Executive Summary
Centura Health, founded in 1996, manages the assets of two sponsors under a joint operating agreement. For more than 100 years, Centura Health hospitals and services have been helping people to live healthier, longer lives. Our sponsors, Catholic Health Initiatives and Adventist Health System, have long provided compassionate, leading-edge care to those in need throughout the region. Our mission is to extend the healing ministry of Christ by caring for those who are ill and by nurturing the health of the people in our communities.

Centura Health is focused on providing affordable, world-class care through an integrated network in Colorado and Western Kansas. Over 17,000 of the best hearts and minds in medicine, along with 6,000 physician partners, serve more than one million patients each year.

In 2007 we saw the potential to integrate several clinical systems into a common, secure Electronic Health Record (EHR) system to make patient health information available across all Centura Health facilities while preserving patient privacy and information security. Centura’s EHR currently contains approximately 2.4 million patient records making it the largest integrated health network in the region.

Our entire organization is committed to improving quality care and patient safety. As such, it is making great progress in these areas through a commitment to evidence-based practice (EBP). Our healthcare decisions integrate the best, most current evidence-based practice with clinical expertise and patient, family, and community values for optimal patient care.

This case study demonstrates how Centura Health successfully implemented two initiatives in the areas of CAUTI prevention and VTE prevention to adopt national best practices and implement measures to exemplify high quality patient care. The Evidence Based Practice (EBP) initiatives described in this case study were implemented to optimize compliance with process measures known to lead to better outcomes. Centura Health successfully decreased Hospital Acquired Conditions (HACs) by reducing the number of catheter associated urinary tract infection (CAUTI) occurrences and preventable venous thromboembolism (VTE) events.

Local Problem being Addressed and Intended Improvement
Centura Health consistently strives to identify and eliminate the risk of HACs that could threaten the lives of our patients and the financial health of our organization and communities. HACs are among the top ten leading causes of death in the United States. [1]. It is well known that HACs can be devastating to patients and families, causing a significant financial burden due to additional medications, treatments, procedures, lost wages, short- and long-term illnesses, as well as pain, suffering and death.
According to the Centers for Disease Control and Prevention, Urinary Tract Infections (UTIs) are one of the most common types of hospital-acquired conditions reported to the National Healthcare Safety Network (NHSN), accounting for more than 30 percent of HACs reported by acute care hospitals. Virtually all healthcare-associated UTIs are caused by instrumentation of the urinary tract (e.g. insertion of catheters); between 15-25% of hospitalized patients receive urinary catheters during their hospital stay. CAUTI (Catheter-Associated Urinary Tract Infection) has been associated with increased morbidity, mortality, hospital cost, and length of stay. The good news is that many CAUTIs may be prevented with recommended infection control measures. The most important risk factor for developing a CAUTI is prolonged use of the urinary catheter. With increased awareness and adoption of improved practices, health organizations in the Colorado region can reduce the risks of CAUTI occurrences.

Venous thromboembolism (VTE) is one of the most common hospital complications and the most common one leading to death. According to the CDC, “About 25% of calf vein DVTs, if left untreated, will extend to involve the proximal lower extremity veins (popliteal, femoral, or iliac veins); a proximal lower extremity DVT, if left untreated, has about a 50% risk of leading to a PE. Venous thromboembolism (VTE) is a term that includes both DVT and PE. VTE is often recurrent, and long-term complications, such as post thrombotic syndrome after a DVT or chronic thromboembolic pulmonary hypertension after a PE, are frequent.” And according to the Journal of the American Medical Association, Pulmonary Embolism continues to be a primary concern for physicians throughout the U.S.

Significant advances have been made in the prevention of hospital associated VTE and it is incumbent on all of us in healthcare to adopt and adhere to the best evidence regarding VTE prophylaxis. In 2013 the incidence of potentially preventable VTE at Centura was 20.73%. This was not satisfactory. With the advent of our EHR era in 2007, we had designed nursing interventions to try to prevent VTE; this was during an era when providers were asked to do little more than view lab results in the computer. We knew that nurses did a very good job of mobilizing patients and adhering to other interventions around this serious hospital acquired condition. It was evident that we needed to change physician behavior. Although providers knew the literature and acknowledged the wisdom of VTE prophylaxis, this aspect of care was too often forgotten in their daily workflow. We set a goal of reducing potentially preventable VTE to zero and focused on the provider-facing tools our EHR offered.

**CAUTI**

**Design and Implementation:** The primary goal of the CAUTI project was to significantly reduce the CAUTI rate per 1000 catheter days. In 2012, Centura Health developed a plan for the full implementation of NPSG.07.06.06 (Implement evidence-based practices to prevent CAUTI, January 1, 2013, The Joint Commission, 2011). This evidence-based prevention program would ensure proper insertion and management of catheters and reduce the incidence of CAUTI in patients with an indwelling urinary catheter.

The Adult Acute Care CAUTI Prevention EBP Team, an interdisciplinary team comprised of physicians, clinical informaticists, IT analysts, and a nurse scientist, was formed to meet 3 main goals:

- Reduce urinary catheter days
- Remove urinary catheter by post-operative day 2
- Reduce CAUTI rate per 1000 urinary catheter days

The team employed a Rapid Improvement Event strategy that involved 3-day long “Rapid Kaizen”
The team developed and implemented a CAUTI Prevention Toolkit that supported ongoing assessment, implementation and audits, education and competency tools. It also provides guidance on additional resources available to support a local overall education approach to achieve the goals established for this EBP. The toolkit included changes to nursing documentation, order sets, and physician documentation in the EHR, and before a new report gathering the newly automated data points on insertion, records of catheter maintenance, removal, and catheter days.

The entire organization was engaged in the education campaign to catheterize only when necessary and remove catheters promptly when indicated. The term “You can’t get a CAUTI if you don’t have a catheter” was heard often.

- Supply Chain product changes were made to ensure indwelling urinary catheter supplies that reflect evidence-based practices are available for practitioner use.
- Clinical practices were standardized relating to insertion, maintenance, and removal of catheters.
- Competency assessments of insertion, maintenance and removal of indwelling urinary catheters were established and enforced.
- A required process metric was established for each facility to achieve a 100% education completion rate for all caregivers.
- A quarterly point prevalence survey for inpatient care areas was conducted in all facilities.
- Leaders had the information and resources to effectively champion the CAUTI EBP implementation and effectively respond to stakeholder resistance.
- Clinical stakeholders have a clear understanding of the burden of CAUTIs and what they must do to avoid unnecessary use of indwelling urinary catheters to reduce patients’ risk for infection along with steps to facilitate prompt removal.
- Clinicians and staff who support catheter care will have the information they need for successful management of indwelling urinary catheters.

**How was Health IT Utilized?** With regard to CAUTI, the method selected by this group guaranteed success through programs that included pre-selected orders for catheter removal post-operatively, standardized catheter management for both medical and surgical patients, and included reminders in physician documentation to indicate why a catheter was still in.
Provider daily progress note documentation:

For nursing staff, reminders were added in nursing documentation based on a removal algorithm that has evolved recently into nurse-driven catheter removal protocols. Additional new nursing tools included the ability to indicate if the urinary catheter was present on admission, and the catheter care intervention was pushed to the nurse’s task list by placement of the ‘insert catheter’ order.

In addition, the following algorithm was instituted for all inpatient units and supported by nursing documentation within the genitourinary assessment that is prompted every shift:

```
Algorithm for Removal of Indwelling Catheter

Indwelling catheter in place?  NO

Yes

Does patient meet criteria to leave indwelling catheter in? (See #1-9 below)

No

Order obtained to remove indwelling catheter?

Yes

Remove indwelling catheter

No

Notify Supervisor

No

Document Continue to assess daily

Yes

Obtain order to remove indwelling catheter

Yes

Order obtained to remove indwelling catheter?

Yes

Remove indwelling catheter

No

No action necessary. Continue to assess urinary output. Avoid catheter placement.
```

Reason for Cont. Catheter:

- Acute Outlet Obstruction
- Incontinence
- Neurogenic Bladder
- Comfort Care/End of Life
- Major Surgery
- Sedated/Comatose
- Difficult Insertion
- Major Trauma
- Special Purpose (Please

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<tr>
<td>Urinary Catheter Present?</td>
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<td>No</td>
<td></td>
</tr>
<tr>
<td>&quot;BEDREST INSUFFICIENT REASON&quot;</td>
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*Table:*

- Acute Outlet Obstruction
- Incontinence
- Neurogenic Bladder
- Comfort Care/End of Life
- Major Surgery
- Sedated/Comatose
- Difficult Insertion
- Major Trauma
- Special Purpose (Please
The nurse can refer to this protocol from within the intervention at any time:

A new report was developed to facilitate data collection and monitoring by our infection preventionists. This report is delivered daily to each hospital-based infection preventionist:

The report examines where catheters are inserted, total catheter days, and documentation of removal. Infection preventionists use these reports to follow up with chart reviews or conversations with physicians or nurses. These experts also perform random direct observation of insertion and maintenance procedures on a unit level. An insertion checklist is in place and compliance with the checklist is included in the direct observation audits.

A robust education and communication program was implemented to educate medical staff, nurses and employees across the hospital emphasizing their role in preventing infection.
Nicholas E. Davies Enterprise Award of Excellence
Reducing the Risk of Hospital Acquired Conditions

Catheter-Associated Urinary Tract Infection Prevention

Physician Newsletter Article

*PHYSICIANS VITAL TO REDUCING RATE OF CAUTIs*

Infections acquired in health care facilities threaten the lives of patients and staff and the financial health of the organization. This is true here at Evani-Yazer Med. National research found 50 percent of all major avoidable hospital complications are catheter-associated urinary tract infections (CAUTIs).

**The power to stop infection is in your hands**

Facility Name is launching a major initiative to reduce CAUTIs and physicians play a critical role if we are to be successful. Research clearly shows two areas where physicians play a critical role in our success.

First is the avoidance of unnecessary catheterizations. According to national research, 41 percent of the time, physicians were unaware of patients who had been inappropriately catheterized. Farther, 21 percent of urinary catheters were not indicated at insertion and 41-00 percent of urinary catheters in place were found to be unnecessary.

Secondly, once a catheter is placed the duration of catheterization becomes the most important infection risk factor for CAUTIs. With increased awareness and adoption of improved practices, other health care organizations have reduced rates of CAUTIs by 48-51 percent. [insert facility's goal for reducing CAUTIs]

**Adoption of nationally recognized guidelines**

Facility Name has adopted a policy and practice standards for use and management of indwelling urinary catheters based on published research and expert guidelines. Physicians and nurses are asked to follow recommended guidelines for placement of indwelling urinary catheters and will review the need for continued use every day for every catheterized patient. To achieve our goal of no healthcare-associated CAUTIs, we ask that you catheterize only when necessary and remove catheters promptly when indicated.

We also ask that you avoid screening and treating asymptomatic bacteruria in catheterized patients and avoid the use of prophylactic systemic antimicrobials.

Nurses, patients will ask “Is a catheter still necessary?”

Our CAUTI initiative includes educating medical staff, nurses and employees across the hospital in their role in preventing infection. Nurses are expected to use strict aseptic insertion techniques. In addition, several mechanisms will be in place to ensure proper daily management and prompt catheter removal per protocol. [insert information about CPOE/IDOC]. Nurses will also ask for orders to remove catheters if indicated.

We will also engage patients and families, encouraging them to wash their hands, maintain strict hygiene, report problems, and question clinicians if a catheter continues to be necessary and when it can be removed.

We can achieve our goal of fewer urinary tract infections in our patients so that they recover sooner and are more comfortable. Working together, we will reach zero CAUTIs.

For questions or to request copies of research articles, please contact: [insert name of facility project lead/phone/email]


**Sidebar**

**Indications for indwelling catheter:**

- Epidural catheters in place
- Major renal, urologic, colorectal, abdominal or pelvic surgery
- For strict urine output or 24-hour urine collection **AND** patient is incontinent or unable to use uinal or bedpan
- Pelvic fracture or crush injury
- Management of urinary incontinence for open wound(s) in sacral or perineal area (e.g. Stage III or IV pressure ulcers)
- To provide relief of urinary tract obstruction not manageable by other means.
- To permit drainage due to neurogenic bladder dysfunction or urinary retention not manageable by other means (i.e., with clean intermittent catheterization).
- Indwelling catheter placed by physician due to difficult insertion or for special purpose.
- Comfort care for end-of-life
Reinforcement of provider utilization of the standard orders and documentation tools is continuous, and included regular reports of CAUTI rates for each MEC, discussions between medical staff leaders and practicing physicians, and rigorous support of our nurses as they began to be more assertive about the decision to remove a catheter. Several hospitals have created nursing protocols for catheter removal with medical staff involvement and approval. Physician trainers, hospitals quality officers and infection preventionists reinforce best practice at the elbow while making their rounds of the hospital floors. Our system clinical and operational leadership adopted HAC and patient safety metrics in the measurement of their overall job performance, which perpetuates leadership support for sustained improvement.

Over time, it was also recognized that a surveillance board could be utilized to track these documentation and compliance pieces in real time to improve responsiveness. The CAUTI Surveillance Status Board was implemented within the EMR in February of 2013. Each facility appoints the people (from unit clerk to charge nurse) responsible for monitoring this board. The monitor will personally follow up with any nurse who has missing documentation or whose patient has catheter days greater than 2, so that appropriate action can be taken.

<table>
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<th>Temp - C</th>
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Value Derived/Outcomes: For the CAUTI project, we coordinated and managed changes in attitude, changes in behavior, and EHR changes. As a result, we have reduced catheter days by 38% since 2012 and reduced catheter associated UTIs by 32% from 2013 to 2014. We reduced our NHSN standardized infection ratio from 1.42 in 2014 to 0.95 in 2015. Assuming the 2012 rate for the ensuing years, and using CDC cost per case of $896 per case, we have saved 108 people from the suffering associated with a CAUTI and avoided nearly $100,000 in cost of care.
Nicholas E. Davies Enterprise Award of Excellence
Reducing the Risk of Hospital Acquired Conditions
VTE Prophylaxis

**Design and Implementation:** In early 2014, we formed a multidisciplinary team comprised of hospitalists, nurses, pharmacists and quality specialists to update our approach to VTE prophylaxis. Several foundational decisions were made by the group:

- We would change from ‘lumping’ to ‘splitting’ as our guiding philosophy for our VTE prophylaxis ordering. At the time we offered two standard order sets: a medical and a surgical approach to ordering prophylaxis. We decided we would make the order sets more specific and thereby shorten them to enhance usability.
- We would build nine condition-specific sets, including medical, general surgical, obstetrics, elective spine, total knee arthroplasty, total hip arthroplasty, hip fracture, craniotomy, and trauma.
- We would build in VTE risk scores and bleeding risk scores.
- We would redesign the contraindication documentation options to make it easier for physicians to identify why VTE prophylaxis was contraindicated.
- We would make it easy to get the right dose of the medication to the patient.

The group systematically reviewed the 2012 ACCP Guidelines and ACOG recommendations to create ten order sets that could be embedded into all condition-based order sets where appropriate. We also added risk scoring to our physician documentation tools as well as our order sets. We got approval from our Physician Advisory Council to allow automatic renal dose adjustment for all anticoagulants and incorporated this aspect into our order sets. All heparin management was protocolled so that our pharmacy experts could monitor and adjust dosages as appropriate. This was endorsed by the system Pharmacy & Therapeutics (P&T) committee when it was formed in late 2014.

**How was Health IT Utilized?:** To address potentially preventable VTE, our project revolved around changing our order sets and provider documentation in the EHR. Provider education was accomplished around the changes; changes to nursing workflow and pharmacy tasks were minimal. Only the medications that are first line recommendations from the ACCP guidelines are included in each of the focused order sets. All order sets contain the recommended monitoring and nursing care. Entirely new to our decision support was the addition of risk scoring tools for VTE and for bleeding to assist the physician during ordering and during documentation to make an appropriate prophylaxis choice. In addition to being a part of all ten individual order sets, the pharmacologic and mechanical contraindications orders are placed strategically in those order sets where VTE prophylaxis will not be used (e.g. hemorrhagic stroke). Additionally, the ability to document contraindications was added to the provider documentation templates.
Reasons for no pharmacologic prophylaxis:
Example of the risking tool filled out:

In documentation templates:

All adult templates have a standard Assessment & Plan section:

The VTE risk & prophylaxis header expands sequentially according to the responses given:
For both projects, our system scorecard tracks our success with preventable harm. This scorecard is used for quarterly operational deep dives with system leaders.

**Value Derived/Outcomes:** Our rate of appropriate VTE prophylaxis has increased by 8.25 percentage points to almost 96%. More importantly, our rate of post op PE or DVT has dropped by 58% since 2013. We estimate we have prevented this serious complication for 171 people in the past 2 years. Assuming a cost per VTE of $10,000, this results in $1,710,000 in cost avoidance.*

For both initiatives, in combination with work done by our clinical teams on falls and other preventable harm, we can claim some contribution to our decreasing overall length of stay from 4.5 days in 2012 to 4.22 days in 2015.

**Lessons Learned**

- These were multidisciplinary, multi-year projects that depended on changing longstanding attitudes and behaviors of our clinical caregivers. Both physicians and nurses were asked to change their thinking about and approach to the use of catheters, and both also became more vigilant about VTE prevention in their daily practice. The CAUTI initiative required a large re-education effort for our nurses since they are largely responsible for the mechanics of catheter insertion and care. Both of these initiatives required a change in ordering habits for our physicians. With VTE, we achieved a substantive change from a holistic optimization project, driven by our Physician Advisory Council which addressed both order sets and physician documentation tools.

- A key element to the success of the CAUTI project was the assignment of a specific nurse leader who was also the leading SME for CAUTI, and who became the project champion across the system.

- Even with the multiple cues for nurses, it became apparent that longstanding behaviors were not reliably changed. As a result, catheter days are included in safety huddles, and nurses continue to drive their colleagues toward long-term accountability.

- The insertion and removal timeframe in the status board is only as accurate as the data entry. Centura identified some discrepancies in how this was being entered and decided to re-educate clinical staff on data entry expectations.

- Clinical Content Governance has a strong partnership with IT to work together to design, build and execute on strategic or tactical goals identified by our clinical and operational leadership. Two multidisciplinary clinical committees (one overseeing nursing dominated workflows, the other overseeing provider dominated workflows, and both including ambulatory as well as inpatient and ED representation) oversee the planning and execution of clinical content changes, decision support, and other function of the EHR. Close coordination with IT and our Business Intelligence team was essential in order to develop the most efficient and effective content changes and reporting tools to support each project. LEAN methodology is used commonly. Each application (i.e. imaging, lab and others) has its own steering committee, comprised of directors and managers of the area from each facility. These groups oversee the workflows, technical build, and content for their area of responsibility. For larger clinical projects we commission multidisciplinary Clinical Effectiveness Groups ad hoc. We have experts in project management and change management available for larger projects. We have agreed to certain guiding principles for all the work we address and certain ‘rules of the road’ for making decisions. Communication is standard and regular, and change is facilitated locally by an Entity Implementation Team.

**Financial Considerations**

The VTE project was supported through routine operational resources, including the content management team, clinical informaticists, IT, and subject matter experts from quality, medical and nursing roles. Committee time for the redesign totaled about 60 hours. IT time for EHR changes was about $8,000. There was no measurable cost for reporting, as it was already in place. Education material development and system wide physician education was supported through normal channels and cost approximately $2,000 in time.
The Physician Advisory Council is comprised of representatives of the active medical staff from each hospital and from our group practice, who are funded by the hospital budget process. This group works closely with our nursing informaticists and clinical pharmacists to optimize the function and usability of our EHR. By focusing on a universally-acknowledged and non-controversial topic such VTE prevention, this group has developed a solid working understanding of how to make substantive change across the entire system of hospitals despite local size, cultural, staffing, and patient population differences.

As our EHR utilization has matured and become the foundation of all clinical care delivered in the system, we have made conscious choices to financially support expert involvement in the process of developing solutions and implementing changes. We support a content management group with three full-time members and multiple subject matter experts who are subsidized for their time. The financial commitment to content management and optimization has steadily grown over the past 3 years, to include approximately $1 million in medical expertise and 15 full-time clinical informaticists. These positions are not considered part of our IT structure or budget, and have been supported by our hospitals and group practice.

The CAUTI project was budgeted for and planned into the larger EMR improvement and evidence based practice initiatives across the organization. The initial Kaizen event and time to develop the toolkit is estimated at about $19,000 of mostly nursing time. IT build test and report writing totaled about $10,000. Education and communication costs were rolled into a mandatory skills lab for all clinical staff. This skills lab is comprised of many varied skills and is considered a mandatory annual activity for our nursing and other clinical staff. The budget for this is about $100,000 each year.

References
