

# A Centralized Monitoring Approach to Pulse Oximetry for Patients on Opioids

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## About the Author



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This article describes EvergreenHealth's processes and lessons learned as it evolved toward centralized continuous monitoring of SpO<sub>2</sub> of patients on opioids. The main focus of this report is how EvergreenHealth implemented the first phase of its initiative, which included centralized continuous monitoring of postoperative patients on opioids (regardless of the route of administration) who yielded a score on the STOP-BAG checklist (a slightly altered version of the STOP-BANG) indicating a high risk for sleep apnea. Following the success of this effort, EvergreenHealth now continuously monitors all postoperative patients on opioids.

EvergreenHealth is an integrated two-hospital healthcare system that serves nearly one million residents in the greater Puget Sound region. The system includes a 318-bed acute care medical center in Kirkland, WA; a network of 10 primary care practices; two urgent care centers; more than two dozen specialty care practices; home care and hospice; and three emergency departments that are open 24/7.

## Getting Started

The impetus for EvergreenHealth's initiative to monitor patients with centralized pulse oximetry came from a patient experience they had prior to the 2014 statement by the Centers for Medicare & Medicaid Services (CMS) for electronic monitoring of patients receiving opiates.<sup>1</sup> The staff were caring for a

patient with a small bowel obstruction who was transferred from a freestanding emergency department. The patient experienced respiratory complications after one dose of opiates was administered and was later diagnosed with previously unknown sleep apnea. The nurse caring for the patient responded quickly and prevented what may have been an adverse event.

Following this experience, a physician-nurse group began looking at its patients receiving opiates and those with diagnosed sleep apnea. A review of the literature identified tools for measuring patient risk for obstructive sleep apnea, and the STOP-BANG tool was selected.<sup>2</sup> This tool incorporates risk assessment for obstructive sleep apnea by asking patients (or their representatives) eight questions: 1) whether they snore, 2) whether they are tired during the day, 3) whether anyone has observed the patient to have stopped breathing during sleep, 4) whether they are being treated for high blood pressure, 5) whether their body mass index is greater than 35 kg/m<sup>2</sup>, 6) whether their age is greater than 50 years, 7) whether their neck size is large ( $\geq 17$  in collar size for men and  $\geq 16$  inch for women), 8) and whether their gender is male. A "yes" answer to three or more questions puts the patient in the high-risk category for sleep apnea.

Completion of the tool was done over the phone with the patient prior to admission. Patient self-measurement of neck circumfer-

ence was determined not to be a reliable indicator for determining sleep apnea. Subsequently, a decision was made not to use the neck circumference measurement in the assessment, and the tool scoring was adjusted to account for the elimination. This version of the tool was called the STOP-BAG.

In spring 2014, the physician-nurse group talked with vendors regarding potential central pulse oximetry monitoring products and visited another hospital that performed centralized monitoring of pulse oximetry. These actions were helpful in selecting a pulse oximetry product (Masimo). In addition, EvergreenHealth's information technology (IT) partners were brought in to the decision-making process early, attending all vendor demonstrations and participating in the site visit and conference calls.

The healthcare system elected to implement a centralized monitoring approach that measured pulse oximetry of patients identified as high risk based on their STOP-BAG score. The monitor-watcher technicians, who also monitored telemetry patients, were trained to monitor changes in SpO<sub>2</sub>. Additional monitor watchers also were hired and trained. Because a majority of patients in the orthopedic/spine/neurology unit would be affected by the initiative, the manager of that unit served as the nursing project lead. The unit has 32 beds and treats patients who frequently receive opiates following surgical procedures.

The screening tool algorithm () being implemented by EvergreenHealth dovetailed with CMS recommendations for the monitoring of patients on opioids.<sup>1</sup> Other driving forces behind the initiative included caregivers having difficulty hearing alarms when doors to patient rooms were closed for privacy concerns. The project also addressed Joint Commission National Patient Safety Goal (NPSG) 07.01.01, which describes the need for ensuring that alarms are heard and responded to on time.

Of note, following this initial implementation, EvergreenHealth expanded the use of centralized pulse oximetry monitoring to include all postsurgical patients on opiates. However, the sections that follow discuss implementation of the first phase: monitoring *at-risk* patients on opioids identified through use of the STOP-BAG checklist.

## Challenges

As with any new initiative, challenges occur as the new method of delivering care is established. Because workflow can be affected, caregivers may be resistant to new processes used in the delivery of care. Initially, some of the nursing staff saw the centralized monitor technicians' notifications of the need to check patients as an interruption to the provision of care. That perception changed rapidly when, during the first two months of the pilot, the nurses experienced the first "patient rescue" based on alerts from the monitor technicians. The alerts afforded nurses the opportunity to intervene early, thereby preventing patient deterioration and a sentinel event.

Another challenge when implementing centralized monitoring is an inherent increase in the amount of monitoring staff. Although the monitoring equipment is not low cost, the salaries of the monitoring technicians were the greatest expense. EvergreenHealth found that for every 40 patients on centralized pulse oximetry, they needed 4.2 full-time equivalents. Therefore, it is important to note that the salary dollars used for this initiative were substantial.

The medical director of quality was part of the multidisciplinary implementation team and served as the physician champion for this initiative, helping to foster acceptance by physicians. He was able to explain the rationale for the selection of the tool they used to assess patient risk (STOP-BAG) and why elective procedures might be delayed due to the need for further testing (i.e., a sleep study) of patients who scored positive on the risk assessment tool prior to the procedure. A provider order set identifies procedures to be implemented when the STOP-BAG screening is positive. However, if no order set was available for a particular patient, nurses were permitted to place the patient on the SpO<sub>2</sub> centralized monitoring if, in their clinical judgement, the patient could be at risk for opioid-induced respiratory depression.

Challenges also arose as the hospital made changes to its workflow to accommodate the centralized monitoring. The assistance of EvergreenHealth's vendor partner was useful in thinking through local barriers based on

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knowledge of the general workflow. The questions asked by the vendor helped the implementation team map out its existing workflow and design new processes. For example, setting the low-SpO<sub>2</sub> alarm default setting to a level that would reduce nonac-

tionable alarms but not affect actionable alarms was important to ensuring that the nurses were not burdened by numerous alarms for which no action was required. EvergreenHealth had been using a setting of 92% blood oxygen saturation level, but the

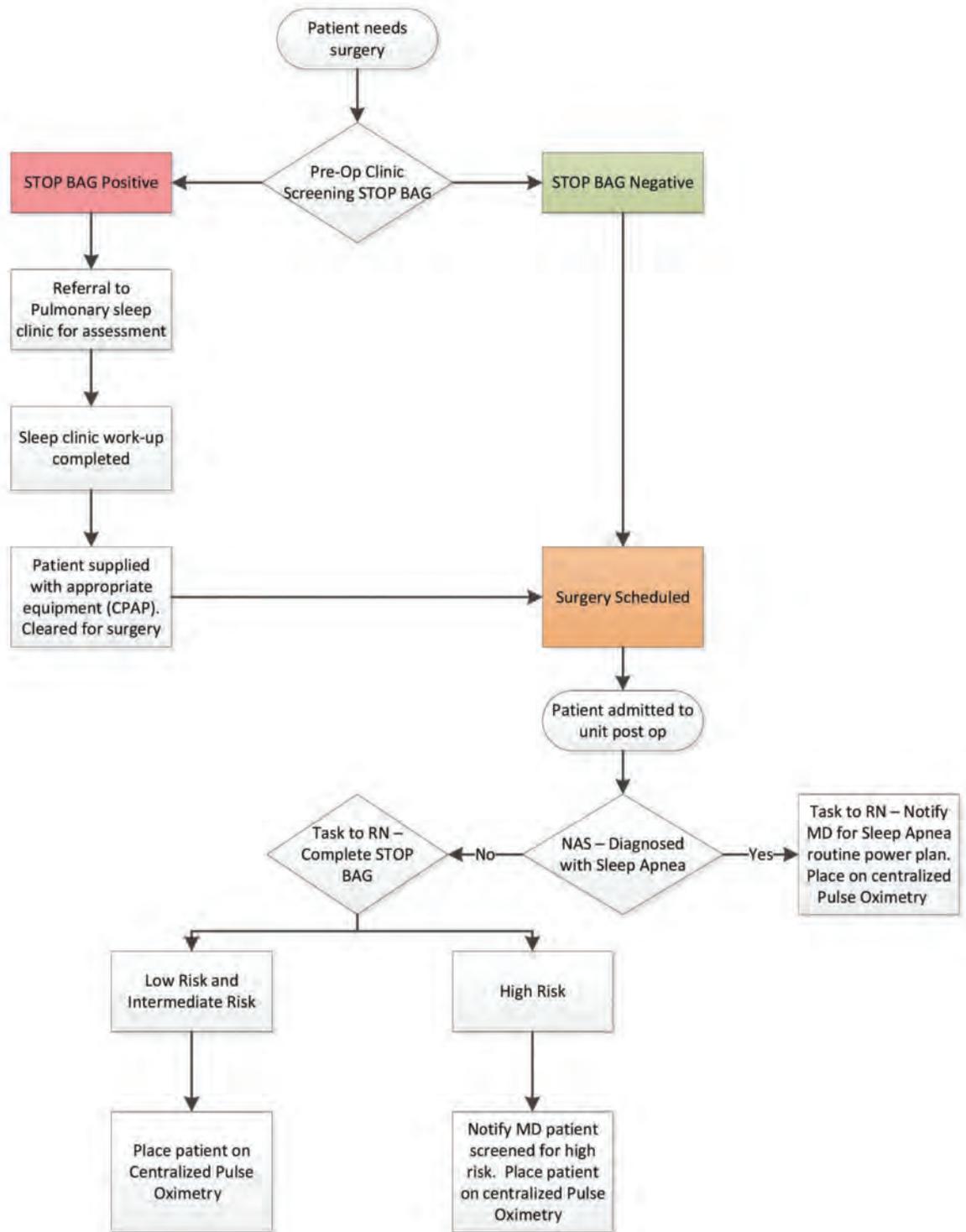


Figure 1. Algorithm for sleep apnea screen and centralized pulse oximetry monitoring for postoperative patients

vendor recommended changing it to 85%. Initially, the physicians were reluctant to go to that level but agreed to 88%. However, after several weeks of running the pilot and gathering alarm data, it was clear that at 88%, numerous nonactionable alarms were still occurring. Therefore, the physicians agreed to the 85% level for the low-SpO<sub>2</sub> default setting.

Another early issue that emerged was that the hospital required nurses to obtain the pulse oximetry monitors from the centralized monitoring room, which took time away from patient care. EvergreenHealth therefore placed the monitors on the nursing units, which saved time in getting the needed equipment. However, this change created an additional challenge in that nurses had to ensure that monitor technicians were notified that they had placed the patient on centralized monitoring. Communication between the nursing staff and the monitor technicians is critical to the success of the program.

### Infrastructure

The change in infrastructure and the use of technology to meet new standards proved to be major challenges for EvergreenHealth. This initiative required the use of wireless technology, and the hospital needed to expand and upgrade its wireless coverage to meet the standards that were set forth by the vendor for critical patient information transmission over a wireless network.

Another unexpected challenge was heat distribution. Initially, the centralized monitoring technology was placed in the same room as the telemetry monitoring and the video patient monitoring used for patients needing sitters. When all this technology was placed in one room, the overall heat generated, particularly in the summer months, became a concern for staff. Despite multiple interventions from plan operations to adjust the airflow and modulate the room temperature, the room remained warm. At the time this article was written, the hospital was looking at relocating the equipment. However, the expense to relocate the dedicated room is significant. Therefore, EvergreenHealth's advice for other hospitals is to choose the monitoring room carefully at the outset, paying particular attention to airflow and temperature.

As the hospital planned the move to centralized monitoring, it found that the existing pulse oximeters were too old to be used in the new monitoring system and therefore needed to be upgraded. The hospital initially purchased 40 pulse oximeters for centralized monitoring of high-risk patients identified by the STOP-BAG checklist. Of note, after the decision was made to monitor all patients receiving intravenous opioids, 40 additional monitors were purchased in the next budget cycle.

### Overcoming Barriers

EvergreenHealth found that a key component in overcoming perceived or real barriers with the staff regarding the centralized monitoring process was to use a deliberate education process. A nursing educator already dedicated to the designated monitoring areas provided the initial staff education. An e-learning activity, which was housed on the computerized learning management system, highlighted general information about the program, the algorithm for sleep apnea patients, how to use the assessment tool, and the performance expectations for each role in the initiative. The activity involved several hours of learning. Live education sessions also were held on the unit. The vendor provided support on each unit at go-live and worked with identified unit champions. The unit champions provided dedicated support to the staff for the first week after go-live and subsequently were available as consultants to answer additional staff questions or to address any issues that emerged. Although this approach to education represented considerable up-front cost, the hospital found that it was well worth the investment because the go-live process proceeded smoothly.

The following comment from the clinical nurse educator reflected the value of the initiative: "Three times in the last six months, the monitor technician has notified the nurse of a patient's desaturation event that had not yet been detected by the primary RN, nor did the patient complain of symptoms. These patients received rapid intervention, and further decompensation was avoided due to the quick alert from the monitor technicians."

The expertise of the vendor also was a key component to the success of the implementa-

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tion. As the vendor had coordinated multiple implementations, they were able to share best practices for the education process leading up to the implementation and during the go-live stage.

### Results

For EvergreenHealth, the value of this initiative was not seen financially but in terms of improved patient care. It was seeing increases in the number of patients with sleep apnea, obesity, and comorbidities, and the health system's primary focus was keeping patients safe in a busy care environment given these realities.

Following the first implementation of centralized monitoring of pulse oximetry in late 2014, and as the program expanded to all postoperative patients on opioids, EvergreenHealth experienced at least five noteworthy desaturation events that were recognized early with the centralized monitoring system. These early detection events helped prevent further deterioration that could have resulted in deaths. Because the program has been evolving rapidly from monitoring postoperative patients on opioids who failed the STOP-BAG to all postoperative patients on opioids, discerning the criteria under which these five patients were being monitored is difficult. However, the common element for successfully detecting early opioid-induced respiratory depression in these five postoperative patients was the use of centralized monitoring of SpO<sub>2</sub>. In addition to the example discussed in the initial phase, one patient experienced a desaturation five minutes after a nurse had performed a check and would not have gone back to check on the patient for some time if not for the alert system. Another patient experienced respiratory arrest while the physician happened to be present in the room during rounding. The physician summoned help, and at the same time, the monitor technician was calling the nurse to check on the patient.

In all five of the reported patient cases, the rapid-response/code team was called and able to intervene. All of these cases resulted in patients being transferred to a higher level

of care but eventually leaving the hospital in satisfactory condition.

This initiative had a positive impact on reimbursement of bundled payments for EvergreenHealth's surgeons. The project has shown positive effects on decreasing patient length of stay and overall patient outcomes, which affect the bundled payment.

### Conclusion and Lessons Learned

By expanding the centralized continuous monitoring program, other types of patient complications have been brought to the attention of hospital staff. "The most impactful thing about our efforts has been saving the lives of patients for whom we did not anticipate we would need to intervene," said Nancee Hofmeister, vice president of nursing and chief nurse officer for EvergreenHealth. She further explained that rather than only capturing patients who had compromised oxygen saturation caused by opioids, the hospital also has been able to intervene for patients with dysrhythmia or pulmonary embolism events that ultimately affected their oxygen saturation.

EvergreenHealth highlighted the importance of the multidisciplinary steering team and how professionals from medicine, nursing, IT, biomedical engineering, and purchasing brought an important perspective and knowledge base to the table. The complexity of the IT component in this initiative cannot be overemphasized; therefore, the early involvement of IT professionals in the process was paramount to the success of the project.

The engagement of the executive team also was crucial. With the early positive patient outcomes during initiation of the program, the executive team, including the chief financial officer, was fully supportive of this patient safety project. As lives were being saved, funding for and expansion of the program became of little concern because the impact on patients was so great. Vendor support and early buy-in from hospital leadership, as well as setting the low-SpO<sub>2</sub> alarm setting to reduce nonactionable alarms, were key elements of a successful implementation process. ■

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