



The
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VITAL SIGNS
AND
PATIENT MONITORING
DURING
CONSCIOUS SEDATION

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-- Instructor --
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VITAL SIGNS & PATIENT MONITORING

DURING

CONSCIOUS SEDATION

LARRY J. SANGRIK, D.D.S.

I. Why Monitor Our Patients

- Should I accept this patient?
 - ✓ Is the patient healthy enough to receive dental treatment from me?
- Impact of my treatment.
 - ✓ How invasive is my treatment?
 - ✓ Impact of sedation on the patient?

II. Triad of Patient Monitoring

- Goal of Patient Monitoring: Presence of Tissue Perfusion
 - ✓ Need for Cardiac Output to deliver oxygenated blood
 - ✓ Need to Respiratory Minute Volume to oxygenate the blood
- Datum versus Data: Understanding the value of multiple readings
 - ✓ Accuracy is increased the larger the sample size
 - ✓ However, a trend is not a guarantee
- Context
 - ✓ The same numbers may have different meanings in differing situations
- Technique: The Triad of Patient Monitoring
 - ✓ Direct monitoring
 - ✓ Vital signs
 - ✓ Advanced monitoring

III. Basic (Direct) Monitoring

- Pallor
 - ✓ Does my patient look healthy?
 - ✓ Influenced by capillaries and hydration of skin
- Overt Respiratory Distress
 - ✓ Examples Include: Congestion, Wheezing, Shortness of breath & Coughing

- Temperature: Indication of Infectious Disease
 - ✓ 98.6°F, (37.0°C) is an average normal temp. However, normal is a range.

DESCRIPTION	TEMPERATURE (°F)	TEMPERATURE (°C)
Normal	97.0 – 99.6	36.11 – 37.56
Onset of Fever	> 99.6	> 37.56
Active Infection	> 101.0	> 38.33
Immed EMS Transport	> 104.0	> 40.00

- Tissue Perfusion
 - ✓ Fingernail 3 Second Test
 - ✓ Pupils Test

IV. Vital Signs

- Six Recognized Vital Signs
 - ✓ Temperature
 - ✓ Height
 - ✓ Weight
 - ✓ Respiratory Rate
 - ✓ Pulse
 - ✓ Blood Pressure
- Temperature
 - ✓ Previously discussed
- Height and Weight
 - ✓ Height and Weight are of significance in dentistry because it impacts airway management
 - ✓ Airway Management
 - Positioning a patient in supine decreases the airway 25%.
 - Having the patient fully opening their mouth causes an additional 50% loss of airway
 - ✓ Many Americans are overweight or obese
 - ✓ The issue is not weight or body mass index



- ✓ The central issue is the *distribution* of the weight
- ✓ Beware of *central adiposity* / It's like breathing with a weight placed on the stomach

- Respiratory Rate
 - ✓ Minute Volume = Tidal Volume X Rate
 - ✓ 14-18 breaths/minute is normal for adults
 - ✓ Children typically have a higher rate

Age	Rate	Age	Rate
Neonate	40	5 years	20
1 week	30	8 years	28
1 year	24	12 years	16
3 years	22	21 years	12

- ✓ Assessment
 - Chest movement
 - N₂O reservoir
 - Precordial stethoscope
 - Automatic monitor (capnography)

✓ Cardiac Cycle

EVENT	HEART MECHANISMS	BLOOD MOVEMENT	MISCELLANEOUS
Systole begins	AV valve closes ↑ Ventricular pressure		1 st Heart sound (lub)
Momentarily later	Aortic valve opens	Ventricle begins to open	1 st heart sound continues
Mid-systole	Ventricular pressure begins decreasing	Ejection fraction has left the ventricle	
Diastole later (Ventricle relaxes)	↓ vent pressure → AV valve closes	Aortic pressure → Coronary Arts Filling	2 nd heart sound (dub)
Momentarily later	Very low vent pressure AV valve opens	70% atrial blood moves to ventricle	
Mid-diastole	Atria contracts	30% “atrial kick”	Ventricle fully refilled for next cycle

✓ Significance to Dentistry

- High Diastolic Pressure
 - ↳ Overworks cardiac muscle
- Low Diastolic Pressure
 - ↳ Inadequate O₂ for cardiac muscle
- High Rate
 - ↳ Inadequate ventricular filling (*Low minute volume due to low stroke volume*)
- Low Rate
 - ↳ Low minute volume

✓ Mean Arterial Pressure (MAP)

- The “average” pressure in the system
- Reflects how hard the heart is working
- Heart spends ⅔ of the time at rest (diastole)

$$\text{MAP} = \frac{\text{SBP} + 2(\text{DBP})}{3}$$

✓ Boundaries of Normal

Age	SBP	DBP
>0.5 yr.	80±16	46+16
0.5-1.0	89±29	60+10
1	96±30	66+25
2	99±25	64+25
3	100±25	67+23
4	99±20	65+20
5-6	94±14	55+9
6-7	100±15	56+8

Age	SBP	DBP
7-8	102±15	56+8
8-9	105±16	57+9
9-10	107±16	57+9
10-11	111±17	58+10
11-12	113±18	59+10
12-13	115±19	59+10
13-14	118±19	60+10
14+	≤119	≤79

- ✓ Hypotension
 - Defined as Systolic <90 or Diastolic < 60 in adults
 - As a practical matter, the issue is, “Is the patient perfusing?”
 - Failing to perfuse...
 - ↳ Effects heart and brain
 - ↳ Consequently, it is an acute emergency
 - ↳ BUT ONLY TREAT IF SYMPTOMS ARE PRESENT
 - Diagnosis
 - ↳ Nail bed test ✓ Pupil response to light
 - Etiology
 - ↳ Inadequate rate (i.e. Pulse < 60)
 - ↳ MOST COMMON: Inadequate contractility (i.e. Pulse > 60)
 - Response
 - ↳ For Most Offices
 - ⇒ Elevate legs, call EMS
 - ↳ If IV is in base
 - ⇒ Fluid challenge
 - ↳ Advanced considerations
 - ⇒ If Pulse < 60, consider atropine
 - Parasympathetic antagonist
 - 0,5 mg every 5 minutes up to 4 doses
 - ⇒ If Pulse > 60, consider ephedrine (*NOT epinephrine!*)
 - A, β1, & β2 Agonist
 - 25 mg up to 2 doses
- ✓ Hypertension / Staging of High Blood Pressure *for Physicians*

Patient's Routine BP

BP Category	Systolic BP	And-vs-Or	Diastolic BP
Normal	< 120	AND	< 80
Elevated	120-129	AND	< 80
Stage 1 HBP	130 -139	OR	80-89
Stage 2 HBP	> 140	OR	> 90

- ✓ Hypertension / Applications to Dentistry
ADA, 2020 based on 2017 AHA & American College of Cardiology
 - <160 AND <100
 - ↳ Proceed normally
 - ELECTIVE (MOST) DENTAL TX: >160 OR >100
 - ↳ Allow patient to rest, retake BP, if it lowers proceed with caution or consult MD for approval
 - ↳ If it does not reduce, postpone elective treatment until patient sees MD
 - EMERGENCY DENTAL CARE
 - ↳ 160-179 (SBP) or 100-108 (DBP)
 - ↳ Proceed retaking BP every 10-15 minutes
 - ↳ Consider strategy to reduce anxiety (i.e. sedation)

↳ Limit epinephrine to 40 mcg (2 carps of 1:100,000)

- EMERGENCY DENTAL CARE
 - ↳ >180 (SBP) or 109 (DBP)
 - ↳ Seek medical consult before emergency care
 - ↳ Refer to MD ASAP
- EMERGENCY HYPERTENSION (“Sangrik’s Law,” not ADA)
 - ↳ >210 or >120
 - ↳ Transfer to via EMS to Emergency Department

✓ Technique

- Choose the correct cuff size
 - ↳ Arm diameter plus 20%
- Expose arm without constriction
- Fit cuff snugly
- Rapidly inflate cuff
 - ↳ 30 mm above estimated systolic
 - ↳ or 220 mm
- Deflate slowly at a rate of 2mm/sec
- Record, inform patient, wait 2 minutes for rebound

✓ Common Errors

- Wrong Equipment
 - ↳ Manual Unit
 - Mercury Unit not generally practical
 - Aneroid / Most common option
 - ⇒ Bladder permanently attached
 - ⇒ Need three for a GP office
 - ⇒ Standard adult
 - ⇒ Large adult or Obese
 - ⇒ Small adult or Adolescent

↳ Automated Units

- Hospital Grade
 - ⇒ Expensive
 - ⇒ Good for all circumstances

✓ Home Model

- ⇒ Adequate for HBP screening
- ⇒ Not reliable at low BP
- ⇒ Not appropriate for emergency use

➤ Wrist Cuffs

- ⇒ Posture sensitive / Must be at heart level
- ⇒ Adequate for HBP screening
- ⇒ Not reliable at low BP
- ⇒ Not appropriate for emergency use

- Loosely Applied Cuff
 - ↳ Artificially high reading
- Incorrect Cuff Size
 - ↳ Reinforces operator bias

- ↳ Cuff too small... reading artificially high
- ↳ Cuff too large... reading artificially low

- Rapid Cuff Deflation
 - ↳ Needle moves actual point of reading before sound is observed
 - ↳ Artificially low reading

- Auscultatory Gap
 - ↳ Under inflating cuff
 - ↳ SPB incorrectly recorded at end of the 2nd Korotkoff sound instead of being of the 1st sound
 - ↳ Artificially low SBP but correct DBP

V. Advanced Monitoring Techniques

See Slides 143-193

VI. Suggested Monitoring Levels

- Local Anesthetic Only
 - ✓ Basic / Possible Vital Signs
 - Pallor Respiratory function
 - Temperature
 - Finger perfusion during emergency
 - Blood pressure as deemed appropriate
 - ↳ New patient
 - ↳ Annually
 - ↳ “Stressful” appointment

- Level I: N₂O Only
 - ✓ Basic assessment
 - ✓ Continual Tidal Volume and Respiratory Rate
 - ✓ Pre-&- Post Tx BP per ADA guidelines

- Level II: Minimal Oral
 - ✓ Basic assessment
 - ✓ Continual Tidal Volume and Respiratory Rate
 - ✓ Pre-&- Post Tx BP per ADA guidelines
 - ✓ General observation of height, weight and body shape

- Level III A: Moderate Oral with N₂O
 - ✓ Basic assessment
 - ✓ Continual Tidal Volume and Respiratory Rate
 - ✓ Pre-&- Post Tx BP per ADA guidelines
 - ✓ General observation of height, weight and body shape
 - ✓ Pulse oximetry

- Level III B: Moderate Intravenous Sedation
 - ✓ Basic assessment
 - ✓ Continual Tidal Volume and Respiratory Rate
 - ✓ Pre-&- Post Tx BP per ADA guidelines
 - Increase BP to every 5 minutes if using cardio-sensitive meds like Precedex
 - ✓ General observation of height, weight and body shape / Check Mallampati score
 - ✓ Pulse oximetry
 - ✓ Capnography suggested
 - ✓ ECG suggested, especially with Precedex

- Level IV (Deep Sedation) and Level V (General Anesthesia)
 - AAMOS Protocols
 - ✓ Basic assessment
 - ✓ Continual Tidal Volume and Respiratory Rate
 - ✓ Continual BP (every 5-10 minutes)
 - ✓ General observation of height, weight and body shape / Check Mallampati score
 - ✓ Pulse oximetry
 - ✓ Capnography
 - ✓ ECG