CASE STUDY | BayCare Health - Reducing Ventilator Days And ICU Length of Stay

BayCare Health System reduces the number of ventilator days in ICUs, along with the overall length of stay

The Challenge

The standard treatment for patients who are unable to breathe on their own is to sedate them and put them on a ventilator. In a hospital ICU (Intensive Care Unit), patients on ventilators are typically weaned off the device after a few days, when it's determined that they are capable of breathing on their own.

"The longer you're on a ventilator, the less your lungs will work naturally," says BayCare Black Belt Angi Jennings. As she learned on her first Six Sigma project, there's a "honeymoon" period when it is advisable to be on a ventilator. After that, however, patients who are not weaned off ventilation soon enough are in danger of developing any number of related complications—ventilator-associated pneumonia, internal infections, oral ulcers and bed sores or other conditions caused by prolonged immobility.

Jennings was assigned a DMAIC project for St. Anthony's Hospital, one of nine hospitals in the BayCare Health System. In addition to the facility's 20-bed ICU, St. Anthony's has a 10-bed cardiovascular ICU. The project goal was to reduce the number of ventilator days in both ICUs by 30 percent. A secondary goal was to reduce the overall length of stay (LOS) in the ICU for vented patients.

In addition to improving patient care—the number one goal at BayCare—the project's forecasted savings were $775,000, attributed to the projected decrease in ICU LOS and a decrease in cost per case.

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>
> *— Angi Jennings, Black Belt BayCare Health System*

The Process

The project was BayCare's first clinical Six Sigma project and the team took advantage of several Six Sigma tools in the Define phase. In addition to a SIPOC diagram and a stakeholder analysis, Jennings recalls that the affinity diagram was a helpful tool for producing a list of the many clinical variables that affected the process.

In all, eight departments interacted with vented patients on a daily basis. Thus, process mapping was also important. "When I interviewed each department separately, they each had their own idea of the way the process flow was supposed to be," Jennings says. "I asked each department, 'If you could pick an ideal situation for this patient, what would it be?' And that's the way we came to a consensus on the future state."

In addition to the many stakeholders, the team discovered during the Measure phase that there was no shortage of data related to the process. The team gathered information on nearly 430 patients, using a combination of continuous and discrete data from a variety of electronic and manual sources. They grouped the data into three categories: demographic, clinical and post-vent care. The result? More than 16,000 data points—a bit overwhelming for the inexperienced team, but a great learning opportunity.

A variety of statistical tools, including ANOVA and regression analysis, helped Jennings pare down the data bit by bit. The analysis revealed an interesting trend: 96 percent of the process variability could be attributed to clinical variables.

Treatments such as AGBs (Arterial Blood Gases), chest X-rays and "sedation vacations" were not always performed, or the results were inconsistently reported on charts.

BAYCARE HEALTH SYSTEM

Summary

Organization
- BayCare Health System

Industry
- Health Care

Business Problem
- High number of ventilator days for ICU patients

Methodology
- DMAIC

Solution
- Interdisciplinary rounding and standard weaning protocols

Benefits/Results
- Savings of $650,000 annually
- Ventilator days reduced by 38%
- ICU LOS reduced by 23% for vented patients
- Reduction in ventilator-related complications
- Improved teamwork and communication amongst care providers

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The data also showed a lack of standardized processes and protocols, and an opportunity to improve communication between the different departments involved. Jennings says that there was little incentive for each area to note what the other areas were doing in the care of the patient. Thus, the status quo became a collective lack of accountability for weaning the patient off ventilation sooner rather than later. Proposing improvements presented a challenge for Jennings, a non-clinician. "I didn't ask anyone on the team to do anything that they didn't already do," she says. "I asked them to be accountable, and to document what they were doing and have that information available at certain times."

Still, there was some resistance to the suggested improvements, such as daily rounding by an interdisciplinary team with representatives from all eight departments. A lack of time and resources was frequently cited as an obstacle.

The project Champion encouraged the departments to pilot the interdisciplinary rounding for one month. On the first day, the team took 2.5 hours to complete rounds for only six patients—not a very timely result. Jennings attributes the difficulty to a lack of preparation, but without assigning any blame. "When we went through the rounding sheet and asked very specific questions about specific care elements, people didn't know the answers because nobody had asked them those type of questions before."

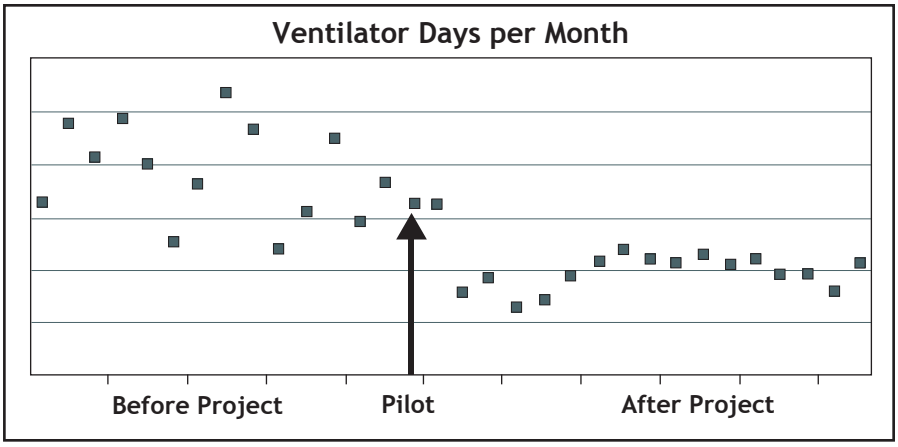
The team adapted quickly, however, and within two weeks was seeing positive results. At that point, Jennings says, "Everybody began to change their work habits. It was probably one of the best exhibits of culture change I have ever seen, because people realized they made a difference."

In addition to the daily rounds, the team agreed on several other improvements, many of which were essential prerequisites to the daily rounds. These included a standard process flow, a weaning protocol and a rounding sheet, which was fine-tuned using a DOE (Design of Experiments). The team also came up with the idea of interdisciplinary "lunch and learns" to help establish a more cross-functional view of the process.

The Results

As a result of this project, St. Anthony's ICUs achieved a 38 percent reduction in ventilator days and a 23 percent reduction in LOS for vented ICU patients. Since the project was completed, the process has remained in control and the hospital has realized $650,000 in hard savings (less than initially forecasted due to a decrease in ICU patient volume).

Perhaps more impressive is that St. Anthony's recently received a Beacon Award for excellence in its ICUs. The project also helped BayCare's performance excellence program get off to a good start. It demonstrated perfectly how the DMAIC process can reduce a huge number of inputs to a critical few, and how important data can be to supporting process improvements. It also proved to be a good training ground for the team. "The most rewarding thing," says Jennings, "is hearing clinicians say to me, 'Participating on this project is one of the best things that's happened to me in my career.'"



Key Tools Used

Define
- SIPOC Analysis
- Macro-level Process Map
- Stakeholder Analysis
- Affinity Diagram
- Fishbone Diagram

Measure
- Cause-and-effect Matrix
- Process Map
- Capability Analysis

Analyze
- FMEA
- Multi-vari Analysis
- Regression Analysis
- ANOVA

Improve
- DOE
- Pilot
- Solution Verification

Control
- Control Plan
- Transition Action Plan

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