Integrating Defensive Monitoring™ in the General Care Unit to Improve Failure to Rescue Trends

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Author: Susan Bruey, RN BSEd MSN

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Contents

Introduction

Aggregate data from healthcare organizations indicate that patients experience preventable complications (or "never events") during their stays in U.S. hospitals and that some of these patients actually die unnecessarily while under the care of the hospital (CMS, 2006). This situation, referred to as "failure to rescue" (Silber et al, 1992), is a focus of many quality improvement initiatives. According to a 2008 publication with information by the Agency for Healthcare Research and Quality, hospitals across the United States voluntarily reported that they averaged between 120 and 150 failure to rescue incidents per 1000 discharges in 2005 (HealthLeaders, 2008).

Many factors contribute to this situation. Patients are sicker today than in years past, as most are treated in less costly outpatient settings rather than in the hospital itself. Today, physicians admit patients to the hospital because they are at a higher risk than outpatient services can support or they require a longer stay for nursing care. When patients are admitted to the hospital, they are typically cared for in Medical-Surgical units where the cost of that care is the lowest and the nurse-to-patient ratios are the highest. Usually on these units, one nurse is responsible for four to eight or more patients for the course of their work shift. The combination of a higher risk patient and the decreased amount of time that a nurse can spend with each patient leads to a chance that undetected complications can occur (Hughes, Mark 2004).

Nurses and caregivers need support more than ever to quickly assess patients for faster intervention if needed.

This paper addresses how patients can benefit when hospitals integrate a cost efficient Defensive Monitoring™ strategy using technology to extend the reaches of their caregivers to more quickly respond when their conditions change.

The Problem Acknowledged

The healthcare industry acknowledges that hospitals must improve the failure to rescue trends. The Institute for Healthcare Improvement (IHI) estimates that over 15 million instances of medical harm occur each year (IHI, 2008) and their 5 million lives campaign sought to protect hospitalized patients from this and other types of harm through its many initiatives. One such initiative is the development of a Rapid Response Team (RRT), whereby a mechanism for summoning qualified help exists for clinical staff and families. This initiative was designed to combat the failure to rescue problem, but alone, it is not enough as this mechanism requires that an individual observe the patient and assess that the RRT should be called for assistance.

In 2008, the Center for Medicare and Medicaid Services (CMS) made the reporting of the failure to rescue statistic a requirement in order to receive federal reimbursements. Now the focus is on decreasing its incidence in hospitals and critical access hospitals that receive CMS funds.

For 2008, the Joint Commission for Accreditation of Healthcare Organizations (JCAHO) created a National Patient Safety Goal (#16) for hospitals to "improve recognition and response for changes in the patient's condition". For 2009, the JCAHO clarified it's criteria for this goal to state "Note: Hospitals are not required to create "rapid response teams" or "medical emergency teams" in order to meet this goal. The existence of these types of teams does not mean that all of the elements of performance are automatically achieved." (JCAHO, 2008). The success of the rapid response team concept is dependent upon an individual observing the patient and assessing that assistance is required, so this concept only meets the second portion of the goal: response. It does not address recognition.

According to the aforementioned 2008 publication by the Agency for Healthcare Research and Quality, hospitals across the United States averaged between 12 and 15 incidences of respiratory failure per 1000 at risk patients in 2005 (HealthLeaders, 2008). Anecdotal reports by hospital RRT teams report respiratory-related conditions as the most common reasons for calling the team. One example is the post-operative patient who develops respiratory depression as a result of the intravenous or epidural patient-controlled analgesia (PCA), which are common methods of pain control on a surgical unit.

Respiratory depression and inadequate ventilation can result when an inappropriate amount of analgesic is administered using the PCA, either by the patient or by his family member. Prolonged and undetected respiratory depression can lead to respiratory arrest, especially if co-morbidities or pre-existing conditions such as obstructive sleep apnea exist. The American Society of Anesthesiologists (ASA) guidelines for caring for these patients post-operatively require that they are monitored for "ventilation, oxygenation, and level of consciousness" at frequent intervals (ASA, 2009). They elaborate that it is necessary to observe a sleeping patient so that ventilation can be truly assessed, as his condition changes when he is aroused. They (ASA) suggest that oxygenation be accessed through continuous pulse oximetry methods, and that the level of consciousness is assessed once the ventilatory status is determined by arousing the patient. These guidelines support the need for closer observation in this patient population.

Current Nursing Practice

Even though the ASA guidelines suggest that these patients be observed and assessed more frequently, the current standards on these units do not support them. Hospitals report that patients show evidence of abnormal signs and symptoms and respiratory distress within six to eight hours of an arrest (IHI, 2008). Vital signs readings are routinely taken every four to eight hours on these care units, and these reports indicate that someone observed these patients to "take their vital signs" in the hours prior to the arrest. More than likely, it was a nursing technician that recorded these numbers, but the arrest occurred because no one "assessed" that a problem existed and took action to intervene soon enough to prevent it.

Even when nurse extenders or nursing technicians are available to assist with patient care activities, the nurse is still responsible to assess their patients for changes in their conditions and to take action when necessary. And it is difficult for one nurse to devote adequate time to monitor a single patient while being responsible for the care of four to eight patients.

One example of a failure in the current nursing practice for patient assessment was discussed in a recent presentation at The Institute for Healthcare Improvement's (IHI) 20th Annual National Forum on Quality Improvement in Health Care in Nashville, Tennessee. The presenter related a problem of inaccurate respiratory rate documentation by the nursing assistants in her facility (IHI, 2008). The nursing technicians took vital sign readings on the patients every four to eight hours, and they recorded these readings and notified the nurses of the results when necessary. During chart reviews following RRT visits, she observed that respiratory rates were consistently recorded as 20 breaths per minute across multiple shifts of caregivers, indicating that the respiratory rates had not been assessed, and thus, had not been reported as being abnormal.

Another variable in this situation is the level of expertise in the nurses themselves. Typically, novice nurses start out on medical-surgical units, and they are placed into the less desirable positions on the off shifts and weekends. Registry staffs are also used during these hours.

According to a recent article in the Journal of the American Medical Association, (Peberdy et al, 2008) the survival rates for cardiac arrest are less for night and weekend shifts than during the normal work day, even when adjusted for potentially confounding patient, event, and hospital characteristics. The researchers noted that "The first documented rhythm at night was most frequently asystole" indicating that most arrest victims were not monitored patients as asystole is a later finding with complications in hospitalized patients. The same study showed that survival rates for monitored patients were nearly double that of unmonitored patients.

The Solution

According to Wachter and Pronovost (2006), the first step toward achieving early detection of changes is to have a program in place that uses the rapid response team framework and that optimizes communication of important patient information. In order for early detection and intervention to succeed:

- Changes in patient's conditions should be detected early, before actual complications occur, and
- Nurses and physicians need to be notified of these changes, and
- The clinical significance of these notifications must be determined and correlated with parameter findings, and
- Patient outcomes need to be affected positively with early intervention

Defensive Monitoring™

The nurses on these units need a better way to assess their patients and to determine when their patient care priorities must shift to better serve the ones in need of their attention. The only way to adequately observe and assess these high risk patients according to the medical practice guidelines is to use technology to continuously monitor them and to notify the nurse when their vital signs change indicating a need for nursing assessment.

Defensive Monitoring™ with the Prefense™ Early Detection and Notification System™ by Nihon Kohden America, Inc. (Foothill Ranch, CA) is a relatively low cost solution to the problem. Using a wireless transmitter and a low cost base station computer, this system monitors for 4 out of the 7 RRT triggers that indicate deterioration (respiration, oxygen saturation, heart rate and blood pressure) while allowing the patient to freely ambulate if desired. The continuous respiration and SpO2 parameters provide valuable tools for detecting subtle changes in ventilation and oxygenation, and the continuous heart rate with the ECG monitor provides detection capabilities that support all types of patient conditions, not just those with a respiratory risk. The non-invasive blood pressure machine completes the assessment data set.

The cost of monitoring patients on a medical-surgical unit has been prohibitive in the past, but Defensive Monitoring™ using the Prefense™ system eliminates the cost barrier and insures that the clinician is notified when the patient's vital signs have changed. This notification is provided through direct alarms and alerts that can be sent through wireless pagers or cell phones, and allows the nurse to refocus his or her priorities. This allows them to assess the patient with changes to close the gap between the time that the patient's condition changes and the time that someone assesses this change.

The goals of the RRT programs are to decrease the numbers of "codes", to treat the patient in his current level of care and to decrease the numbers of transfers to a more costly higher level of care (IHI, 2008). Defensive Monitoring™ with the Prefense™ system supports those goals and contributes to a cost savings by allowing the patient to be cared for and discharged from a general care unit.

A side benefit of this system is being able to export the vital signs directly to the electronic medical record using standard health level 7 (HL7) information protocols. This capability provides the nurse with another mechanism to stay informed of the patient's status, and it eliminates the problems of documented values that do not reflect the actual patient condition.

Case Study

Vanderbilt University Medical Center conducted a blinded study using a Defensive Monitoring™ system provided by Nihon Kohden America (Berry, 2008). The following baseline assumptions were the driving factors for the study:

- A large number of physiologic disturbances go undetected on post operative floors.
- Patients are assessed every four hours on post-operative nursing units and their conditions are unknown at any given time.
- The RRT only responds when called and their visits typically result in transferring patients to ICU or step down units.

Vanderbilt Study Details

- Number of study subjects = 27
- Total Monitored Hours = 476.32
- Average age = 57
- Gender - 14 Female, 13 Male

The clinical areas were chosen due to the high numbers of RRT calls, so the anticipated outcomes of the study were:

- Early detection of potentially life threatening changes in vital signs
- Reduction in time to detection of clinically significant events
- Reduction in time to intervention during clinically significant events
- Reduction in the number of admissions to intensive care units

The Monitoring Infrastructure

Multi-parameter wireless transmitters (Figure 1-NTX™ wireless transmitter) were used to monitor respiration, pulse oximetry, heart rate and rhythm and non-invasive blood pressure on the subjects. All patients gave consent to participate and completed a satisfaction survey upon completion. The caregivers were blinded to the study as more patients actually wore the device than were studied.

The base station computer was located off of the nursing units, and all study data was exported to the Vanderbilt Vigilance Alert System (Acuitec) that sent alerts to the research nurses according to the hospital's rapid response team criteria through pagers and handheld PC's (Figure 2-NetKonnect™).

They used the handheld PC's to view the alert data and live, near real-time patient waveforms and vital signs and historical information using a remote access application (NetKonnect), also by Nihon Kohden America, to assess the patient from any location on the Vanderbilt Medical Center campus. When they observed clinically significant data, they reported this to the patient's nurse.

Figure 1

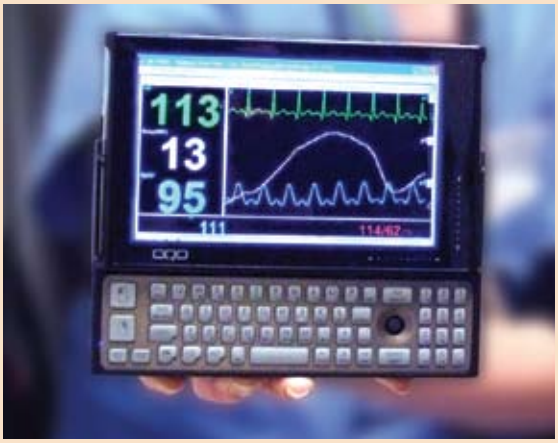
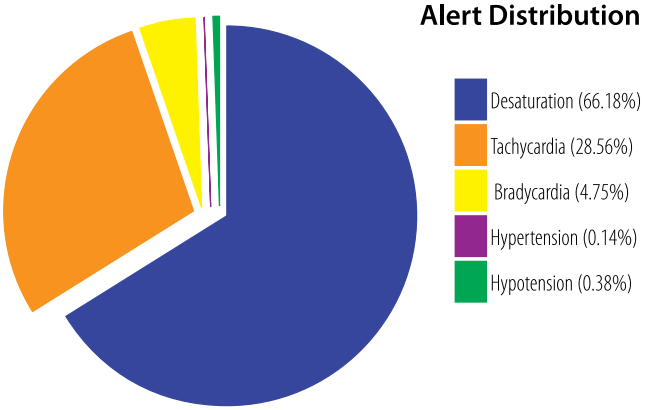


Figure 2

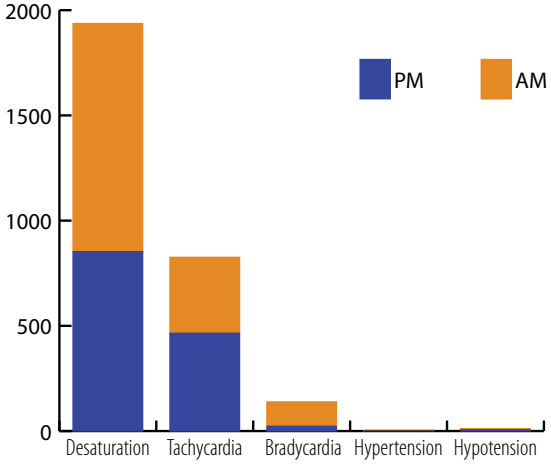
Study Findings and Conclusions

Respiratory alerts accounted for more than double that of any of the other early warning signs.

Nearly one half of all desaturation alarms and well over half of all tachycardia alarms occurred at night during this study, which supports the findings as reported by Peberdy et al in the JAMA in 2008 that this is a critical time for patients to be monitored.



Alert Summary
Clinical Early Warning Signs



Other findings:

- One patient required a transfer to a higher level of care; a stepdown unit.
- Approximately 10% of these post-operative patients had serious cardiac and respiratory complications that were only detectible with real-time monitoring.
- Multiple instances of ECG rate and rhythm alerts demonstrate the need for the basic ECG monitor that includes the impedance respiration parameter to detect post operative respiration depression.

- The pulse oximeter is a valuable tool for corroborating the respiratory events in order to determine clinical significance.
- Many of the alerts were determined to be expected results due to ambulation or other normal activities and that Rapid Response Team alert criteria could be too sensitive for real-time monitoring.
- It is important to use more than one monitoring method as patients choose to remove finger probes and leadwires, but not necessarily at the same time.

According to the researchers:

- A combined approach for improved recognition and response is required in these patients.
- Closer surveillance is required, as a large number of physiologic disturbances go undetected on post-surgical hospital units, and especially during the night time hours.

Patient Acceptance

Study patients were given a device satisfaction questionnaire, and while there were a few patients that felt uncomfortable wearing the NTX device, 91% of the patients said they felt safer wearing it and 87% said they would recommend the device to other hospitalized patients. Defensive Monitoring™ appears to be one method for improving and maintaining patient satisfaction and it could be seen as a strategic marketing advantage in this area for healthcare organizations.

Summary

Conditions are different in hospitals today and the mission is to provide a higher quality of patient care to those who entrust them. Through current research and regulations, we know that:

- A large number of physiologic disturbances go undetected on unmonitored units and "failure to rescue" situations are real. Patients deserve our attention to prevent them.
- Unmonitored cardiac arrest patients have less than half the chance of survival to discharge than monitored patients, and deaths from cardiac arrest are more frequent at night and weekends than during the day on non-monitored patients.
- The RRT mechanism requires a human call for assistance.
- Many RRT calls result in moving the patient to a higher more costly level of care.
- Statistics show that the sooner an intervention occurs, the better the patient outcome, and the cost of that patient's care is minimized.

Just as the nurse serves as the eyes and ears of the physician, technology can serve as the eyes and ears of the nurse. Because unmonitored patients can have serious respiratory and cardiac complications that are not detected soon enough using traditional care models, we must look to other methods for assistance.

Defensive Monitoring™ by Nihon Kohden America, Inc. with continuous multi-parameter monitoring has shown to be an effective mechanism for triggering early detection of changes in the patient's condition by notifying the nurse that the patient needs attention. Additional research is required and is ongoing, but the evidence is showing that by responding to the monitoring alerts, the nurse gets to the patients that need them the most and then do what nurses do: prevent the "failure to rescue" conditions by assessing the situation sooner and making the right clinical decision to intervene as appropriate.

References

Berry, J. (2008). *Preventing Deaths in Patients: Who are Falling Outside the ICU (Pilot Study)*. AACN NTI, 2008 Class Code 676.

CMS (2006). Fact sheet: *CMS IMPROVES PATIENT SAFETY FOR MEDICARE AND MEDICAID BY ADDRESSING NEVER EVENTS* Retrieved November 2008 from www.cms.hhs.gov .

CMS (2008). *Inpatient Prospective Payment System (IPPS) FY 2009 final rule.* Retrieved July 2008 from www.cms.hhs.gov.

Hughes L., Mark B. (2004). *Processes Contributing to Failure to Rescue in Acute Care Hospitals*. AcademyHealth Meeting San Diego, Calif.

Peberdy, A.; Ornato, J; Larkin, G. et. Al. (2008). *Survival From In-Hospital Cardiac Arrest During Nights and Weekends* JAMA. 299(7):785-792.

Silber JH, Williams SV, Krakauer H, Schwartz JS. (1992). *Hospital and patient characteristics associated with death after surgery. A study of adverse occurrence and failure to rescue*. Med Care. 30:615-629.

The Agency for Healthcare Research and Quality (2008) *HealthLeaders Media Fact File* February. Retrieved September, 2008 from www.healthleaders.com .

The American Society of Anesthesiologists (ASA) (2009). *New ASA guidelines address aggressive pain treatments, related respiratory depression.* Retrieved February, 2009 from www.asahq.org.

The American Society of Anesthesiologists (ASA) (2006) *Practice guidelines for the perioperative management of patients with obstructive sleep apnea*. Retrieved September, 2008 from www.asahq.org.

The Institute for Healthcare Improvement (IHI). (2008). *5 Million Lives Campaign*. Retrieved August 2008 from www.ihi.org.

The Institute for Healthcare Improvement (IHI). (2008). *Accelerating Point-of-Care Recognition of Risk*. Santa Clara Valley Medical Center, San Jose, CA

The Joint Commission for Accreditation of HealthCare Organizations (JCAHO) (2008). *National Patient Safety Goals*. Retrieved August 2008 from www.jcaho.org .

Wachter, Robert M.; Pronovost, Peter J. (2006). *The 100,000 lives campaign: A scientific and policy review*. Jt Comm J Qual Patient Saf. Nov;32(11):621-7.

NIHON KOHDEN

Nihon Kohden America, Inc.
90 Icon Street, Foothill Ranch, CA 92610
Toll-free: 800.325.0283
Phone: 949.580.1555 Fax: 949.580.1550
www.nkusa.com – email: info@nkusa.com