:* accuracy, data quality, urinary catheter, denominator data, infection prevention, CAUTI SIR, CAUTI SUR.

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Urinary tract infections (UTIs) rank as the third most common type of healthcare-acquired infection (HAI) reported to the National Healthcare Safety Network (NHSN) (Leaptrot, 2023). Between 12% to 16% of hospitalized adult patients receive an indwelling urinary catheter (IUC) during their hospital stay leading to a 3% to 7% increased risk for developing a catheter-associated urinary tract infection (CAUTI) (CDC, 2021). Approximately 75% of CAUTIs lead to complications (e.g., bacteremia, endocarditis, vertebral osteomyelitis) accounting for over 13,000 US deaths annually (CDC, 2015a; CDC, 2021).

The key to preventing UTIs is to avoid the use of IUCs. Clinical indications must be defined to avoid unnecessary use, and prompt removal of IUCs is recommended if used (CDC, 2015b). Surveillance is critical to preventing HAIs like CAUTIs. Similarly, adherence to surveillance protocols and data reporting requirements are important for accurate and meaningful data. Finally, data quality impacts microsystems' CAUTI metrics (Standardized Infection Ratio (SIR) and Urinary Catheter Standardized Utilization Ratio (SUR)) (CDC, 2021).

This project is geared towards the improvement of CAUTI denominator data used for CAUTI prevention and public reporting. The MSN candidate—a Quality Nurse Consultant responsible for HAI surveillance, data analysis, and reporting—chose non-critical care units due to the number of reported CAUTI events in 2022. It is therefore vital that the Clinical Nurse Leader (CNL) further investigate the underlying causes and contributing factors influencing high CAUTI SIR and device SUR. The precision in calculating the denominator data is imperative because of California's mandated public reporting, hospital performance comparisons, and data-driven infection prevention efforts.

The CNL will champion transformational leadership to motivate key stakeholders in prioritizing the urgent need to modify the data extract logic. The CNL will also empower stakeholders to participate in solution implementation for data quality improvement. See Appendix A.

Problem Description

The existing Infoview Foley Catheter Days report is utilized for the daily abstraction of urinary catheter device days. A retrospective Infoview report review revealed data capture inconsistencies that may primarily be attributed to (a) multiple Epic Health Connect system upgrades, (b) outdated denominator data extract logic, and (c) inaccurate documentation of IUCs in the lines, drains, and airways (LDA) flowsheet section of the electronic medical record (EMR) by frontline staff. Furthermore, this review uncovered additional issues: a) device data extract logic abstracts the denominator data across patient encounters; b) applies the date and time of emergency department (ED) encounter as the patient admission date and time; c) device data extract logic begins calculating the device days upon ED encounter if old IUC is present or inserted in the ED; and d) the current 23:00 hour cap excludes IUCs that are partially present on a given day (CDC, 2021). Furthermore, data analysis showed that the logic capture had 60% accuracy over a seven-day period. The 2022 CAUTI SIR of 1.11 is above the 0.70 target, while the urinary catheter SUR of 0.93 is below the target of 1. However, this may inaccurately represent the microsystem's status due to now known incomplete and/or inaccurate data reported to NHSN (NHSN, 2022). See Appendix B.

This quality improvement project is implemented in non-critical care units of a California-based acute care facility in the Diablo Service Area. Highly reliable organizations such as this hospital implements evidence-based practices in providing patient-centered care.

Moreover, the organization continually seeks opportunities to improve quality and patient safety and this project will significantly influence the targeted and data-driven infection surveillance and prevention initiatives. This project also supports the organization's mission to provide high quality but affordable care to members and communities.

Available Knowledge

The internet-based search was based on the PICOT question: How will modifying the urinary catheter device days data extract logic (I) improve data capture by 20% (O) in Non-Critical Care units (P) by July 31, 2023 (T). A key term search in PubMed and CINAHL (*accuracy, data quality, urinary catheter, denominator data, infection prevention, CAUTI SIR, CAUTI SUR, NHSN, AHRQ, CMS, Medicare, Medicaid, mandate*) discerned relevant studies to the research question. Article screening involved a review of the title, research design, methodology, and conclusion. The top five resources addressing denominator data quality and implications to clinical practice, CAUTI SIR, and urinary device SUR were selected. Although the project does not involve clinical experimentation, HIPAA compliance must be maintained. It is important because reports and data validation involve personal identifying information and protected health information (PII/PHI). The Johns Hopkins Nursing Evidence-Based (JHNEBP) appraisal tool was utilized to rate the selected articles (Dang, et al., 2021). See Appendix C for evidence table.

Donnelly et al., (2021) conducted a retrospective review of IUC in a quaternary hospital. The study determined that modifying the manual device days count from midnight to 11:00 hours produced a 50% increase in denominator data, consequently decreasing the CAUTI rate by 33.6%. While the authors found that this data capture resulted in the facility's highest yield, the optimal time for denominator data capture varies between facilities since NHSN does not firmly

specify the time for device count. The use of IUCs peri-operatively was mentioned however, the authors failed to indicate the patient volume undergoing ambulatory surgery. Such data is useful in determining outcomes since outpatient denominators are to be excluded from inpatient surveillance. The authors also acknowledged EMR reliance where end-user documentation accuracy influences the denominator data. This study is useful in determining a specific time of day for optimizing denominator data capture. This evidence has been rated V B.

A study conducted by Muthee et al., (2018) demonstrated that data accuracy, completeness, consistency, and reliability influence the integrity of data analysis. The study also showed that Routine Data Quality Assessment (RDQA) improved data harmony. The cross-sectional study was performed across 53 healthcare facilities in Kenya (n=27 hospitals, n=18 health centers) over pre- and post-intervention period focused on data completeness and accuracy. The authors also outlined the inclusion and exclusion criteria for facility selection. The authors reviewed 2,369 records from baseline and 2,355 records from follow-up RDQA. A total of 25 data elements were selected for validation between paper charting and EMR with noted increased data harmony in 20 out of 25 elements. The results are statistically significant, suggesting that repeated RDQA enhances data quality improvement, which supports the recommendation for routine Infoview report validation especially with EMR upgrades. The authors outlined several study limitations; therefore, it is rated a level III B.

Fakih et al. (2019) suggest that CAUTI SIR is a useful metric to address the overall infection risk or harm to a patient population, microsystem, and facility wide. The study showed that SIR can be supplemented by the urinary catheter SIR to reduce device utilization and efforts to prevent CAUTI events in a microsystem or healthcare organization. The study demonstrated that the CAUTI denominator data influences the predicted number of CAUTI events and the

predicted number of urinary catheter device days. The Cumulative Attributable Differences (CAD) can also be utilized to set the target and achieve a CAUTI reduction goal. This study supports the significance of updating the data extract logic to improve CAUTI metrics and prevention efforts. This study is rated level III A.

The final two pieces of evidence are NHSN clinical practice guidelines outlining the CAUTI denominator data reporting requirements and instructions, as well as the step-by-step process and template for data validation. The only caveat for these guidelines is the lack of recommended optimal time for data abstraction. These guidelines were rated as IV A.

The body of evidence found outlines the denominator data collection and validation process, supports the importance of routine data quality check and analysis, stresses the relevance of selecting the optimum time for data capture. These articles also align with the CNL's recommendation to modify the Infoview report.

Rationale

The Diffusion of Innovation (DOI) Theory is a theoretical framework illustrating the progression for which people adopt new ideas, products, processes, or practices. Everett Rogers propagated this theory concentrating on the group process of innovation. There are two parts to this theory: innovation and diffusion (King et al., 2019). According to King et al. (2019), innovation uses new and creative ideas to solve a problem whereas diffusion communicates an innovation perceived to have a positive outcome or benefit to an individual or group. The dissemination of new information or knowledge can then drive change. While innovative strategies are designed to provide knowledge, they also ensure the diffusion of innovation and its acceptance by all involved for sustained impact. There are five stages of the innovation-decision

process: (a) innovation awareness, (b) attitude formation and persuasion, (c) adoption or rejection, (d) implementation, and (e) decision reinforcement or reversal (King et al., 2019).

Roger's innovation theory supports the CNL's enhanced strategy for data abstraction while the diffusion theory guides the CNL in disseminating information and the strategic plan to improve the device days data extract logic. The DOI theory will also guide the CNL to gain buy-in and continued support by informing stakeholders about the inconsistencies of the existing Infoview report, the urgency to modify the logic to comply with mandated reporting, as well as the opportunities to improve data quality, infection prevention efforts, and quality outcomes.

Additionally, Rogers' theory indicates three categories on how people adopt innovation based on their behaviors and characteristics. The first group to quickly adopt innovations are innovators. As ideas and perceived benefits are disseminated, more people become open thus cultivating early adaptors and early majority. The late majority and laggers are people who require additional time to process the benefits of the innovation. This allows for identification of the innovation's potential barriers, limitations, and any inadvertent consequences that early adaptors and early majority may have missed (King et al., 2019).

A CNL's awareness of how individuals react and adapt to change enables the exploration of different approaches in all phases (communication, brainstorming, persuasion, implementation, evaluation) of the project to maintain team motivation and momentum. The DOI theory is helpful in drafting the project's power grid and in identifying the hierarchy of stakeholders for which the information must be presented. The chief nurse executive and centralized surveillance team are the project's early adaptors and must be informed immediately since they are primarily involved in HAI surveillance and reporting. The next group of individuals to be involved is the information technology (IT) team because they are responsible

for program maintenance and enhancements. IT is critical to logic modification as they will produce the desired results, while the project team will ensure compliance with reporting guidelines and data accuracy. See Appendix D for Power Grid.

Specific Project Aim

By revising the electronic urinary catheter device days data extract logic, the CAUTI denominator data quality in non-critical care units will improve from a baseline of 60% to 80% by July 31, 2023.

Context

Modifying the Infoview report is critical to the preservation of data quality and integrity as well as compliance with regulatory reporting. Data quality is crucial for HAI surveillance and national hospital performance monitoring. Additionally, hospitals with poor California Department of Public Health (CDPH) and Centers for Medicare and Medicaid Services (CMS) HAI reporting and quality performance face regulatory penalties and non-reimbursement of HAIs.

A microsystem and cost benefit analysis were performed to determine the feasibility of this Quality Improvement (QI) project. Overall, the evaluation signifies a microsystem with a willingness to change and a robust IT system that can support the technical requirements for improving data capture and abstraction. Despite limited time and human resources, this project can improve regulatory reporting compliance and CAUTI metrics.

Setting

The quality improvement project is set in a 249-bed acute care, teaching hospital in the Diablo Service Area in Northern California. The focus is on non-critical care units with 23,355 admissions and 56,818 patient days in 2022.

Purpose

The non-critical care units efficiently utilize resources in providing high-quality and affordable patient-centered care to patients and their families. The microsystem employs evidence-based infection prevention practices to reduce HAIs and promote a culture of safety.

Patients

The non-critical care units cater to medical-surgical and telemetry patients. The patient population is more concentrated on elderly patients, ages 65 and above since the geographical location is surrounded by assisted living and skilled nursing facilities.

Professionals

The dynamic non-critical care units have very proactive leaders, physicians, and staff members who utilize evidence-based interventions to prevent HAIs. The key stakeholders are highly interested in data and are proactively involved in harm prevention. See Appendix D. They consistently partner with the infection prevention team to improve processes and workflows, as well as seek solutions to rectify identified issues.

Patterns

The CAUTI SIR for the non-critical care units is 0.82 which is slightly above the organization's target of 0.7, while the IUC device SUR is 0.86. An assessment of the CAUTI denominator data revealed 8,251 IUC device days with five CAUTI events in 2022, impacting the medical-surgical patient population. CAUTI was noted to be more prevalent among women (three infections versus two in men) particularly impacting the following age groups: 19-44, 45-64, and 65-84 (NHSN, 2022). Due to the patient population, the incidence of falls, hospital-acquired pressure ulcers, C. diff infections, and SSIs are also high.

Processes

The CAUTI prevention bundle is implemented for all IUC insertions and maintenance. The infection prevention team performs weekly rounds on patients with IUCs while the nursing leadership team performs chart audits focused on each component of the CAUTI bundle. The promotion of harm prevention and reduction is integrated into the weekly GEMBA rounds, shift huddles, nurse knowledge exchange (NKE), staff meetings, and CAUTI event drilldown investigation.

SWOT Analysis

The organization's mission is to provide high-quality, safe patient care and harm prevention. A SWOT analysis was conducted to assess the QI project's feasibility, benefits, and mission alignment (see Appendix E). It determined that the organization has a robust interoperable computer system that is enormously fundamental to the project's success. It also revealed the great potential to improve the methodology for CAUTI surveillance, reduce device utilization, and reduce healthcare costs and infection risks. The hospital's innovative and supportive culture will also be greatly beneficial throughout the project's lifetime. Furthermore, the data extract logic revision can improve regulatory reporting compliance, positively impact hospital revenue, and magnify public recognition.

However, the aggressive project timeline, as well as lack of IT expertise and financial resources are deemed weaknesses of the project. Moreover, the QI project involves abstraction and investigation of sensitive patient health information thus introducing crucial data privacy and security threats. Finally, non-compliance with regulatory reporting requirements makes the organization vulnerable to regulatory agency surveys and penalties. This can detrimentally threaten hospital reimbursements and revenues. Despite these known weaknesses and threats, the

QI project can immensely bolster the organization's ability to provide high quality patient care by implementing the proposed methodology modifications to CAUTI surveillance.

Cost Benefit Analysis

The average cost of CAUTI in non-critical care units is estimated at $13,793 per event with an additional LOS of 3 days based on internal surveillance and financial analysis. Therefore, accurate IUC device utilization data is crucial to CAUTI surveillance and prevention. Updating the IUC device days data extract logic used of surveillance and public reporting will yield a net savings of $196, 616 during the first year alone. See Appendix F. Moreover, data quality and integrity play an important role in public reporting, CMS reimbursement, and maintaining CMS 4-star rating on harm prevention.

Power Interest Grid and Communication Plan

The primary driver propelling this project is compliance with regulatory reporting requirements along with implications for hospital CMS reimbursements. Conveying the urgent need for logic modification to the appropriate IT personnel was crucial. A Situation-Background-Assessment-Recommendation (SBAR) was also presented to the chief nurse executive, Centralized Surveillance Team, and other key stakeholders. See Appendix D. Additionally, the urgency to rectify the identified flaws of the current extract logic enabled the rapid escalation of the SBAR to the IT senior consultant. Moreover, the local facility's desire to improve CAUTI prevention efforts helped mobilize the project while threats of reduced hospital revenue gained traction and interest from all involved stakeholders. Prioritizing the issue is key to establishing the project team. Lastly, the project team discussed progress updates during bi-monthly meetings.

Intervention

This quality improvement project entailed modification of the existing Infoview Foley Catheter Report to improve the accuracy of IUC device days data capture. The project involved a retrospective review of records using the Infoview report against the EMR. The device data for December 2022 was utilized as the baseline data for this QI project. Then, the IUC device days data extract logic was modified according to the denominator data collection and reporting guidelines outlined by the NHSN.

A three-pronged approach was applied to the device days extract logic to increase the accuracy of data capture. Firstly, a criterion was added to the logic to limit data capture per single inpatient encounter only. Secondly, a criterion was added to apply the date of inpatient admission status as the date of inpatient admission. Another set of criteria was also employed to apply the date and time of inpatient admission as the beginning of device days count, if an old IUC was present at the time of inpatient admission. Additionally, the logic applied the discharge date and time, if IUC removal or disposition date and time were not documented upon patient discharge. This enabled the logic to stop counting the device days for a specific inpatient encounter. Thirdly, the time of data capture was modified from 23:00 to 23:59 hours to capture more IUCs and maximize device days count. Data validation was performed after modifying the device days extract logic using the three data elements outlined in the process measures (See Appendix G). Then, the data points from the staged Infoview report were compared with actual EMR documentation to assess data capture precision and accuracy once all modifications were employed.

Furthermore, serial rapid Plan-Do-Study-Act (PDSA) cycle was performed to mitigate newly identified issues and unintended consequences of the logic modification. Data validation

was necessary after each PDSA cycle to evaluate intervention validity and effectiveness. The cost of project implementation represented a fraction of the annual spending for UTI treatment of a single patient based on the cost benefit analysis. The average cost to treat HAI CAUTI is $13,793 per event (Leaptrot, 2023). Based on an internal HAI surveillance and financial impact analysis, a patient incurs an average additional length of stay (LOS) of 3 days compared to patients in the same Diagnosis Related Code (DRG) without a CAUTI. The hospital spends an additional $6,459 per event (BD Integrated Analytics, 2023). The actual annual cost for managing and treating UTIs will be exponential if multiplied by the total number of reported CAUTI events in non-critical care units on a given calendar year. Overall, the project implementation will yield a net savings of $196,616.00 in Year 1 and $393,232.00 in Year 2.

Study of the Intervention

To increase the accuracy of electronic IUC denominator data capture by 20%, the logic had to search for eligible inpatient admission encounters, eligible IUCs, and appropriately (start and end) count device days on a given inpatient encounter. For consistency, the data capture had to occur at the same time every day. See gap analysis in Appendix B. It was also imperative that NHSN data collection guidelines were followed when modifying the device days data extract logic. The project's progress was discussed by the project team at bi-monthly team meetings.

PDSA Cycle 1

The initial logic modification included a) capturing the current inpatient admission encounter and searching for eligible IUC; b) applying the date of inpatient admission status as the date of inpatient admission; c) counting device days on the date of IUC insertion or the date of inpatient admission, if an old IUC is in place at the time of admission; d) applying the date and time of patient discharge, if removal or disposition date and time are not documented in the

EMR; and e) modifying data capture time 23:00 to 23:59 hours. An Infoview report was generated using the modified logic in the Infoview stage as part of report development testing and validation. Furthermore, a crosswalk of IUCs captured in the Infoview report and LDA section of the EMR was performed by the CNL using the data points to assess the logic's precision and accuracy in data capture. See Appendix H and Appendix I. The date and time of inpatient admission and patient discharge was also cross walked with the admission, discharge, and transfer (ADT) section of the EMR.

PDSA Cycle 2

The second cycle rectified any newly identified issues or unintended consequences of the initial logic modification as well as retested the exclusion criteria. In this cycle, the application of the logic's established exclusion criteria was assessed to ensure that only eligible IUCs were captured during an eligible inpatient encounter. Additionally, the logic's ability to assign only one device day if a patient had two or multiple IUC insertions on a given day was evaluated. Finally, the volume of device days captured using the new time for data extract was assessed and compared with the baseline data to determine whether the revised time more comprehensively captured IUC data on a given calendar day and yielded more device days as planned. The CNL performed data validation using the staged Infoview report against the actual IUC documentation in the LDA flowsheet of the EMR. After the CNL verified the data to be accurate, the Infoview report using the modified logic was submitted for additional data validation by the Centralized Surveillance Team. See Appendix I. Afterwards, another PDSA round was planned to assess the validity of the volume of captured device days.

PDSA Cycle 3

The third cycle was centered on selecting the best appropriate data collection time and revalidating the data to determine whether the modified logic completely and accurately captured all eligible IUC device days. After the CNL and CST validated that all data points were accurately captured by the modified logic, the final version of the device days extract logic was submitted to the project team for sign-off and approval. Once approved, the modified device days extract logic was placed into the Infoview production platform. Finally, the revised logic was planned for implementation. See Appendix J.

Measures

The outcome measure of the project is 20% improvement in data quality captured by the device days data extract logic. The project had three process measures: implementing criteria that will search for urinary device per single inpatient admission encounter, implementing criteria that will capture and apply the date of inpatient admission status as the date of inpatient admission, and finally modify the data extract logic so that the program auto-calculates devices per calendar day capped at 23:00 hours. The outcome and process measures were all set for an 80% target goal. After completing a series of PDSA cycles, the quality improvement project achieved 100% data capture and accuracy for each outlined measure, far exceeding the targets. See Appendix G.

Ethical Considerations

This project is set in non-critical care units of an acute care facility involving daily abstraction of IUC device days from Infoview reports and EMR data. The project was reviewed by USF MSN program faculty and approved as a QI project using the Quality Improvement review guidelines. See Appendix K. It is also confirmed not to present untested methods or

standards based on the non-research determination form. Therefore, an Institutional Review Board review is not needed to conduct this project to improve CAUTI denominator data capture.

The University of San Francisco values cura personalis, being an advocate for others, and diversity (USF, 2023). This QI project is deeply rooted in promoting the overall health and well-being of patients by preventing hospital acquired CAUTIs through patient safety and infection prevention advocacy. This project also embodies USF's values through collaboration with multidisciplinary stakeholders that bring diverse perspectives into project planning, collective decision-making, implementation, and evaluation.

Moreover, this project encompasses two ethical principles of the American Nurses Association (ANA, 2015): Provision 3.4 "professional responsibility in promoting a culture of safety" and Provision 4 "authority, accountability and responsibility." This QI project will result in the implementation of evidenced-based infection prevention strategy for CAUTI prevention. Finally, the hospital can improve patient care and patient safety by routine surveillance and HAI CAUTI prevention, which consequently improves quality health outcomes.

Outcome Measure Results

The initial logic modifications resulted in 100% data capture and accuracy based on the established process measures. The outlined process measures resulted in the extract logic capturing all IUCs present in full or in part on a given calendar day at 24:00 hours. Upon data validation, it was noted that the logic captured three instances where IUC was documented as "indwelling catheter urostomy," "indwelling catheter nephrostomy," and an old IUC with a "disposition of not present on assessment without a device removal date." Although there was a noted increase in device days captured, the actual total number of devices was not evaluated at this point.

In the next cycle, the exclusion criteria were updated to exclude IUCs documented as "indwelling nephrostomy" or "indwelling urostomy" and IUCs with a documented disposition of "not present on assessment." Data validation was performed after this update to assess data capture accuracy. Additionally, the total number of device days from this validation was compared with the baseline data. A substantial increase in the number of device days was observed, which was primarily attributed to the logic capturing all devices that were fully or partially present on a given day and devices that were removed before the time of daily denominator data capture. The observed increase prompted verification with the CAUTI denominator data validation tool regarding inclusion of removed IUCs before the data capture time. See Appendix L. Excluding these device days directly impacts IUC device SUR and indirectly impacts the CAUTI SIR. Since these device days also pose patient infection risk, the team opted to clarify with (and was confirmed by) NHSN that IUCs removed prior to the time of data capture must be excluded. Based upon NHSN determination, the devices were excluded from the daily denominator data count.

During the final PDSA cycle, the team also requested another report using 23:59 hours as well as 23:00 hours as the capped time of data capture. A criterion to exclude removed IUCs before the time of data extract was also added to evaluate which time will yield the most device days. This entails losing one device day per patient if IUC is removed before the scheduled data extract. After data validation, it was determined that 23:00 hours was the optimum time for data extract since it yielded the most accurate results. The final iteration of the revised logic yielded 100% data capture and accuracy for all established process measures leading to a 40% increase in data quality. See Appendix L. Improved CAUTI data quality enhanced the risk adjustment required to generate a more accurate predicted number of urinary catheter days and infections to

calculate the SUR and SIR respectively. See Appendix M. Lastly, the logic's precision in data capture from the IUC database revealed that improper or lack of end-user documentation in the LDA Avatar and LDA flowsheet could potentially impact the quality of the denominator data count.

Summary

The QI project demonstrated the core learnings that data accuracy and reliability remain highly dependent on end-user documentation. Data inputted by frontline staff influenced the precision in the data captured by the revised extract logic. Creating logic workarounds were necessary to capturing eligible IUCs and accommodating for varied end-user EMR documentation. Additionally, the precision in modifying the device days data extract logic is also reliant upon the IT's in-depth knowledge of the device database and EMR, as well as the QNC's clinical expertise and understanding of data collection and NHSN reporting requirements. Employing additional criteria to maximize data capture yielded much greater precision in combination with frontline EMR documentation that is complete, timely, and consistent. The project produced successful results only with complete, accurate programming of the device days data extract logic.

Valuable lessons regarding the importance of frontline staff education were learned. Although the project yielded a remarkable data quality improvement, the key findings from the PDSA cycles and data validation post revised logic implementation called for frontline staff re-education. This continued education must include trainings on (a) routine IUC assessment; (b) timely and appropriate documentation of IUCs in the LDA Avatar and LDA flowsheet of the EMR; (c) IUC clean-up and removal of remote IUCs from the database or LDA Avatar; (d) Patient Care Services (PCS) department must determine process for consistent documentation of

IUCs retained at the time of patient discharge; and (e) physicians' timely inpatient admission order entry.

The PDSA model for improvement was instrumental to the success of the QI project. The proper identification of the root causes of the logic's inconsistencies in data capture guided the intervention design. Understanding the flaws in data extract logic programming and the translation errors of real-time end user IUC documentation in the EMR was also crucial to the project outcome. Another key contributor to the project's success was involving the correct stakeholders that can propel the project forward and determining the most qualified IT experts to support logic revision. Additionally, setting the specific project aim, establishing the outcome and process measures, and developing a solid plan of interventions as approved by the project team was also important. With the tight project timeline, it is vital for the team to understand the plan, their individual roles and responsibilities, and deliverables, therefore routine communication and follow up was established during the bi-monthly project team meeting. Moreover, interventions and testing changes were guided by the findings and outcomes of each PDSA cycle. Cross-functional collaboration was also key to the QI project's success. Finally, the implementation and evaluation of outcomes are key to the project's success and sustainability. Upon completing the final PDSA cycle that validated 240 records, there was an observed data capture and accuracy of 100%. However, the data validation sample size represented only a small portion of the total monthly denominator data over a six-month period. Conversely, it was noted that the data logic functioned as expected with the premise that it consistently applied the established criteria when searching for eligible IUCs during the scheduled daily denominator data count.

Conclusions

The data extract logic revision significantly increased the data quality for CAUTI surveillance and reporting. The enhanced device utilization data positively impacts the risk adjustment, resulting in a more accurate predicted number of catheter days and infections when calculating catheter utilization ratio and CAUTI SIR. Given this, the final iteration of the revised logic was deemed 100% accurate in data capture, leading to its approval and implementation in April 2023. The successful project outcomes also led to the operationalization of the revised logic across the health system's Northern California region in April 2023. The enhanced data can also be used as an adjunct to the CAUTI SIR to improve infection prevention efforts in non-critical care units.

Annual data extract logic and data quality assessment is key for sustainability. It is also essential to train back-up IT personnel to support and troubleshoot the denominator data extract program. Furthermore, routine education and training is necessary for nursing personnel and the physician group about complete, timely documentation. Moreover, the revised logic can be utilized as the template for CAUTI denominator data abstraction enterprise wide. Finally, the success of this project is also paving the way for a feasibility study to automate the CAUTI denominator data feed to the electronic HAI surveillance platform. In eliminating manual data entry into the surveillance platform, this revised process will immensely improve the Centralized Surveillance Team's workflow and efficiency.

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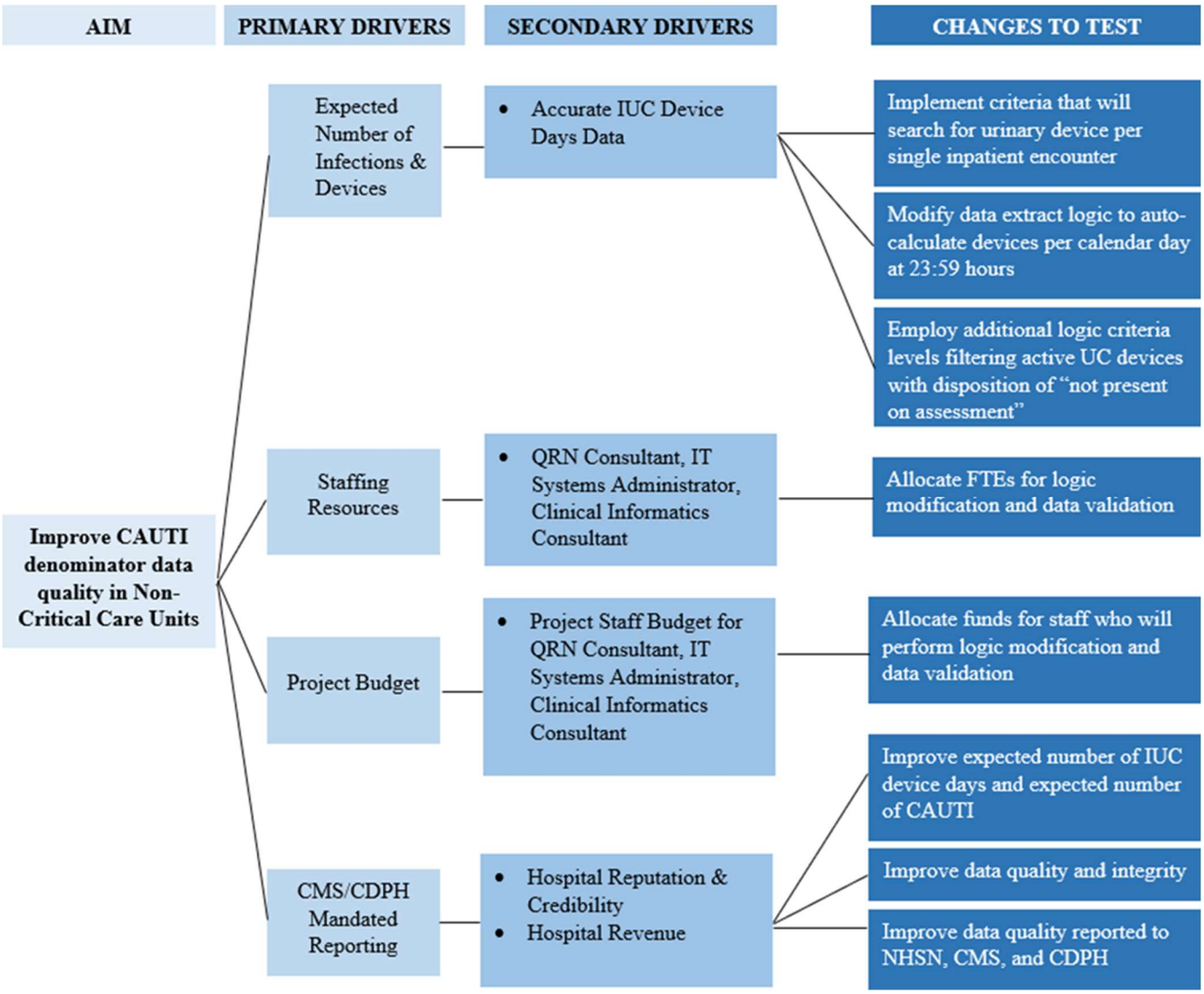
Appendices

Appendix A: Driver Diagram



Appendix B: Gap Analysis

Gap Analysis		
Area Under Consideration: Modification of the Infoview Foley Catheter Days Report and device days extract logic.		
Desired State	**Current State**	**Action Steps**
Urinary device days extract logic is 80% accurate in capturing urinary device days from EMR.	Urinary device days extract logic is only 60% accurate in capturing urinary device days from EMR.	Update the Infoview Foley Catheter Days report.
CAUTI SIR with target of 0.85 and Urinary Catheter SUR within the target of 1.	CAUTI SIR, CAUTI SUR	Investigate potential cause of low predicted number of infections and low predicted number of urinary catheters.
Updated urinary catheter device days extract logic. The logic abstracts data from the LDA Avatar and Lines, Drains, and Airways section of DocFlowsheet.	Multiple Epic Health Connect system upgrades--LDA Avatar and Lines, Drains, and Airways section of DocFlowsheet.	Assess whether the device days data extract logic pulls data from the new LDA Avatar.
Urinary catheter device days extract logic looks at current inpatient encounter only and counts device days for that specific encounter only.	Device days extract logic captures urinary catheter days across multiple inpatient and outpatient encounters.	Modify logic to search and use current inpatient encounter only.
The urinary catheter device days extract logic will: exclude ED encounter; logic applies the date/time of inpatient status as the date/time of inpatient admission; and will start counting device days at the time of inpatient status if old urinary catheter is present.	Device days extract logic begins counting urinary catheter days in ED when a urinary cather is inserted in the ED and/or the patient comes with an old urinary catheter.	Modify logic to apply the date/time of inpatient status as the date/time of inpatient admission. The logics will start counting the device days for old urinary catheter at the date/time of inpatient encounter.
Urinary catheter device days extract logic will apply the date/time of patient discharge as the date/time of device removal, if date/time of removal and/or disposition are undocumented. The logic will stop counting the device days count at the date of discharge.	For urinary catheters without documented removal date/time, the device days extract logic continues to identify and count device days across inpatient encounters until a removal date/time is documented.	Modify logic to apply the date/time of discharge and add a criterion to stop the device days count at the time of discharge.
Device extract logic excludes urinary catheters with a documented disposition of “not present on assessment.”	Device days extract logic captures old urinary catheter days with a documented disposition of "not pesent on assessment."	Modify logic to exclude old urinary catheters with a documented disposition of "not present on assessment."

Appendix C: Evaluation Table

Evaluation Table

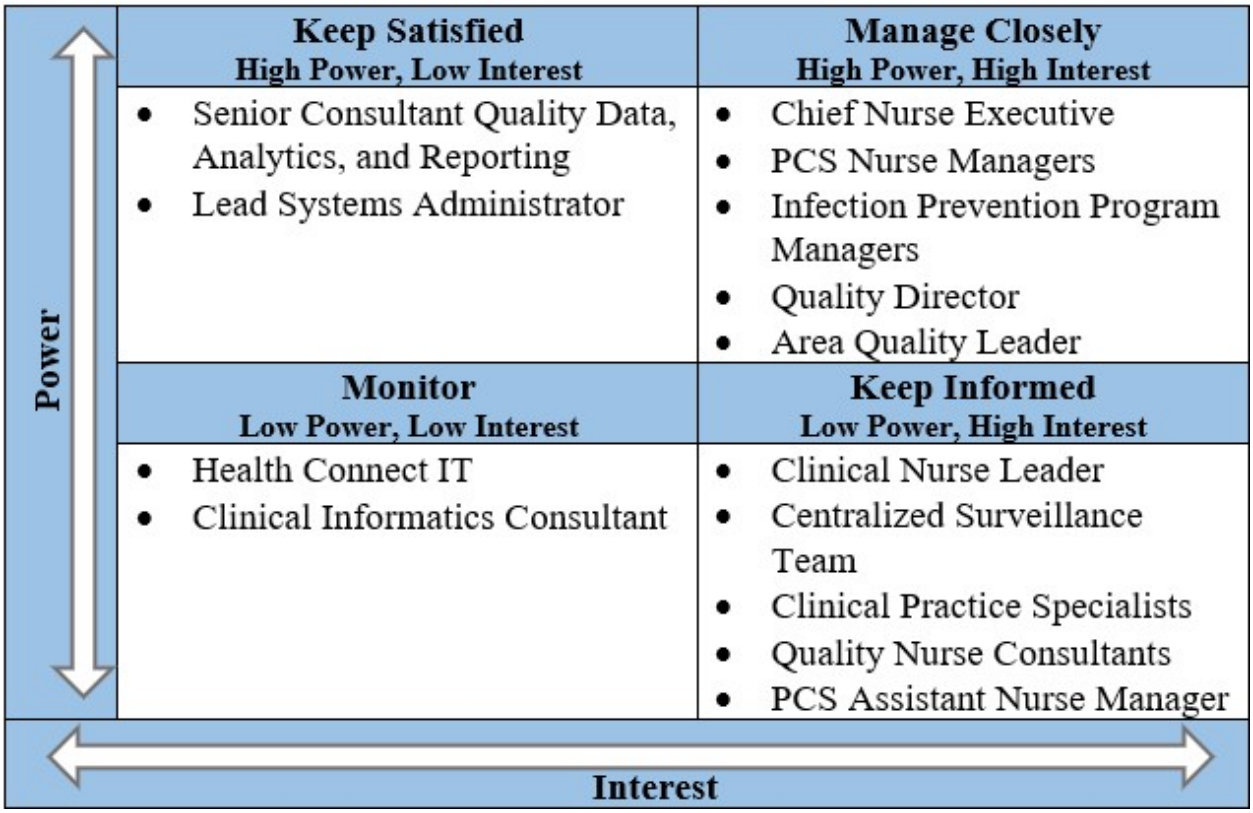
PICOT Question: How will modifying the urinary catheter device days extract logic (I) improve data capture by 20% (O) in a Med-Surg-Tele unit (P) within 6 months? (T)

Study	Design	Sample	Outcome/Feasibility	Evidence Rating
Donnelly, L. F., Wood, M., Loh, L., Tekic, N., Shin, A. Y., & Scheinker, D. (2021). Effect of time of daily data collection on the calculation of catheter-associated urinary tract infection rates. *Pediatric Quality and Safety, 6(5)*, e466. 1-4. doi:10.1097/pq9.0000000000000466. Effect of Time of Daily Data Collectio	Quality Improvement Project	7,548 pediatric patients with urinary catheter within 20-month period in a quaternary hospital	Modifying the time of manual urinary catheter device days extract from midnight to 1100 yielded a 50% increase in denominator data capture. CAUTI rate decreased by 33.6% using the modified time for the denominator data extraction. Useful in determining a specific time of day to count the urinary catheter device days to optimize denominator data capture.	V B
Muthee, V., Bochner, A. F., Osterman, A., Liku, N., Akhwale, W., Kwach, J., Prachi, M., Wamicwe, J., Odhiambo, J., Onyango, F., & Puttkammer, N. (2018). The impact of routine data quality assessments on electronic medical record data quality in Kenya. *PLoS One, 13*(4):e0195362. doi: 10.1371/journal.pone.0195362. The Impact of Routine Data Qualit	Cross-sectional	53 facilities in Kenya with baseline RDQA 27 out of 53 facilities (9 hospitals and 18 health centers) with follow-up RDQA	The study showed that Routine Data Quality Assessment (RDQA) improved data harmony by a mean of 1.79 with a 95% confidence interval of 0.25 to 3.33. Data accuracy, completeness, consistency, and reliability influence the integrity of data analysis. RDQA is a valuable method in identifying common data quality issues in the EMR yielding meaningful improvements to data quality.	III B

Study	Design	Sample	Outcome/Feasibility	Evidence Rating
National Healthcare Safety Network (NHSN). (2021, November 10). *Urinary tract infection (Catheter-associated urinary tract infection [CAUTI] and non-catheter-associated urinary tract infection [UTI] events.* Retrieved from https://www.cdc.gov/nhsn/psc/uti/index.html NHSN PSC CAUTI Module.pdf	Practice guidelines	n/a	Outlines the reporting requirements and instructions for CAUTI denominator data. Outlines the inclusion, and exclusion criteria for data reporting. Provides guidelines for denominator data collection method, denominator data capture (manual versus electronic), data and validation.	IV A
National Healthcare Safety Network (NHSN). (2020). *Toolkit for data quality checks for reporting facilities: 2020 Internal validation guidance.* Retrieved from https://www.cdc.gov/nhsn/pdfs/validation/2020/2020-nhsn-iv-for-facilities-508.pdf CAUTI Denominator Data Quality Check	Practice guidelines	n/a	Outlines the reporting instructions for CAUTI denominator data count. Outlines the step-by-step process for electronic denominator data capture as well as data quality validation. Provides a denominator data validation template useful for data quality check.	IV A

Study	Design	Sample	Outcome/Feasibility	Evidence Rating
Fakih, M., huang, R., Bufalino, A., Erlinger, T., Sturm, L., Hendrich, A., & Haydar, Z. (2019). The case for a population standardized infection ratio (SIR): A metric that marries the device SIR to the standardized utilization ration (SUR). *Infection Control & Hospital Epidemiology. 40*(9), 979-982. doi:10.1017/ice.2019.175 Retrieved from https://www.cambridge.org/core/journals/infection-control-and-hospital-epidemiology/article/case-for-a-population-standardized-infection-ratio-sir-a-metric-that-marries-the-device-sir-to-the-standardized-utilization-ratio-sur/44A723E516427841E2D6FFDB5653685C/share/badfc1e84078c64030512484601e4ef9d2481610  Device Utilization Ratio As Performanc	Cross-sectional	84 hospitals from a single healthcare system	The study showed that the CAUTI denominator data influences the predicted number of CAUTI events and predicted number of urinary catheter device days. The CAUTI Standardized Infection Ratio (SIR) is a desirable metric in designing interventions to reduce infections in a microsystem as well as system wide. The urinary catheter Standardized Utilization Ratio (SUR) can be used to supplement the SIR in efforts at reducing urinary device use, consequently preventing CAUTI events. The Cumulative Attributable Differences (CAD) can be utilized to set the target and achieve a CAUTI reduction goal.	III A

Appendix D: Power Grid



Appendix E: SWOT Analysis

	FAVORABLE/HELPFUL	UNFAVORABLE/HARMFUL
INTERNAL	**Strengths** • Innovative, supportive culture • Readily available microsystem • Robust, interoperable computer system • Data accessibility • Improve data integrity & accuracy • Work efficiency & productivity • Patient-centered care • Improve CAUTI surveillance & prevention • Decrease healthcare costs by reducing device utilization, infections, LOS	**Weaknesses** • Low stake holder buy-in • Lack of IT human resources • Lack of financial resources • Resistance to change • Aggressive timeline • End user EMR documentation
EXTERNAL	**Opportunities** • Improve compliance with regulatory reporting • Maintain/improve CMS quality rating • Increase CMS reimbursement • Contributing resource for standardization of device days extract process • Public recognition	**Threats** • Lack of NHSN-recommended specific time for data extraction • Data privacy & security • Technology breakdown and/or interconnectivity • Reduced revenue/reimbursements • Regulatory penalties

Appendix F: Cost Benefit Analysis

Financial Analysis: Updating the Urinary Catheter Device Days Data Extract Logic for BOXI Infoview Report					
Project Savings/Cost Avoidance (ROI)				**Year 1 Annual Cost Savings**	**Year 2 Annual Cost Savings**
Net Savings = Cost Avoidance - Improvement Cost				**196,616.00**	**393,232.00**
Improvement Revenue (Cost Avoidance	**Hours/Day**	**Days/Month**	**Cost Per Month**	**Year 1**	**Year 2**
Average cost of HAI-CAUTI per event			$ 13,793.00	$ 165,516.00	$ 331,032.00
Average additional Length of Stay (LOS) per event (3 days per event)	$ 2,153.00		$ 6,459.00	$ 77,508.00	$ 155,016.00
Total Cost			**$ 20,252.00**	**$ 243,024.00**	**$ 486,048.00**
Improvement Costs			**Cost Per Month**	**Year 1**	**Year 2**
CNL x 1 (240 hrs at $80.00/hr plus $24/hr for benefits=$104) for 6 months only	$ 832.00	$ 4,160.00	$ 4,160.00	$ 24,960.00	$ 49,920.00
CST Quality Nurse Consultants (24 hours at $80.00/hr, plus $24/hour for FTE benefits = $104) x 3 FTEs	$ 2,496.00		$ 7,488.00	$ 7,488.00	$ 14,976.00
IT-Systems Administrator (total of 8 days at $ 140.00 /hr for a project)	$ 1,120.00		$ 8,960.00	$ 8,960.00	$ 17,920.00
BOXI Infoview annual maintenance cost				$ 5,000.00	$ 10,000.00
Total Cost			**$ 20,608.00**	**$ 46,408.00**	**$ 92,816.00**

Appendix G: Project Charter

TITLE
Data Quality: Integral to CAUTI Surveillance & Improvement in Non-Critical Care Units

GLOBAL AIM
To increase the accuracy of the indwelling urinary catheter (IUC) device days data capture by updating the denominator data extract logic according to the National Healthcare Safety Network (NHSN) reporting requirements.

SPECIFIC AIM
By revising the IUC device days data extract logic, the CAUTI denominator data quality in non-critical care units will improve from a baseline of 60% to 80% by July 31, 2023.

BACKGROUND
Urinary tract infections rank as the fifth most common type of healthcare-acquired infection reported to NHSN. Between 12% to 16% of hospitalized adult patients will receive indwelling urinary catheter (IUC) during their hospital stay leading to a 3 to 7% increased risk for developing a catheter-associated urinary tract infection (CAUTI) (CDC, 2021). According to the CDC, 75% of UTI events are associated with urinary catheter use (CDC, 2015a). UTIs can also lead to complications such as pyelonephritis, bacteremia, endocarditis, and vertebral osteomyelitis and account for over 13,000 deaths in US hospitals annually (CDC, 2021).

The key to preventing UTIs is to avoid unnecessary use of indwelling urinary catheters. If use is unavoidable, then the IUC must be removed promptly, when no longer clinically indicated (CDC, 2015b). Surveillance is therefore critical in preventing healthcare-acquired infections like CAUTIs. It is equally important to accurately calculate the IUC device days as it is the primary driver of infection prevention efforts. However, the automated system currently in place for data extract is inconsistent in capturing the IUC device days from the electronic medical record (EMR). This has regulatory reporting ramifications and negatively impacts the metrics for CAUTI, specifically the Standardized Infection Ratio (SIR) as well as the Urinary Catheter Standardized Utilization Ratio (SUR).

SPONSORS
1. Director, Regional Infection Prevention
2. Senior Consultant, Quality Data, Analytics, and Reporting (QDAR)

GOALS
1. Improve data accuracy by counting urinary catheter days per inpatient admission encounter.
2. Improve data accuracy by using the inpatient admission status as the date of inpatient admission.
3. Increase data capture by counting the device days per calendar day.

MEASURES

Outcome Measure	Data Source	Goal
Improve the CAUTI denominator data quality from a baseline of 60% to 80% by July 31, 2023.	• Infoview Report-Inpatient LDA IUC Device Days Report • EHR-LDA Flowsheet	80%
Process Measures	**Data Source**	**Goal**
Modify data extract logic by implementing criteria that will search for urinary device per single inpatient admission encounter.	• Infoview-IUC Device Days Extract Logic	80%
Modify data extract logic by implementing criteria that will capture and apply the date of inpatient admission status as the date of inpatient admission	• Infoview-IUC Device Days Extract Logic	80%
Modify data extract logic so that the program auto-calculates devices per calendar day capped at 23:00 hours with exclusion of IUCs removed prior to data extract time	• Infoview IUC Device Days Extract Logic	80%
Balancing Measures	**Data Source**	**Goal**
CAUTI SUR will initially increase due to corrected and improved data quality and integrity.	• HAI Scorecard • NHSN Database	1.00
CAUTI SIR is utilized to drive unit prevention and improvement efforts.	• HAI Scorecard • NHSN Database	0.85

TEAM MEMBERS

1. Senior IT Consultant, Co-Lead
2. CNL-Quality Nurse Consultant, Co-Lead
3. Quality Nurse Consultants (Centralized Surveillance Team)
4. Lead Systems Administrator (Data & Analytics Business Intelligence, Insights, & Enhancement)
5. Senior IT Consultant (Data & Analytics: Cogito Development Consulting)
6. Clinical Informatics Consultant (Adult Critical Care & Medical Surgical Domain)

REFERENCES

Centers for Disease & Control and Prevention. (2015a, October 16). *Catheter-Associated urinary tract infections (CAUTI).* https://www.cdc.gov/hai/ca_uti/uti.html

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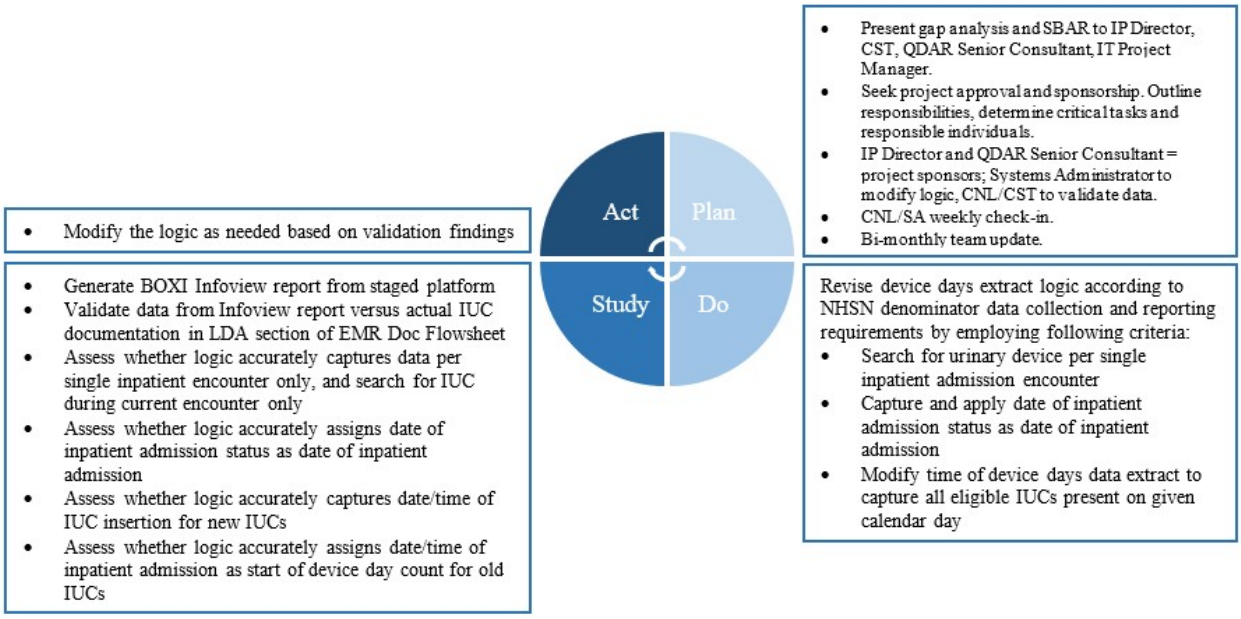
Appendix H: Plan, Do, Study, Act (PDSA) Cycle

PDSA Cycle 1

What are we trying to accomplish?
Increase the accuracy of the indwelling urinary catheter (IUC) or foley device days data capture in non-critical care units.

How will we know that a change is an improvement?
IUC device days data quality increase from a baseline of 60% to 80% by July 31, 2023.

What changes can we make that will result in improvement?
See below.

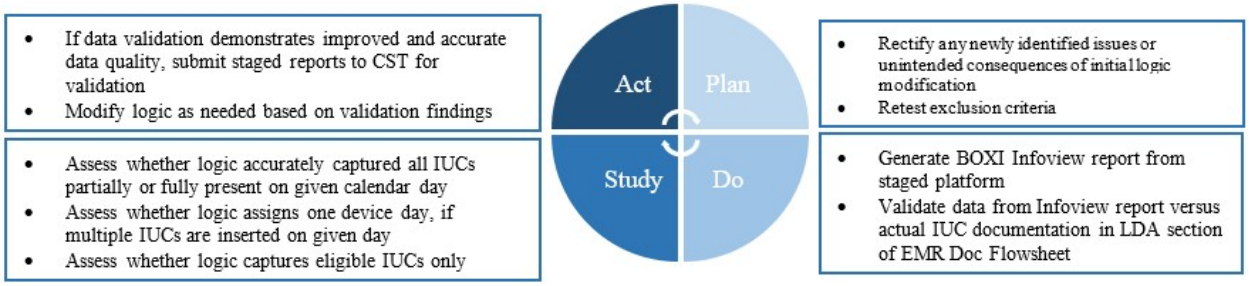


PDSA Cycle 2

What are we trying to accomplish?
Increase the accuracy of the indwelling urinary catheter (IUC) or foley device days data capture in non-critical care units.

How will we know that a change is an improvement?
IUC device days data quality increase from a baseline of 60% to 80% by July 31, 2023.

What changes can we make that will result in improvement?
See below.



PDSA Cycle 3

What are we trying to accomplish?
Increase the accuracy of the indwelling urinary catheter (IUC) or foley device days data capture in non-critical care units.

How will we know that a change is an improvement?
IUC device days data quality increase from a baseline of 60% to 80% by July 31, 2023.

What changes can we make that will result in improvement?
See below.

- Assess whether process and outcome measures are met
- Once outcome measure is met, seek approval from CST/IP director
- Implement revised logic into BOXI production
- Utilize modified device data extract logic to pull 1Q/2Q 2023 IUC device days data
- Continue data validation for 3 additional months to assess sustained results
- Prepare final reports by July 31, 2023

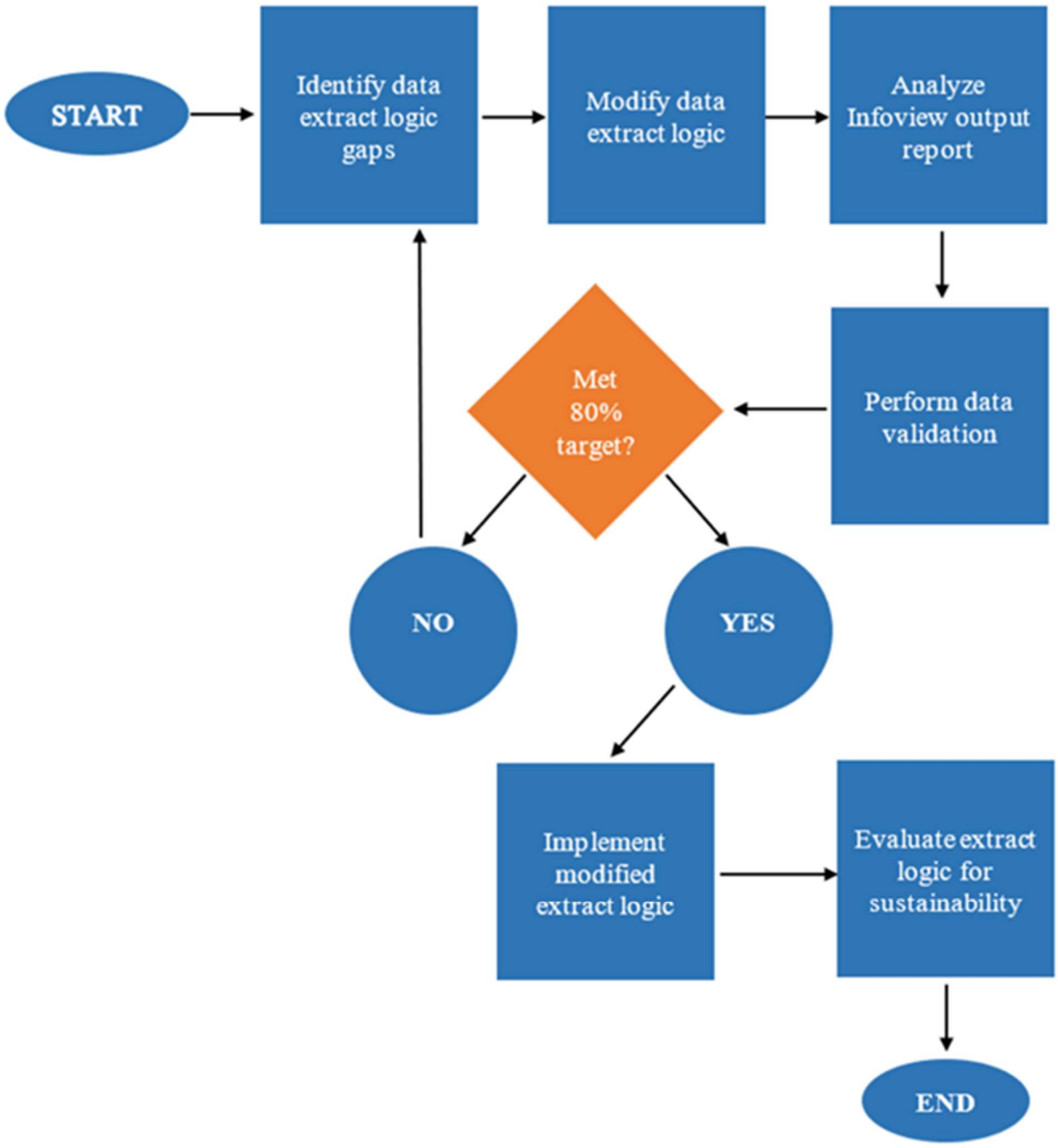
- Select most appropriate data collection time
- Revalidate data if modified logic completely and accurately captures all IUC device days

- Assess whether logic accurately captures all IUCs partially or fully present on given calendar day
- Assess whether logic assigns one device days, if multiple IUCs are inserted on given day
- Assess whether logic captures eligible IUCs only

- Generate BOXI Infoview report from staged platform
- Validate data from Infoview report versus actual IUC documentation in LDA section of EMR Doc Flowsheet

Appendix I: Process Map

Indwelling Urinary Catheter Device Days Data Extract Logic Modification Process Map



Appendix J: Project Timeline

PROJECT TIMELINE								
TASKS	**LEAD**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**
Crosswalk Infoview IUC device days output report and EMR	CNL, QNCs, Clinical Informatics Consultant							
Review NHSN CAUTI denominator data reporting requirements	CNL, QNCs							
Identify team members and key stakeholders	CNL, IP Director							
Determine project focus and develop aim statement	CNL							
Microsystem Assessment	CNL							
Develop Project Charter and establish measurements	CNL							
Seek sponsor approval	CNL, IP Director							
Bi-monthly Meetings- Project Status Report	CNL, Project Team							
Review Infoview IUC device days extract logic, output report, & NHSN data reporting requirements with IT	CNL, Senior IT consultant, Lead Systems Administrator							
PDSA 1: Modify Infoview IUC days extract logic	Lead Systems Administrator							
Validate Infoview IUC device days output report using modified logic versus EMR	Lead Systems Administrator/CNL							
PDSA 2: Review Infoview IUC device days output report using modified logic; validate data and make necessary adjustments to the logic	Lead Systems Administrator, CNL, QNCs							
PDSA 3: Validate Infoview IUC device days output report versus EMR; make adjustments as needed	Lead Systems Administrator, CNL; QNCs							
Complete IUC device days data validation; seek approval for implementaton of revised logic	CNL							
Perform additional data validaton; prepare final reports	CNL							
Final Presentation	CNL							

Appendix K: Institutional Review Board

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CNL Project: Statement of Non-Research Determination Form

Student Name: Mary Grace Daria

Title of Project: Data Quality: Integral to CAUTI Surveillance and Improvement in Non-Critical Care Units

Brief Description of Project: This quality improvement project is set in non-critical care units of an acute care facility in the Diablo Service Area located in California. The existing Infoview Foley Catheter Days report is utilized for the daily abstraction of urinary catheter device days. Recent review of the report shows inconsistencies in data capture impacting the CAUTI SIR and urinary catheter device SUR. The inaccuracies may primarily be attributed to the following: multiple Epic Health Connect system upgrades; outdated denominator data extract logic; and inaccurate documentation of IUCs in the lines, drains, and airways (LDA) flowsheet section of the electronic medical record (EMR) by frontline staff. This project will increase the accuracy of urinary catheter device days capture from 60% to 80% by updating the electronic device days data extract logic by July 31, 2023. Moreover, the organization continually seeks opportunities to improve quality and patient safety and this project will significantly influence the targeted and data-driven infection surveillance and prevention initiatives.

A) **Aim Statement:** By revising the IUC device days data extract logic, the CAUTI denominator data quality in non-critical care units will improve from a baseline of 60% to 80% by July 31, 2023.

B) **Description of Intervention:** This project will revise the urinary catheter device days extract logic used by Infoview to account for urinary device days. The process measures include to implement criteria that will: 1) search for urinary device per single inpatient admission encounter; 2) capture and apply the date of inpatient admission status as the date of inpatient admission; and 3) calculate urinary catheter days at 23:59 hours.

C) **How will this intervention change practice?** Revising the urinary catheter device days extract logic used for the Infoview Foley Catheter Days report will eliminate additional urinary catheter days between inpatient encounters and while the patient is in the emergency department (ED). The revised logic will also apply the date and time of inpatient admission status instead of the ED encounter. Finally, the revised logic will exclude urinary catheters with a documented disposition of "not present on assessment." All these changes will consequently improve compliance with NHSN and regulatory reporting requirements.

D) Outcome measurements: The CAUTI denominator data quality in non-critical care units will improve from a baseline of 60% to 80%.

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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: Data Quality: Integral to CAUTI Surveillance and Improvement in Non-Critical Care Units	**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 formally supervised by the Institutional Review Board.*"	X	

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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):

Mary Grace Daria

Signature of Student: Mary Grace Daria **DATE** January 31, 2023

Liesel Buchner

SUPERVISING FACULTY MEMBER NAME (Please print):

Signature of Supervising Faculty Member: Liesel Buchner **DATE** January 31, 2023

Appendix L: Data Validation Tools

NHSN Toolkit for Data Quality Checks for Reporting Facilities

IUC Device Days Data Validation Using Revised Infoview Output Report Versus EMR

IUC Device Days Data Validation Using Revised Infoview Output Report Versus EMR														
			Infoview Report		EMR		Infoview Report	EMR	foview Repo	EMR	Infoview Report	Infoview/EMR	EMR Review Findings	
MONTH	DATE	# records reviewed	Inpatient ADM Date/Time	Discharge Date/Time	Inpatient ADM Date/Time	Discharge Date/Time	IUC (insertion/start, date/time)	IUC (insertion/start, date/time)	IUC (removal date/time)	IUC (removal date/time)	23:00 Data Pull	% Compliance	*NOTE: For data pull-validate Infoview output report before and after insertion and removal to ensure IUC is not captured prior to insertion date and after removal*	
JAN														
	1/1/2023	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	1/20/2023	4	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	Data extract logic captured the first instance of inpatient admission class and started counting IUC as programmed. Logic also captures the date/time of succeeding INPT ADM MD oder entry.	
	1/26/2023	6	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	1/13/2023	4	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	1/29/2023	4	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	1/15/2023	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	1/8/2023	4	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	1/22/2023	5	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	1/31/2023	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	1/30/2023	4	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	TOTAL	40												
FEB														
	2/5, 2/6, 2/8	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	Data extract logic captured the first instance of inpatient admission class and started counting IUC as programmed. Logic also captures the date/time of succeeding INPT ADM MD oder entry.	
	2/20/2023	6	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	2/5/2023	6	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	2/14/2023	1	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	2/17/2023	4	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	2/24/2023	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	2/28/2023	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	2/1/2023	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	2/1/2023	4	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	2/1/2023	7	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	TOTAL	40												
MAR														
	3/1/23	2	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	Logic captured an IUC inserted in 2010 from the IUC database; accurately transcribed into the LDA Avatar but not included in the active LDA flowsheet. Logic accounted for IUC device days as programmed.	
	3/15/2023	5	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	3/20/2023	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	3/27/2023	2	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	3/11/2023	5	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	3/24/2023	4	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	3/1/2023	4	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	3/28/2023	4	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	3/2/2023	5	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	3/9/2023	6	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	TOTAL	40												

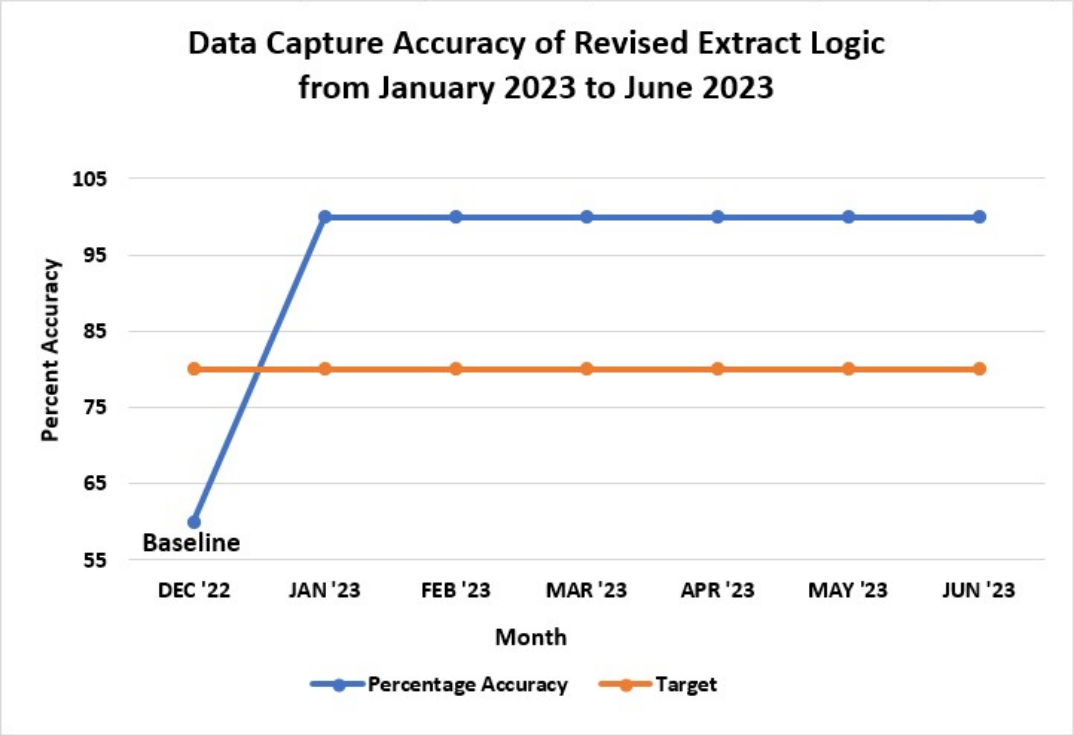
IUC Device Days Data Validation Using Revised Infoview Output Report Versus EMR														
			Infoview Report		EMR		Infoview Report	EMR	foview Repo	EMR	Infoview Report	Infoview/EMR	EMR Review Findings	
MONTH	DATE	# records reviewed	Inpatient ADM Date/Time	Discharge Date/Time	Inpatient ADM Date/Time	Discharge Date/Time	IUC (insertion/start, date/time)	IUC (insertion/start, date/time)	IUC (removal date/time)	IUC (removal date/time)	23:00 Data Pull	% Compliance	*NOTE: For data pull-validate Infoview output report before and after insertion and removal to ensure IUC is not captured prior to insertion date and after removal*	
APR														
	4/8-4/10	5	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	Logic captured an IUC inserted in 2010 from the IUC database; accurately transcribed into the LDA Avatar but not included in the active LDA flowsheet. Logic accounted for the IUC device days as	
	4/15-4/17	5	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	Logic captured an old IUC from the database w/o insertion/removal time. Logic accounted for the IUC device days as programmed.	
	4/18/2023	6	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	4/28-4/29	4	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	4/19/2023	5	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	4/30/1930	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	Logic captured an IUC inserted in 2009 from the database. Logic accounted for the IUC device days as programmed. Confirmed with IT.	
	4/10/2023	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	4/21/2023	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	4/4/2023	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%		
	4/11/2023	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	Data extract logic captured the first instance of inpatient admission class and started counting IUC; accounted for device days as programmed. Logic also captures the date/time of succeeding INPT ADM MD oder entry. Captured an old foley from the LDA Avatar w/o removal/ disposition date & time but IUC was not documented in the LDA	
	TOTAL	40												

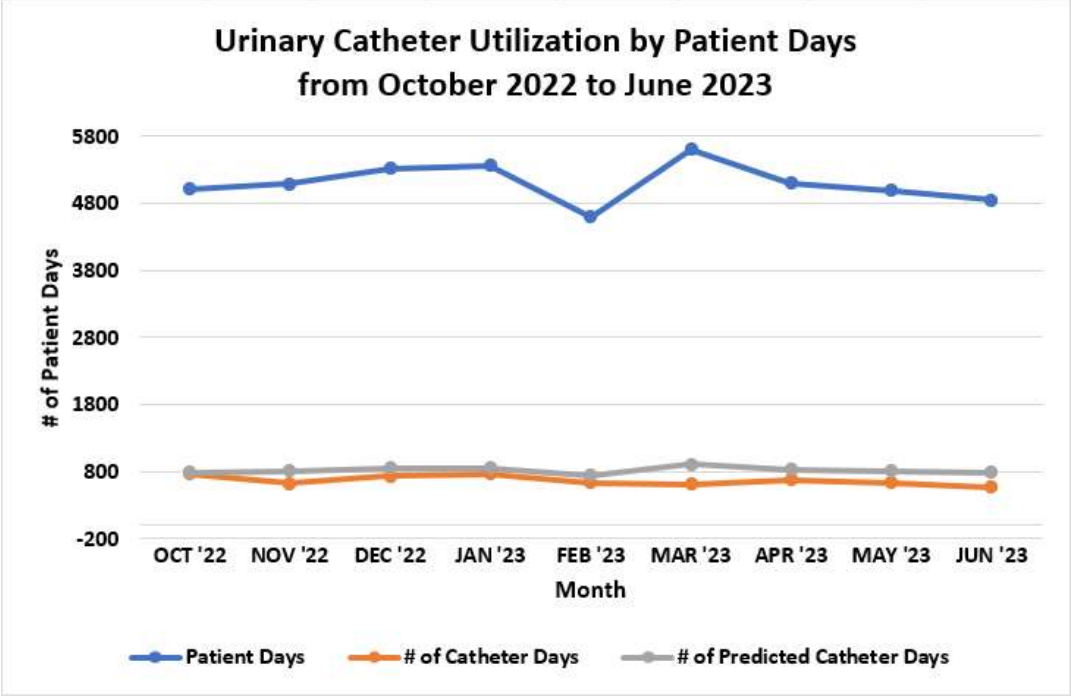
IUC Device Days Data Validation Using Revised Infoview Output Report Versus EMR													
			Infoview Report		EMR		Infoview Report	EMR	foview Repo	EMR	Infoview Report	Infoview/EMR	EMR Review Findings
MONTH	DATE	# records reviewed	Inpatient ADM Date/Time	Discharge Date/Time	Inpatient ADM Date/Time	Discharge Date/Time	IUC (insertion/start, date/time)	IUC (insertion/start, date/time)	IUC (removal date/time)	IUC (removal date/time)	23:00 Data Pull	% Compliance	*NOTE: For data pull-validate Infoview output report before and after insertion and removal to ensure IUC is not captured prior to insertion date and after removal*
MAY	5/17/23	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	
	5/1/23	2	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	
	5/4/23	1	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	Data extract logic captured the first instance of inpatient admission class and started counting IUC; accounted for device days as programmed. Logic also captures the date/time of succeeding INPT
	5/26/23	2	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	
	5/15/23	2	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	Data extract logic captured the first instance of inpatient admission class and started counting IUC; accounted for device days as programmed. Logic also captures the date/time of succeeding INPT
	5/15/23	10	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	Logic captured an IUC without insertion and removal time. Logic applied 12MN as the time of insertion/removal time while the patient remains admitted to the
	5/31/23	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	
	5/23/23	7	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	
	5/6/23	4	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	
	5/6/23	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	Logic captured an IUC inserted w/o documented insertoin time; logic applied 12MN as insertion time. FIN assessment started on the same day at 1455.
	5/18/23	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	1 record with foley from 6/14-617 but no foley in LDA and Avatar, logic captured the foley from 2010 without a removal date and asigned device days accurately
	TOTAL	40											

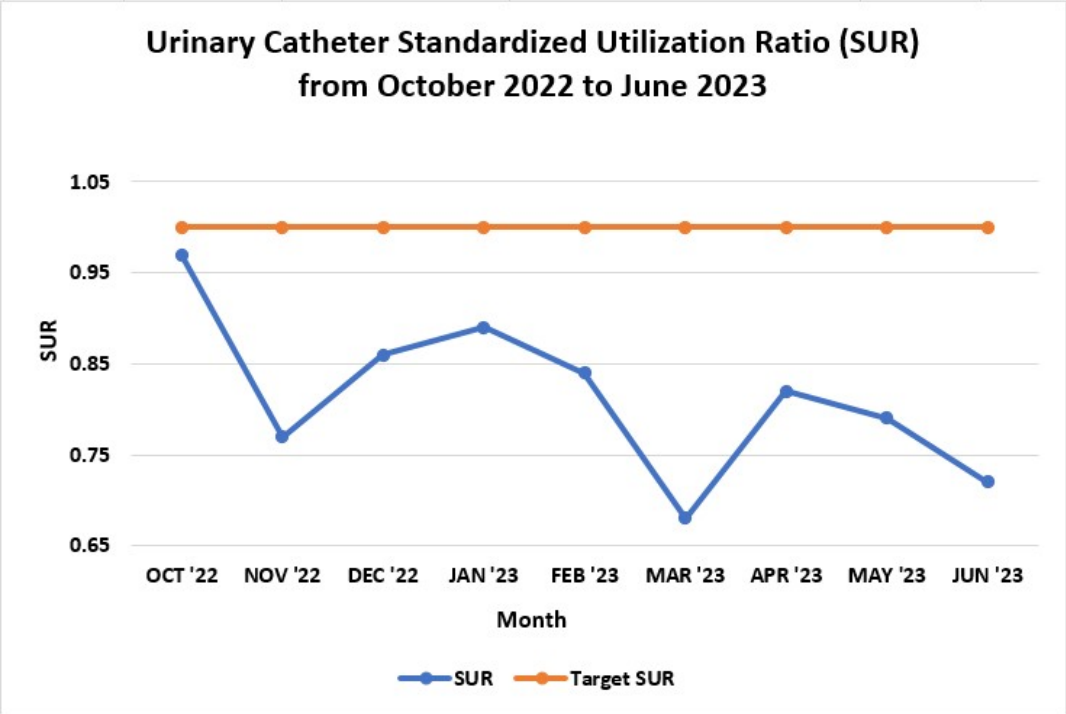
IUC Device Days Data Validation Using Revised Infoview Output Report Versus EMR													
			Infoview Report		EMR		Infoview Report	EMR	foview Repo	EMR	Infoview Report	Infoview/EMR	EMR Review Findings
MONTH	DATE	# records reviewed	Inpatient ADM Date/Time	Discharge Date/Time	Inpatient ADM Date/Time	Discharge Date/Time	IUC (insertion/start, date/time)	IUC (insertion/start, date/time)	IUC (removal date/time)	IUC (removal date/time)	23:00 Data Pull	% Compliance	*NOTE: For data pull-validate Infoview output report before and after insertion and removal to ensure IUC is not captured prior to insertion date and after removal*
MAY	5/17/23	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	
	5/1/23	2	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	
	5/4/23	1	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	Data extract logic captured the first instance of inpatient admission class and started counting IUC; accounted for device days as programmed. Logic also captures the date/time of succeeding INPT
	5/26/23	2	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	
	5/15/23	2	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	Data extract logic captured the first instance of inpatient admission class and started counting IUC; accounted for device days as programmed. Logic also captures the date/time of succeeding INPT
	5/15/23	10	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	Logic captured an IUC without insertion and removal time. Logic applied 12MN as the time of insertion/removal time while the patient remains admitted to the
	5/31/23	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	
	5/23/23	7	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	
	5/6/23	4	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	
	5/6/23	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	Logic captured an IUC inserted w/o documented insertoin time; logic applied 12MN as insertion time. FIN assessment started on the same day at 1455.
	5/18/23	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	1 record with foley from 6/14-617 but no foley in LDA and Avatar, logic captured the foley from 2010 without a removal date and asigned device days accurately
	TOTAL	40											

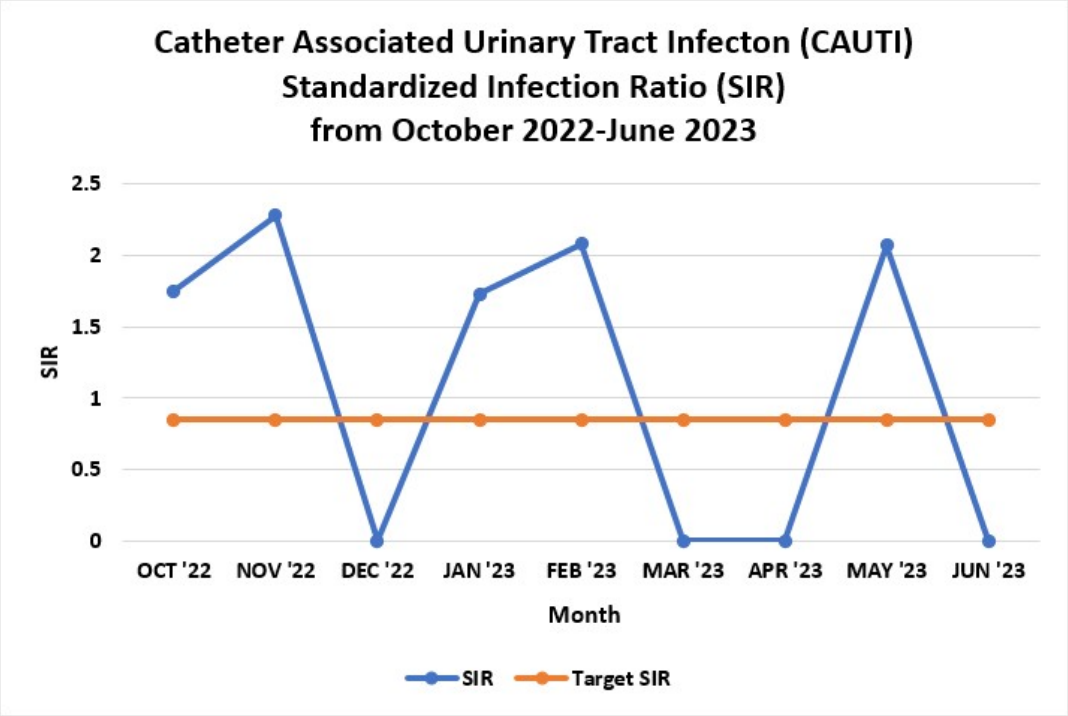
			Infoview Report		EMR		Infoview Report	EMR	foview Repo	EMR	Infoview Report	Infoview/EMR	EMR Review Findings
MONTH	DATE	# records reviewed	Inpatient ADM Date/Time	Discharge Date/Time	Inpatient ADM Date/Time	Discharge Date/Time	IUC (insertion/start, date/time)	IUC (insertion/start, date/time)	IUC (removal date/time)	IUC (removal date/time)	23:00 Data Pull	% Compliance	***NOTE:*** *For data pull-validate Infoview output report before and after insertion and removal to ensure IUC is not captured prior to insertion date and after removal*
JUN													
	6/8, 6/14	2	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	Logic captured an IUC inserted on day of ADM w/o insertion time, logic applied the date and time of inpt ADM as expected.
	6/10/2023	7	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	
	6/23/2023	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	Logic captured an IUC from 2010 but not in LDA FS or LDA Avatar. Logic accounted device days throughout ADM since there is no removal/disposition date/time. Logic applied the set criteria as programmed. Confirmed with IT.
	6/4/2023	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	Logic captured old foley from the Avatar w/o removal date but not trasncribed in the active LDA flowsheet, logic accounted for device days as programmed.
	6/26/2023	4	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	
	6/16/2023	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	
	6/7/2023	8	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	
	6/13/2023	5	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	
	6/9/2023	3	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	
	6/3/2023	2	matched	matched	matched	matched	matched	matched	matched	matched	matched	100%	
	TOTAL	40											

Appendix M: Outcome & Balancing Measures Visualization






Urinary Catheter Standardized Utilization Ratio (SUR)
from October 2022 to June 2023
1.05
0.95
0.85
0.75
0.65
SUR
OCT '22
NOV '22
DEC '22
JAN '23
FEB '23
MAR '23
APR '23
MAY '23
JUN '23
Month
SUR
Target SUR


Catheter Associated Urinary Tract Infecton (CAUTI)
Standardized Infection Ratio (SIR)
from October 2022-June 2023
2.5
2
1.5
1
0.5
0
SIR
OCT '22
NOV '22
DEC '22
JAN '23
FEB '23
MAR '23
APR '23
MAY '23
JUN '23
Month
SIR
Target SIR