ALARM FATIGUE CAN DECREASE THE SAFETY OF DENTAL OFFICE SEDATION AND ANESTHESIA

An elderly friend suffered a stroke that resulted in significant dementia and unilateral physical disability. Consequently he was forced to give up his independent living residence for a nursing home where he could receive constant care and supervision. His physical and mental disabilities relegated him to a status of high risk for a fall that could result in a catastrophic outcome. Upon my initial visit, I wondered how my demented, uncooperative friend's risk of a fall could be minimized, because of all of the rules that prohibit continuous physical restraint of uncooperative patients. The nursing home assured me that a pressure-sensitive alarm pad would be installed on his mattress that would sound whenever it sensed that his body was no longer in contact with the bed, and that would alert the nursing staff to immediately check on him and assist him to the bathroom to prevent injury from a fall. That eased my mind until later visits, when I observed that whenever he took a short afternoon nap and rolled over on his side, the alarm would frequently sound but no one would respond until perhaps 10 minutes later. I expressed my concerns to the nursing supervisor, who indicated that these false alarms happened all the time and almost always the patients were still in their beds. Their nursing staff would check on the patients as soon as the staff had a spare minute to reset the alarms. Of course, as a dentist anesthesiologist intimately familiar with the value of alarms, I was appalled.

Apparently this clear example of alarm fatigue, a desensitization to the alarm due to the high incidence of false alarms, is not just a problem at this particular nursing facility. According to a study recently published by Shorr,¹ nearly 28,000 inpatients in general medical, surgical, and specialty units in a major hospital were studied for the effect of the hospital's major effort to decrease the incidence of inadvertent falls by the use of bed alarms. Despite the hospital's effort to train its staff on the use of bed alarms, the conclusion was that the intervention designed to increase bed alarm use increased alarm use but had no statistically or clinically significant effect on fall-related events. One might ask why the alarms didn't help. Dr Shorr hypothesized that the staff developed what he called alarm fatigue. "How many times a week do you hear a car alarm go off?" he asked. "You become desensitized."

Likewise, the Joint Commission² recently issued a Sentinel Event Alert entitled "Medical Device Alarm Safety in Hospitals." It stated:

Many medical devices have alarm systems; among them are bedside physiologic monitors that include ECG [electrocardiogram] machines, pulse oximetry devices, and monitors of blood pressure and other parameters; bedside telemetry; central station monitors; infusion pumps; and ventilators. These alarm-equipped devices are essential to providing safe care to patients in many health care settings; clinicians depend on these devices for information they need to deliver appropriate care and to guide treatment decisions. However, these devices present a multitude of challenges and opportunities for health care organizations when their alarms create similar sounds, when their default settings are not changed, and when there is a failure to respond to their alarm signals. The number of alarm signals per patient per day can reach several hundred depending on the unit within the hospital, translating to thousands of alarm signals on every unit and tens of thousands of alarm signals throughout the hospital every day. It is estimated that between 85 and 99 percent of alarm signals do not require clinical intervention, such as when alarm conditions are set too tightly; default settings are not adjusted for the individual patient or for the patient population; ECG electrodes have dried out; or sensors are mispositioned. As a result, clinicians become desensitized or immune to the sounds, and are overwhelmed by information—in short, they suffer from "alarm fatigue." In response to this constant barrage of noise, clinicians may turn down the volume of the alarm, turn it off, or adjust the alarm settings outside the limits that are safe and appropriate for the patient—all of which can have serious, often fatal, consequences.

The Joint Commission's Sentinel Event database includes reports of 98 alarm-related events between January 2009 and June 2012. Of the 98 reported events, 80 resulted in death, 13 in permanent loss of function, and 5 in unexpected additional care or extended stay. Common injuries or deaths related to alarms included those from falls, delays in treatment, ventilator use, and medication errors; all were traced back to alarm system issues.

On a smaller scale, but nevertheless equally important, the increased reliance on technologically advanced physiological monitors with alarms in the provision of dental office moderate sedation, deep sedation, and general anesthesia increases the opportunity for alarm fatigue to decrease the margin of safety for our patients.

We experience on a daily basis that the pulse oximeter probe becomes dislodged from its optimal position on the finger and the alarm is falsely triggered. We know that inadvertent leaning on the blood pressure cuff by the operating dentist or surgical assistant can falsely alter the blood pressure reading and trigger a false alarm. The tip of the combined supplemental oxygen/carbon dioxide end-tidal sampling nasal cannula can become kinked or obstructed, particularly during operations in the anterior maxilla, and can trigger a false apnea alarm. Despite the high incidence of these false alarms, every dentist must understand that when an alarm sounds, the procedure must be immediately stopped without fail and the patient quickly evaluated for the basics of adequate ventilation, oxygenation, and circulation. We must believe that the abnormal monitor reading is correct until proven otherwise, because valuable time will be lost readjusting the monitor if in fact the monitor is correctly indicating that a major, possibly catastrophic event is now in progress or soon will escalate to that level if an immediate intervention is not made. We must be highly disciplined to accept that the information from the monitor may be correct, even when it is likely to be just another false alarm.

Your editor has seen numerous examples of written reports and depositions of general anesthesia–licensed dentists who have fallen into the trap of monitor alarm fatigue. One such dentist recognized an alarm as a sudden decrease in the pulse oximeter reading. He replaced the oximeter probe on several different fingers and then on several fingers of the opposite hand in an attempt to get a normal reading, but the readings were all still abnormal. He then requested a pulse oximeter from another operatory and that also appeared to be faulty until the patient eventually suffered a hypoxia-induced cardiac arrest. Another dentist stated that although the pulse oximeter was sounding, the ECG monitor appeared to be acceptable, so he continued with the last extraction and during the suturing, the patient suddenly and unexpectedly went into asystole. Another dentist explained to the arriving paramedics, who had quickly determined that the patient was in pulseless electrical activity, that his use of positive-pressure ventilation was all that was needed despite the pulse oximeter and blood pressure alarms because the ECG was still reasonably normal and the ECG monitor had not yet sounded. As an example of a less-trained sedationist, a general dentist trained during a weekend-type oral

sedation course testified that during sedation with multiple doses of oral triazolam and nitrous oxide–oxygen, the pulse oximeter sounded so frequently that it was difficult to concentrate on the placement of multiple dental implants, so the pulse oximeter was turned off for multiple periods of time during the prolonged appointment. The memory function of the pulse oximeter later demonstrated that during the times when the monitor was sounding, the readings were in the 70% range and gradually dropped into the 40% range at the end of the procedure, just before the patient was suddenly recognized to be in cardiac arrest by an astute dental assistant.

Dentists must understand that although monitor alarm fatigue may be a normal response, we must also be disciplined to know that it is our mortal enemy in office sedation and anesthesia and must be conquered every time that an alarm sounds. We must also understand that we must never treat the monitor but rather the patient. The monitor gives us only a small piece of the physiological puzzle of patient well-being. One never treats an adult with a monitored heart rate of 40 beats per minute with atropine or ephedrine without additional information. Although these drugs may be indicated if the blood pressure is also very low, they can be lethal if the diagnosis is a protective reflex bradycardia due to a hypertensive crisis. The drugs also will ultimately do little good if the bradycardia is due to severe hypoxemia due to hypoventilation. The bottom line is that although high-tech monitors give us only a narrow window into actual human physiology and frequently issue false alarms, their information must be taken seriously by us to provide the widest margin of safety for our patients. We can never accept the excuse that monitor alarm fatigue was the cause of a bad sedation or anesthesia outcome.

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REFERENCES

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