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## SECTION IV

### MONITORS

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MONITORS

One of the primary responsibilities of the dentist during oral sedation is to be the guardian for the sedated patient during the procedure. Optimal vigilance requires an understanding of the monitors. An in depth study of how all of the required monitors work will be taught at the course. It is important to memorize the below information. This will allow a systematic and efficient skill set when evaluating the patient’s physiologic profile during sedation.

Utilize the monitors with a system:

I. **OXYGENATION**
II. **VENTILATION**
III. **CIRCULATION**

The components of each are as follows:

I. **OXYGENATION**
   - Clinical: Skin, Lips, Gums, Blood
   - Monitors: Pulse Oxymetry

II. **VENTILATION**
   - Clinical: Chest, Abdomen, Breath Sounds, Verbalization
   - Monitors: Capnogram, Precordial Stethoscope, Stethoscope

III. **CIRCULATION**
   - Clinical: Palpable Pulse, Capillary Refill Time
   - Monitors: EKG, NIBP
**Oxygenation - Pulse Oximetry**

Oxygenation refers to the concentration of oxygen in the blood. It can be determined rapidly through the use of a basic clinical exam.

- Skin color
- Flush lips
- Conjunctiva
- Capillary refill

Pulse oximeters are mandatory sedation monitors for dental sedation. Oximetry depends upon the observation that oxygenated and reduced hemoglobin differ in their absorption of red and infrared light. Oxyhemoglobin absorbs more infrared light 990nm. Deoxyhemoglobin absorbs more red light 660nm. The change in light absorption during arterial pulsations is the basis for oximetry determinations.

Pulse oximetry is a procedure used to measure the oxygen level (or oxygen saturation) in the blood. It is considered to be a noninvasive, painless, general indicator of oxygen delivery to the peripheral tissues (such as the finger, earlobe, or nose). Oxygen in the air is breathed into the lungs. The oxygen then passes into the blood where the majority of the oxygen attaches to hemoglobin (a protein located inside the red blood cell) for transport in the bloodstream. The oxygenated blood circulates to the tissues. Pulse oximetry technology utilizes the light absorptive characteristics of hemoglobin and the pulsating nature of blood flow in the arteries to aid in determining the oxygenation status in the body.

- First, there is a color difference between arterial hemoglobin saturated with oxygen, which is bright red, and venous hemoglobin without oxygen, which is darker.
- Second, with each pulsation or heartbeat there is a slight increase in the volume of blood flowing through the arteries. Because of the increase of blood volume, albeit small, there is an associated increase in oxygen-rich hemoglobin. This represents the maximum amount of oxygen-rich hemoglobin pulsating through the blood vessels.
A clip-like device called a probe is placed on a body part, such as a finger or ear lobe, to measure the blood that is still carrying or is saturated with oxygen. The probe houses a light source, a light detector, and a microprocessor, which compares and calculates the differences in the oxygen-rich versus oxygen-poor hemoglobin.

![Pulse Oximeter](image)

The four pieces of valuable information that can be determined from pulse oximetry:

1. Oxygen Saturation - primary information
2. HR (Heart Rate) - measured through capillary pulsations
3. Rhythm (Approximate) - if the pulse oximetry beats are regular, it is unlikely that an arrhythmia is present
4. Perfusion (Approximate) - because the device senses capillary pulsations, this means some degree of tissue perfusion is occurring

POINT: a blood pressure is being generated by the heart!
**Ventilation** - Capnography / Plethoragraph / Precordial Stethoscope

Clinical Exam
- Misting
- Chest excursion
- Audible sounds

**Capnography:**
This monitor determines the presence of end tidal CO2 to confirm ventilation. Aspiration technique: Aspiration capnographs continuously suction gas from the mouth into a sample cell within the monitor. End tidal CO2 monitoring is now the standard of care for moderate sedation. Capnography provides the following information
- Confirmation of ventilation
- Respiratory rate

**Plethoragraph:**
This monitor determines rhythmic chest movement via the EKG leads. The plethoragraph determines a chest excursion rate BUT DOES NOT verify ventilation.
**Precordial Stethoscope:**
The precordial stethoscope is a mainstay tool that assists in detecting airflow through the large airways. This is yet another way to evaluate ventilation.

**Stethoscope:**
The stethoscope allows the practitioner to listen for the heart rate, rhythm, and pathological sounds.
Circulation - NIBP / EKG / Stethoscope

Clinical assessment

- Radial Pulse: HR, Rhythm, Perfusion Pressure
- Brachial Pulse: HR, Rhythm, Perfusion Pressure

Noninvasive arterial blood pressure monitoring detects blood pressure via Oscillometry. Oscillometry: Arterial pressures cause oscillations in cuff pressure. These oscillations are small if the cuff pressure is inflated above the SBP. When the cuff pressure decreases to the SBP, the oscillations markedly increase. At this time, the SBP is detected. Definitions:

- Systolic arterial blood pressure (SBP) is the peak pressure generated during systolic contraction
- Systolic Arterial Blood Pressure (SBP) is the peak pressure generated during systolic contraction
- Diastolic Arterial Blood Pressure (DBP) is the trough pressure during diastolic relaxation
- Mean Arterial Pressure (MAP) is the time weighted average of arterial pressures during a pulse cycle
- \[ \text{MAP} = \frac{(\text{SBP}) + 2(\text{DBP})}{3} \]
- NIBP monitoring gives the following information: SBP, DBP, MAP, HR
Electrocardiography:
The EKG is a recording of the electrical potentials generated by myocardial cells. It helps detect dysrhythmias, myocardial ischemia, conduction issues and electrolyte disturbances. Patient movement electric surges and faulty electrodes can yield false signs. The three lead system is the most common used for sedation.