

## Citation

Cheney FW: The ASA Closed Claims Study after the pulse oximeter: A preliminary look. *American Society of Anesthesiologists Newsletter* 54(2): 10-11, 1990.

### Full Text

As of January 1, 1990, pulse oximetry was included in the ASA Standards for Basic Intra-Operative Monitoring: the expectation was that use of the pulse oximeter would improve patient safety. One of the ways of assessing the reality of this expectation will be through analysis of data from the ASA Closed Claims Study. The pulse oximeter first came into clinical use in the mid- to late 1980s; the ASA Closed Claims data base now has accumulated a few claims in which a pulse oximeter was in use intraoperatively. Preliminary analysis of these claims may yield some indication as to what the future might hold.

First, representatives of insurance companies participating in the Closed Claims Study have commented on the reduction in the number of serious injuries since the pulse oximeter became widely used among their insureds. It is too soon to be able to quantify this effect in the Closed Claims data base, but we hope to be able to estimate the size of the effect as more recent claims are processed.

Second, since we are now receiving claims with pulse oximeter saturation readings in the records, we can derive a better picture of the nature of the untoward events leading to claims of malpractice and the role of the pulse oximeter on patient outcome. As of December 1, 1989, there were approximately 2,000 cases in the overall data base; of these, there were 100 claims in which a pulse oximeter was in use during the intraoperative period. Table 1 shows the overall classification of the occurrences that led to the injuries, the number of cases in each category and the number of cases in which brain damage or death occurred. Injuries unrelated to the use of the pulse oximeter include nerve damage, burns, awareness, postoperative myocardial infarctions and purely surgical complications, such as uncontrolled hemorrhage. Of the two probe injuries, one was due to ischemia, and the other was a burn on the finger. Respiratory events include all cases in which the outcome was related to a respiratory system problem. Circulatory events include only those where cardiac arrest or stroke occurred in the presence of adequate oxygenation determined by the pulse oximeter.

**Table 1**

<b>Classification of Claims in Which Pulse Oximeter Was Used</b>		
<b>Occurrence</b>	<b># Cases</b>	<b># Brain Damage or Death</b>
Unrelated to use of pulse oximeter	67	8
Probe injury	2	0
Circulatory	10	7
Respiratory	16	15

As the pulse oximeter would be expected to play a significant role in the prevention of respiratory-related occurrences, this category was further sub-classified (Table 2) . In the three cases in which the pulse oximeter was misused, there were two esophageal intubations and one case in which the anesthesiologist was attempting to adjust the probe while the patient was clearly cyanotic. All three cases resulted in severe injury (Table 2). Of the five cases of airway obstruction, one was from bronchospasm, one from a mediastinal mass and three were from upper airway obstruction. In one case, the pulse oximeter showed high saturations, but the patient was cyanotic when the drapes were removed. Finally, there were seven cases where the pulse oximeter was in use during surgery, but the untoward event occurred after its use was discontinued. Three of these cases occurred prior to or during transport to the post-anesthesia care unit (PACU). Four other cases involved respiratory events in the PACU where presumably the pulse oximeter would have been helpful in prevention of the incident.

**Table 2**

<b>Classification of Respiratory-Related Occurrences in Which the Pulse Oximeter Was Used</b>		
<b>Occurrence</b>	<b># Cases</b>	<b># Brain Damage or Death</b>
Pulse oximeter misused	3	3
Airway obstruction	5	5
False high reading	1	1
Immediate postop event after pulse oximeter disconnected	7	6

Seven of the 10 circulatory-related occurrences were sudden cardiac arrests in the presence of an adequate oxygen saturation. In seven cardiac arrests, high pulse oximeter readings essentially ruled out hypoxemia as the cause of the arrest. There was payment in only **one** of these seven cases. This low payment rate is notable because these cardiac arrests might have been attributed to pre-existing undiagnosed hypoxemia prior to the introduction of the pulse oximeter. It seems that the anesthesiologist is held more strictly liable for respiratory-related rather than circulatory-related untoward events. The use of the pulse oximeter will rule out the convenient hypothesis of "pre-existent hypoxemia" as the cause of unexplained cardiac arrest during anesthesia; attention should now focus on other possible mechanisms for these events, such as vagal nerve-related events and anaphylaxis.

The lack of denominator data means the Closed Claims Study may never be able to provide definitive answers on the effect of pulse oximetry on anesthesia-related patient safety. However, these preliminary results do provide some insight as to how the pulse oximeter may favorably change the picture of anesthesia-related injury and assessments of liability.

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