

Summary

Effective monitoring reduces the potential for poor outcomes that may follow anesthesia by identifying derangements before they result in serious or irreversible injury. Standards for basic anesthetic monitoring have been established by the American Society of Anesthesiologists (ASA). Today's standards (last amended on October 25, 1995) emphasize the importance of regular and frequent measurements, integration of clinical judgment and experience, and the potential for extenuating circumstances that can influence the accuracy of monitoring systems. (ASA, 2003).

Standard I requires qualified personnel to be present in the operating room, to monitor the patient continuously and modify anesthesia care based on clinical observations and the responses of the patient to dynamic changes resulting from surgery or drug therapy. Standard II focuses attention on continually evaluating the patient's oxygenation, ventilation, circulation, and temperature and specifically mandates the following :

- 1- Using an oxygen analyzer with a low concentration limit alarm during general anesthesia.
- 2- Quantitative assessment of blood oxygenation during any anesthesia care
- 3- Continuously ensuring the adequacy of ventilation by physical diagnostic techniques during all anesthesia care. Quantitative monitoring of tidal volume and capnography are encouraged in patients undergoing general anesthesia.

- 4- Ensuring the adequacy of circulation by the continuous display of the ECG, and determining the arterial blood pressure at least at 5 minute intervals. During general anesthesia, circulatory function is to be continually evaluated by assessing the quality of the pulse, either electronically or by palpation or auscultation.
- 5- Endotracheal intubation requires qualitative identification of carbon dioxide in the expired gas. During general anesthesia, capnography and end-tidal carbon dioxide analysis are encouraged.
- 6- During all anesthetics, the means for continuous measuring the patient's temperature must be available. When changes in body temperature are intended or anticipated, temperature should be continuously measured and recorded on the anesthesia record. (*ASA , 2003*).

Oximetry readings can be altered by a number of factors. The site of measurement must be clean and dry and have minimal movement to permit adequate signal transmission. Nail polish and other environmental factors such as bright overhead lighting or sunlight can also interfere with transmission. Cold ambient temperature, leading to peripheral vasoconstriction, decreases skin blood flow and may result in difficulty for the oximeter to determine pulsatile flow needed for a reading. Also Patient conditions that likewise are associated with poor peripheral perfusion, such as decreased cardiac output, some dysrhythmias, shock, and certainly cardiac arrest, may result in difficulty for the oximeter to determine pulsatile flow and giving a valid reading (*Murray et al , 2000*).

Although the inherently reliability of pulse oximetry has led to its wide use in anesthesia and critical care, remaining problems include motion sensitivity, causing false alarms and erroneous measurements, and

hypoperfusion, causing loss of signal. several manufacturers have developed proprietary methods to address these problems based on analysis of frequency, waveform morphology, or saturation. Published evidence supports the ability of new generation pulse oximetry to detect hypoxemic episodes more reliably than conventional devices under conditions of patient motion and hypothermic hypoperfusion. (*Iritia k et al, 2003*)

Capnography, the measurement of CO₂ in expired gases, has evolved in the last few years into a commonly used procedure. Whereas a variety of techniques can be used for CO₂ measurement (e.g., mass spectrometry, Raman analysis), most capnographs rely on infra red absorption. Use of this technique can reliably and quantitatively provide vital respiratory monitoring information in the operating room and in all critical care areas. (*Graveenstein Js et al, 2000*).

PAC provides measurements of several hemodynamic parameters such as central venous pressure (CVP), pulmonary artery pressure (PAP), pulmonary artery occlusion pressure (PAOP) or pulmonary capillary wedge pressure (PCWP) and other derived parameters.. There have been a number of surveys to determine how well physicians, nurses, and other health care practitioners interpret PAC data. Even in the realm of idealized pressure tracings and data presentation, nurses,¹ American physicians, and European physicians¹ all incorrectly interpret the data in 25% to 50% of cases. This deficiency has been recognized by the National Institutes of Health and a variety of professional societies who have created initiatives and resources to improve PAC education . (*PAC education project, 2005*) .

It is difficult, and often impossible, by clinical evaluation of recovery of neuromuscular function, to exclude with certainty clinically significant residual curarization, so in daily practice significant residual block can be excluded with certainty only if objective methods of neuromuscular monitoring are used. Good evidence –based practice dictates that clinicians should always quantitate the extent of neuromuscular recovery using objective monitoring. At a minimum, the TOF ratio should be measured during recovery whenever a non depolarizing neuromuscular block is not antagonized. (*Eriksson Li, 2003*).

The effects of anesthesia and surgery on the CNS may be monitored by recording processed EEG activity, as in the bispectral index or the Patient State Index. These indices are used as measures of hypnosis, sedation, and the probability of recall using a variety of anesthetic agents (thiopental, propofol, midazolam, isoflurane, and sevoflurane). The use of the BIS can facilitate faster emergence and improve recovery from general anesthesia by allowing more precise titration of anesthetic effect. (*Lehmann A et al, 2002*).