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Pulse oximetry: An essential tool for the busy med-surg nurse

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With nurse-patient ratios commonly ranging from 1:4 to 1:10, monitoring high-acuity patients on the med-surg unit poses a challenge. Pulse oximetry, which measures arterial oxygenation saturation (Spo2), can help you meet this challenge.

Pulse oximetry is highly efficient and easy to use. It measures the differential absorption of two wavelengths of light on total hemoglobin and oxyhemoglobin. Intermittent or “spot-check” readings can be done with less expensive portable devices or with a pulse oximeter that’s integrated into a portable vital-sign machine.

Pulse oximetry provides a “big-picture” clue to your patient’s status—not a defining diagnosis. Nonetheless, it promotes early intervention for patients at risk for deterioration outside the critical or intensive care unit. (See Continuous pulse oximetry to the rescue by clicking on the PDF icon above.)

Advantages of pulse oximetry monitoring

With little or no need for calibration, warm-up, site preparation, or operator training, pulse oximetry has become the most convenient noninvasive way to monitor Spo2 on an ongoing basis. It is valuable when beginning patient assessment and to help determine if continuous monitoring is indicated. In the med-surg unit, continuous monitoring provides a safer environment by helping clinicians identify problems earlier in patients at risk for adverse respiratory events. Early problem detection can reduce costs and help avert the need for patient transfer to the intensive care unit. On med-surg units, pulse oximetry can be done at the nurse’s discretion within the parameters of the oxygenation order, such as “2 L by nasal cannula, titrated to an Spo2 value above 90%.”

Continuous vs. intermittent monitoring

Few guidelines exist to determine which med-surg patients require continuous rather than intermittent pulse oximetry monitoring—and most haven't been updated since the 1990s.

Clinical practice guidelines on oxygen therapy from the American Association of Respiratory Care state only that arterial blood gas or pulse oximetry values should be obtained in any patient treated with oxygen.¹ Older guidelines from the Society of Critical Care Medicine (SCCM) and the Consortium on Respiratory Monitoring on the General Care Floor recommend continuous pulse oximetry monitoring for patients who:

- have a critical or an unstable airway
- are receiving conscious sedation during diagnostic procedures
- have a condition or history that suggests a risk of significant desaturation
- have known lung dysfunction
- have obstructive sleep apnea or morbid obesity
- are in acute pain and receiving analgesics at dosages likely to cause respiratory depression
- have cardiopulmonary disorders severe enough to result in at least one documented desaturation episode treated with supplemental oxygen
- are at risk for desaturation at the time of discharge or transfer from an intensive or post-anesthesia care unit
- are undergoing hemodialysis.^{2,3}

SCCM recommends intermittent monitoring for patients on supplemental oxygen and those with tracheostomies who are on long-term mechanical ventilation for stable, chronic respiratory failure.

Although dated, these guidelines are a good starting point for facilities to develop a program for continuous pulse oximetry monitoring on med-surg units.

At the University of Pittsburgh Medical Center (UPMC) Shadyside, current nursing practice guidelines include obtaining Spo₂ readings for all patients on pulse oximetry as part of scheduled vital signs. With

the advent of electronic physician order entry, all oxygen (O₂) and O₂ titration orders at UPMC now include either intermittent or continuous Spo₂ monitoring.

Challenges of pulse oximetry

One drawback of continuous pulse oximetry monitoring may be the cost of integrating it into a central monitoring system. Others include false alarms, staff complacency with alarms, and patient-related issues, such as limited ambulation, failure to keep sensors on, or failure of sensors to read properly. Many of these problems can be addressed when implementing a monitoring program.

Sleep vs. waking Spo₂ levels

With intermittent vital-sign and Spo₂ monitoring, a true pulse oximetry reading may never be obtained: A caregiver who approaches a sleeping patient to obtain vital signs may awaken the patient, causing immediate vital-sign changes. Many patients have normal Spo₂ levels when awake but decreased levels during sleep. Roughly one-third to one-half of adverse events requiring critical interventions in hospitals are related to altered respiratory function.⁴ Thus, high-risk patients should undergo frequent if not continuous pulse oximetry monitoring—especially those with sleep-disordered breathing, as in sleep apnea.

When transferred to med-surg floors, patients with sleep apnea, those receiving opioids, and those recently transferred from post-anesthesia care units or intensive care units (ICUs) where continuous Spo₂ monitoring is used are at high risk for needing ICU readmission because of the switch from continuous to intermittent vital-sign and Spo₂ monitoring. Patients with sleep-disordered breathing are more prone to arrhythmias, myocardial infarctions, and stroke. The nursing staff needs to be able to monitor them more closely to prevent serious adverse events.

False alarms

Patient movement and low perfusion can increase false alarms and cause erroneous measurements. Also, if the oximetry sensor is placed on the same side as an automatic inflatable blood pressure cuff, a false alarm may sound when the cuff inflates.

Frequent false alarms can cause “alarm fatigue” in caregivers. Hearing the same alarm go off or hearing frequent alarms on specific patient leads can desensitize nurses to alarms and cause them to miss

significant true alarms. Also, use of the monitor may lead them to focus more on the monitor than the patient.

In addition, false alarms may require staff interventions that interfere with patients' sleep, and can cause anxiety in patients and families. To avoid needless anxiety, teach them how pulse oximetry works and why false alarms may occur.

Newer pulse oximetry technologies (sometimes called "smart" technologies) are designed to decrease false alarms, increase the reliability of true alarms, and alert clinicians to patterns or trends that give early warning of respiratory decompensation. Consider, for example, a patient with sleep apnea: If the patient stops breathing for several seconds, the Spo2 value may remain in the normal range or rise above the alarm limit range; or it may be slightly below the alarm range and then return to normal. In this case, the alarm may not sound because the time limit wasn't violated; if the alarm does sound, the nurse might consider it a false alarm because it occurred only momentarily. With newer technology, the repeated pattern of lower Spo2 value and alarm violation alerts the staff to review the patterns and assess the patient further. Also, some newer oximetry systems have visual graphs that show the length and degree of desaturations, which are more telling than a single number or trend.

Patient movement and other types of artifact

Patients who are cold should be kept warm with blankets or a heating blanket to prevent motion artifact caused by shivering. Also be aware that ambient light fluctuations can produce false pulsatile signals leading to false alarms, and that nail polish may interfere with accurate Spo2 readings (depending on its color and type). Research on this topic isn't conclusive. To prevent possible interference, keep the sensor covered with a blanket and remove nail polish when possible. The best pulse oximetry systems filter out artifact and assess patient desaturation trends. In addition, be aware that dark skin pigmentation can interfere with readings, so assess patients carefully.

Frustration for ambulatory patients

Pulse oximetry can frustrate ambulatory patients because the cable tethers them to the monitor. Ideally, pulse oximetry systems shouldn't limit patient activity. Sensors that can be removed or replaced easily, as for bathing or hand hygiene, increase patient adherence and may help limit costs.

Notifying nurses of low Spo2 level alarms

With the high nurse-to-patient ratios on med-surg units, monitoring and evaluating Spo2 changes can pose a challenge. False alarms and limited resources make it difficult to consistently assess low Spo2 level alarms. Some portable heart monitors allow an Spo2 probe to be attached so oximetry values can be read at the nurses' station; however, this requires a means of notifying the bedside nurse of the alarm. Monitor technicians have been used to report alarms to bedside nurses (usually by phone).

At UPMC Shadyside, bedside nurses have access to wheeled computers that give remote access to the patient's cardiac and pulse oximetry data. The computer can be moved into a patient's room during assessment or a crisis.

In a trial at Dartmouth-Hitchcock Medical Center (DHMC) in Lebanon, New Hampshire, the pulse oximetry monitoring system used a pager to notify the bedside nurse when a patient had a consistently low Spo2 level for longer than 30 seconds⁷; the 30-second delay helped limit false alarms caused by patient movement. Nurses reported the paging system fit well into their busy day and other care responsibilities. The trial was so successful that the system has been extended to other noncritical care areas. Since then, calls to the rapid response team at DHMC have decreased and fewer patients have required transfer to the ICU. (See Pulse oximetry and rapid response teams by clicking on the PDF icon above.)

Pulse oximetry in long-term acute-care hospitals

Long-term acute-care hospitals (LTACHs) care for patients with complex medical problems, many of whom are admitted directly from ICUs at short-term hospitals. In many cases, LTACH nurses care for both med-surg and critical-care patients. This poses special patient-monitoring challenges. At many LTACHs, a large percentage of patients have respiratory problems, such as ventilator dependency, new tracheostomies, and failure to wean from the ventilator. To promote patient safety, continuous pulse oximetry monitoring should be the standard for most, if not all, of these patients.

Toward the future

Ideally, oximetry equipment should be upgradeable for future technologies, and pulse oximetry data should be integrated with the patient's electronic medical record. Proper and consistent use of pulse oximetry is an invaluable patient-care tool—on med-surg floors as well as ICUs. Monitoring and follow-up treatment of patients with low Spo2 values will continue to enhance outcomes.

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Nicolette C. Mininni is an advanced practice nurse in critical care at the University of Pittsburgh Medical Center (UPMC) Shadyside, Pittsburgh, Pennsylvania. Michelle L. Marino is a staff nurse in the cardiothoracic intensive care unit at UPMC Shadyside. Wendy Kohler is a clinician in the Neuroscience ICU at UPMC Shadyside. Mary Jo Stephan works in the cardiothoracic intensive care unit at UPMC Shadyside.





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