SUSTAINING VAP BUNDLE COMPLIANCE IN THE ICU: A MODEL OF CQI

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Abstract

In 2005 the School of Industrial Engineering Technology at Indiana University Purdue University Indianapolis and the Sisters of Saint Francis Health Services, Inc, partnered to develop a Lean Six Sigma program in healthcare. Saint Margaret Mercy in Hammond and Dyer Indiana implemented an ICU LOS project aimed at delivering evidence-based care to all patients in the ICU on mechanical ventilation. Standardized protocols were developed and the initial results demonstrated dramatic reduction in total ventilator days, total ICU LOS, and the unit's ventilator associated pneumonia rate (VAP). For various reasons including: difficulty transitioning the project ownership during the Control phase from facilitator to process owner, weakening staff engagement in the project, multiple management changeovers within a two year period and initial absence of a clinical nurse specialist, the project outcomes deteriorated. ICU LOS went back up, staff compliance to the protocols and bundles decreased and the VAP rate was also affected. Leadership in the ICU, as well as the LSS project leader identified the issues to sustainability and the need for a stronger control plan. A VAP committee was started to focus, initially, on the failure modes of the current process and raise the project metrics back to the threshold. This team has now been able to identify further improvements in the care of the mechanical ventilated patient and has been able to develop the initial VAP project into one of continuous process and quality improvement.

History

Sisters of St. Francis Health Services, Inc. and IUPUI

Back in 2005, the corporation of Sisters of St. Francis Health Services, Inc. partnered with the School of Industrial Engineering Technology at Indiana University Purdue University Indianapolis to develop a corporate-wide Lean Six Sigma program. Each of the 13 facilities under the corporation had key staff members trained in the Lean Six Sigma methodology by the IUPUI professors. The training and project work were concurrently implemented. Meaning while each project team was trained in LSS techniques and tools, those tools and techniques were applied to a specific process. Each region of the parent corporation implemented many projects within the first two years as part of this partnership with IUPUI.

The Northern Indiana Regional Project

After successfully implementing their first LSS project, Emergency Department Lab Result Turn Around Time, the Chief Executive of the Northern Indiana Region decided to engage a team in analyzing the issue of Intensive Care Unit Length of Stay. ICU length of stay had been an issue that had eluded the executives of the four hospitals in the NIR for quite some time. Benchmark data from the Centers for Medicare Services revealed that some hospitals in the NIR were having increased utilization costs in their ICU's compared to other local hospitals. A team was pulled together made up of representatives from all four hospitals. Team members included Quality department managers and directors, QA analysts, case management, and a critical care educator.

The ICU LOS Project

The Define Phase

The team developed a project charter and performed voice of the customer analysis. From this analysis a SWOT diagram was created displaying key strengths, weaknesses, threats and opportunities of the current process. Customer input showed that although the ICU units all had strong, skilled nursing staff, that same staff had reservations to changing their practices. This was noted by the team as a barrier that would need to be overcome during any implementation in the ICU.

The Measure Phase

A report was created with the IS department to pull together specific historical data based on demographics as well as on charges to each patient account. The goal was to have an automated report that would deliver key measurements integral to measuring each ICU's performance fairly and accurately. This report gave specific diagnosis information, the patient's ICU LOS, the patient's overall hospital LOS, as well as total ventilator days per patient and their discharge disposition. In addition to this report, a data collection tool was developed to be used to assess for delays in discharge from the ICU. The case managers at each of the four campuses were responsible for collecting this data daily, assessing for delays in discharge. If the patient did not meet the criteria for ICU admission any longer, the case manager would choose a reason for delayed discharge. These delays included physician preference, waiting for tests. They also tracked whether any ventilator weaning assessments or trials were occurring for those ICU patients who were on mechanical ventilation.

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Analyze Phase

Once the data was collected at all four hospital sites, data was charted and analyzed. Root cause analysis was performed. ICU LOS and number of ventilator days were found to have a positive correlation. This led the team to further focus on the mechanically ventilated patients and the comparisons of clinical practices for this patient group between the four hospital sites. Clinical practice issues were discovered based on individual physician practices at the individual sites but also between sites.

Varying physician practices in timing of weaning trials and tracheostomy placement were found to be key process input variables. The differences in practice were reflected through data analysis of total ICU LOS and total ventilator days by discharge disposition. As many team members intuitively believed, those patients that were discharged to a long term care facility had higher LOS and ventilator days. These patients are those that require more long term mechanical ventilation and need tracheostomies prior to being discharged.

Following evidence-based practices with any degree of reliability was also found to be a key input variable. Clinical practice recommendations for mechanically ventilated patients include: maintaining head of bed elevation greater than 30 degrees, unless contraindicated, deep vein thrombosis prophylaxis, stress ulcer prophylaxis, daily sedation vacation and assessment for readiness to wean.

Improve Phase

The team developed improvements by benchmarking and through the use of affinity diagrams for each of the key process input variables. Utilizing an effort/impact matrix, the team chose the "best" solutions and began work on a planned pilot.

The team then held a meeting with the Champion team, made up of key Executives from the Region, as well as from each hospital campus. This Champion Team chose one campus to pilot the improvements. That campus was St. Margaret Mercy in Hammond, Indiana. Being that there was only one team member on the core Regional team from the Hammond campus, it was decided to pull another Hammond team of front-line staff into the project to avoid any buy-in issues.

This new team was made up of nurses and respiratory therapists from the Hammond campus. Core team improvements were refined by this local team, to better fit the needs of this specific campus. Physician Champions were engaged in the project and team members were given a brief introduction to the tools and methodology of Lean Six Sigma.

The pilot date was set, starting only with those physicians who agreed to be a part of the pilot. The improvements that were piloted included:

- Development of a standardized ventilator order set, including all elements of the ventilator bundle.
- Developed respiratory therapy-driven weaning protocol to reduce impact of varying physician practice in this area.
- Developed standard intensive glycemic control protocol.
- Implemented daily multidisciplinary patient rounds with a daily goals sheet to achieve patient-centered care.
- Visual controls developed for HOB scale to ensure adequate 30 degree elevation.
- Visual control set-up for glucometers, as well as purchase of additional glucometers to reduce non-value added time staff was spending searching for machines.
- Enforced oral care practices to meet practice recommendations.

Pilot Results

With three participating pulmonologists and their patients, this project team started the initial phase of the pilot on February 1, 2006. Within one month, the results were impressive. ICU LOS and total ventilator days were reduced significantly as compared to the non-pilot group. Glucose levels were better controlled and the measures of the ventilator bundle were up to greater than 85%.

With these results, the Champion team decided to spread the pilot to the entire ICU. Education and newsletters were sent to all physicians. The next pilot phase started April, 2006 and applied to all mechanically ventilated patients in the ICU.

The ICU-wide pilot results continued to be impressive, reducing both ICU LOS and total ventilator days by an average of 3.5 days. The results spilled over to total hospital LOS, with dramatic reductions. In addition to the LOS reductions, improvements in patient outcomes were also experienced. Ventilator associated pneumonia, a complication of mechanical ventilation, was reduced by 76%. Within one year of the project implementation, ICU mortality rates dropped by 3% at the Hammond campus.

Spreading the Results

By August 2006, Champion Executives decided to rotate the project to the other campuses. St. Margaret Mercy in Dyer, Indiana was the first campus to rotate this project. Again results were immediately achieved with reductions in both ICU LOS and total ventilator days. Within 10

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months, ICU mortality rates were reduced in this ICU by 4%, and the unit went 12 consecutive months without a single ventilator associated pneumonia. The remaining two hospitals also implemented this project and have also seen dramatic improvement in clinical outcomes and LOS reductions.

Sustaining the Results

The Control Phase

The team decided that three separate data collections would need to be ongoing for the Control Phase of this project. ICU LOS and ventilator days in the ICU would be collected and analyzed on a Quarterly basis through an automatically generated report developed with the Original Regional team. A report was generated through the IS department to pull all glucose levels for all ICU patients and would be reported to the unit on a monthly basis. Data on the elements of the ventilator bundle were to be collected on a daily basis during the multidisciplinary rounding and would be entered and analyzed on a monthly basis through the Quality Services department. The ICU did not own any of their own data with this set up. This would prove to be problematic later in the sustainability with this project.

The unit lacked a manager for most of the time period from February 2006-February 2008. In fact, they were without a manager for approximately 12 of the 24 months. Four manager changes occurred during the 24 month time period. The first absence of ICU leadership was one week following the initial pilot roll-out. In terms of the project implementation, the project facilitator had to take on the roles of Clinical Nurse Specialist and Manager. Educating staff on a daily basis, leading multidisciplinary rounds, supporting implementation of clinical practice changes with staff and physicians in the unit were roles the facilitator had to take on, roles that would have been assumed by the unit manager and CNS.

Three to four months into the implementation, a temporary manager was placed in the unit. The transition of ownership of the project was difficult to achieve. Now there was a unit manager, so the project facilitator could not continue the role of leader in the unit as far as the project was concerned. Yet, manager buy-in to the project, especially concerning the multidisciplinary rounding, was not present. As a result, the project metrics deteriorated. LOS increased and compliance to the bundle waned. In November 2007, the unit was again without a manager. The unit manager for the Intermediate Care Unit was placed as Interim manager of the ICU, in addition to her other unit. Project metrics were then reported to her and multidisciplinary rounding was reinstated. At this time a CNS was also hired for the unit. Evidence-based care practices were upheld and supported, as were multidisciplinary rounding.

A short while after the CNS was hired for the unit, a manager was also found. Again the project metrics were faced with challenges. Process ownership did not occur and project metrics again fell below target levels. Despite these losses, VAP was nearly eliminated from the ICU. As another manager left the ICU leaving the unit without a leader, the Clinical Nurse Specialist carried on supporting the project until another Interim Manager was found.

Again there was a learning curve and buy-in issues since this new manager was not a part of the original project team and had not made the decisions involved with the project. A decline was again note din the second quarter 2008 with LOS and especially with glucose control within the ICU.

The project facilitator and the ICU CNS believed that a VAP Committee was needed to pull together the front-line clinical staff back into the project with folks from Quality Services and Performance Improvement. To further support this idea, the CNS performed some process observation, as the data that was being collected during patient rounds was suspect. She discovered that ventilator bundle compliance was at an all time low of 36%. With this knowledge the VAP Committee was formed to regain the impressive impact of the initial project and to identify further opportunities for improvement.

From the first meeting, the team made a decision to fully enforce the multidisciplinary daily rounds. It was identified that many of the other disciplines, such as case management and pharmacy, had not been arriving for rounds due to changes in their time commitments for other duties. The ICU Manager and Critical Care Director contacted these individuals and the rounds were again a daily routine. During these meetings many other opportunities for improvement have been identified. Visual controls had since been lost; they were now brought back to the unit. It was discovered that a dedicated suction line was not available as a dedicated suction line for the endotracheal tubes. This team brought about that change by installing dedicated lines in each patient room.

The project metrics in Hammond have been sustained over time. Because of the Control phase of the Lean Six Sigma process, the formation of this continuous quality improvement committee, the results will continue to be sustained. Each time the data suggests that the project control is affected, there is always a reaction and a root cause analysis performed to ensure the control is regained. This is sustainability. In healthcare, we can not expect our clinical staff to remain constant like a gauge on a machine. Individuals think for themselves, through education and strong leadership support the Six Sigma process can prove

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to be highly sustainable. The LSS process has to be modified for healthcare, knowing that we can never drive out variability completely in these sensitive clinical areas. Each of our projects has been in a constant Control Phase state, requiring frequent monitoring and attention. As we identify further opportunities for improvement within our ICU, through this committee, we are attacking clinical practice changes every step of the way. Clinicians are very accustomed to change, and resisting it. Instead of Lean Six Sigma becoming the "flavor of the month," through various committees we have empowered our employees to embrace change and realize their efforts will make a sustainable difference to their patients.