The Christus St. Vincent (CSVRM) Hospital Board and Senior Executive Team has prioritized quality of care and set a "Zero-Harm" goal, as is stated in our Strategic Plan. The hospital has established a Clinician-Directed Performance Improvement (CDPI) program to help attain this goal. CDPI gives practicing clinicians the protected time, support, and training to conduct performance improvement projects based on their insight, expertise, and frontline understanding. The CDPI ICU dyad (physician and nurse) pursued this project to improve prevention of Central Line Associated Bloodstream Infection (CLABSI) with approval and guidance from the CDPI Steering Committee, including Senior Executive Team members. CDPI collaborated with leadership from relevant departments including Quality, Lab, ICU, and ED.

**PROCESS OF IDENTIFYING NEED**

Historically, CSV patients had high rates of CLABSI, as reported to NHSN for purposes of CMS public reporting and pay-for-performance programs. CLABSI is a significant cause of morbidity and mortality and our high rates were fundamentally incompatible with our institutional goal of "Zero-Harm." At the level of the front line, the CDPI ICU clinician dyad had witnessed this morbidity and mortality first hand and were committed to prevention. In addition, the attributable cost of each episode generated by CLABSI was over $350,000 per year.

**PROCESS OF IMPROVEMENT METHODS**

This project was conducted through the CDPI performance improvement course called the CSV Advancing Training Program in Healthcare Delivery Improvement, which takes place over the course of one year and is designed to walk participants through a performance improvement project. The course teaches the 4Ms Model for improvement, which centers on three primary questions (What are we trying to accomplish? How will we know that change is improvement? What changes can we make that will result in improvement?) linked to rapid cycles of Plan-Do-Study-Act (PDSA). It borrows the principles of reducing variation and statistical process control from Six Sigma. In addition, the course promotes the use of many Lean tools, such as value stream mapping, Ishikawa/Fishbone diagrams, the 8 major types of waste, the 5Why’s, and the 5S system for workplace organization.

The CDPI clinician dyad established a project team including representation from frontline physicians and nurses with consultation by infectious disease and the quality department. Basic analyses of processes and respiratory data suggested line use near national needs and room for improvement and standardization around insertion and maintenance practices. An audit by an infectious disease specialist of all CLABSIs from 2014-2017 suggested that 75% were likely secondary to blood culture contamination.

Based on this baseline analysis, the team decided to focus on 4 contributors to CLABSI, as shown in the figure to the right. A specific aim statement (stating the primary metric and what change was targeted, for what population, over what time period) was formed for each contributor. Interventions are summarized below:

1. **Decreasing use of central lines:**
   - Development of standardized indications for ICU central lines with posting on PI nurse clipboards at each room
   - Discussion of duration and need for central lines built into rounding checklist and daily multidisciplinary ICU rounds
   - Education and data feedback
   - Increasing use of line insertion best practices:
     - Creation of a centralized line insertion checklist
     - Creation of expectation that line insertion checklist is completed by a second nurse observer in real time, to encourage active monitoring
   - Increasing use of line maintenance best practices:
     - Development of a bundle of best practices for the daily nursing care of central lines (e.g. dressing changes, use of cures caps on unused ports, etc.) with posting on PI nurse clipboards at each room
     - Implementation of daily “line rounds” before interdisciplinary ICU rounds to audit use of best practices and indications for central lines, and to provide an opportunity for bedside education
   - Education and data feedback
   - Decreasing blood culture contamination:
     - This part of the project was led by the Quality Department, Lab, and ED, with data analysis and reporting support from CDPI. As above, an audit suggested that 1/3 of our reported CLABSI cases may actually have been contamination.
     - Didactic education for technicians and phlebotomists
     - Hands on training for technicians and phlebotomists
     - Prioritization of issue on ED Tech Council
     - Regular data feedback

**RESULTS**

- **Decreasing use of central lines:**
  - Rate of use of central lines reduced by 65% (0.39 line days per patient day to 0.18 line days per patient day, p<0.0001)
- **Increasing use of line insertion best practices:**
  - Rate of totally complete line insertion checklists for non-ICU central lines placed in the ICU
  - Mean ICU patient-days between events increased from 889 to 3704 after all interventions in place, p=0.0005
- **Increasing use of line maintenance best practices:**
  - Decrease in standardized infection ratio reported to NHSN/CMS from 2.35 to 1.90 (p<0.0001)
- **Decreasing blood culture contamination:**
  - Rate of use of central lines reduced by 65% (0.39 line days per patient day to 0.18 line days per patient day, p<0.0001)

**LESSONS LEARNED AND SUSTAINABILITY**

Jurian’s trilogy specifies three components of a complete quality program: (1) quality planning/QP, (2) quality improvement/QI, in which teams of experts research, develop, and test improvements; and (3) quality control/QC, in which the improvements developed by QI teams are operationalized, hardened, and sustained. When CDPI first began this project in late 2015, the organization had invested heavily in QI, but had not yet developed the interface with QC. As a result, the gains that were achieved in late 2015/early 2016 were partially lost when the QI team turned its attention away.

This is readily apparent in Graph III above. After initial gains in compliance with line maintenance practices, daily auditing was not sustained, and compliance temporarily decreased. As our data reflected this loss of engagement, CDPI returned attention to this project, at this time with explicit collaboration with unit management and nurse leadership to ensure continued support for operations. As a result of this and other lessons, in order to improve the sustainability of our QI efforts, our organization has further developed its QC capability as follows:

1. **Close working relationship between nurse management and CDPI:** With participation of CDPI Nurse Manager in Nurse Leadership Meetings
2. **Position of Director of Performance Improvement Nurse Coordinator,** who serves as the interface between CDPI teams/projects and unit management. For example, the P.I. Nurse conducts audits to support the CLABSI projects, attends unit huddles to present data and information relevant to CLABSI, and provides bedside support and education.
3. **Regular feedback of data to management and frontline,** for example on CDPI whiteboards on units.