

Vital Signs and Monitoring Devices



OBJECTIVES

- Define key terms introduced
- Identify the vital signs used in prehospital patient assessment.
- Explain the use of vital signs in patient care decision making.
- Demonstrate assessment of pulse, respirations, skin, pupils, blood pressure, oxygen saturation, and blood glucose.

continued

OBJECTIVES

- Integrate assessment of vital signs into the patient assessment process, according to the patient's condition and the situation.
- Discuss the importance of documenting vital signs and the times they were obtained in the patient care record.
- Demonstrate assessment of pulse, respirations, skin, pupils, blood pressure, oxygen saturation, and blood glucose.

continued

OBJECTIVES

- **Discuss the meaning of “SAMPLE”**
- Differentiate between vital signs that are within expected ranges for a given patient, and those that are not.
- Compare and contrast the techniques of assessment and expected vital sign values for pediatric and adult patients

continued



Gathering the Vital Signs

Importance of Vital Signs

- Outward signs of what is going on inside the body
- Identify important conditions or trends in patient conditions
- Gathered on virtually every EMS patient
- Patient severity and treatment priorities may prevent acquisition



Vital Signs

What Are Vital Signs?

- Pulse
- Respiration
- Skin color, temperature, and condition
(plus capillary refill in infants and children)
- Pupils
- Blood pressure

continued

What Are Vital Signs?

- Baseline vital signs: first vital signs obtained
- Repeat vital signs: gain further information by establishing trends

Pulse

Definition:

Pulse is the rhythmic expansion and contraction of an artery caused by the impact of blood pumped by the heart.

- Palpable pressure of heart beating, causing blood to move through arteries in waves

continued

Pulse

- Can be felt by placing fingertip over artery where it lies close to body's surface and crosses over bone



Pulse Rate

- Number of beats of heart per minute
- Rate is number of beats felt in 30 seconds multiplied by 2
- Varies among individuals

continued

Pulse Rate

- Normal rate for adult at rest is between 60 and 100 beats per minute
- Rate above 100 beats per minute is rapid (Tachycardia)
- Rate below 60 beats is considered slow (Bradycardia)
- Above 120bpm and below 50bpm considered serious

continued

Think About It

- What normal situations might account for a heart rate outside the normal range?

Pulse Quality

- Two factors determine pulse quality
- Rhythm
 - Regular
 - Irregular
- Force
 - Strong
 - Weak

Pulse Rhythm

- Reflects regularity
 - Regular when intervals between beats are constant
 - Irregular when intervals are not constant

Pulse Force

- Pressure of pulse wave as it expands artery
 - Pulse should feel strong
 - Thready—when pulse feels weak and thin

Common Pulse Locations

Radial

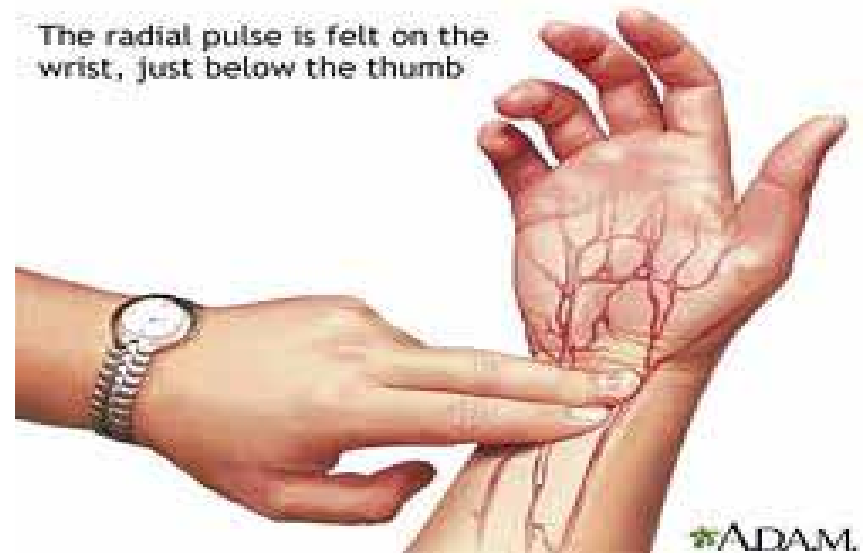
Brachial

Carotid

Radial Pulse

- Wrist pulse
- Used in patient's greater than 1 year
- Found by placing first two fingers on thumb side of patient's wrist just above the crease

The radial pulse is felt on the wrist, just below the thumb



Brachial Pulse

- Used in patients younger than 1 year
- Upper arm pulse (between bicep and tricep muscle)

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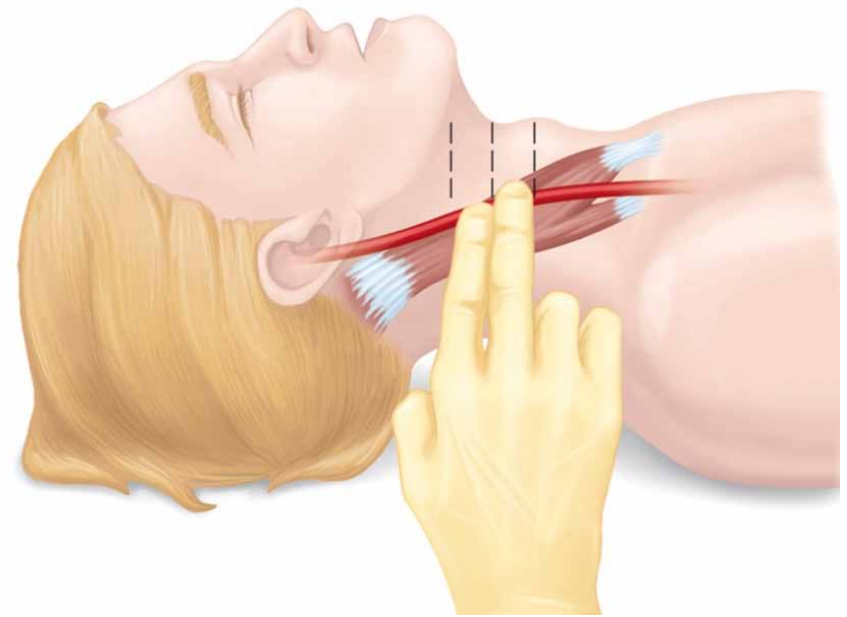
Brachial Pulse



- Found by placing three fingers on patient's anterior upper arm (between bicep and triceps muscle) just distal to armpit

Carotid Pulse

- Felt along large carotid artery on either side of neck
- Never access both sides of artery at same time
- Avoid excess pressure on geriatrics
- Typically used in cardiac arrest



Assessing Pulse

- Count pulsations for 30 seconds and multiply by 2
- If rate, rhythm, or force is not normal, continue with count for full 60 seconds
- Judge rhythm and force

Respirations

- With regard to vital signs, respiration means the act of breathing in and out
- Measurement includes both rate and quality

Respiratory Rate

- Respiratory rate—number of breaths the patient takes in 1 minute
- Rate of respiration is classified as normal, rapid, or slow

continued

Respiratory Rate

- Normal rate for adult at rest: 12–20 breaths per minute
- Age, sex, size, physical conditioning, and emotional state influence breathing rates
- Rates above 24 breaths per minute (rapid) or below 8 breaths per minute (slow) are potentially serious findings

Respiratory Quality

- Four categories
 - Normal, average chest wall motion
 - Shallow, slight chest or abdominal wall motion
 - Labored, increases effort to breath
 - Noisy, increase in audible sound of breathing

Assessing Respirations

- Assessed by observing the patient's chest rise and fall
- Count number of breaths taken over 30 seconds and multiply by 2
- Note rate, quality, and rhythm of respiration

Skin

- Color, temperature, and condition of skin can provide valuable information regarding circulation
- Should be assessed in the nail beds, oral mucosa, and conjunctiva for adults
- Assessed in palm of hands and soles of feet in infants

Skin Color

- Normal
 - Pink
- Abnormal
 - Pale: Indicates poor perfusion
 - Cyanotic: (blue grey) indicating inadequate oxygenation or poor perfusion
 - Flushed: (red) indicating exposure to heat or carbon monoxide (CO) poisoning
 - Jaundice: (yellow) Indicating abnormal liver

continued

Cyanosis Images



Evaluating Capillary Refill

- Press on nail bed or top of hand or foot and release
- Observe how long it takes normal pink color to return
- Normal—less than 2 seconds

Skin: Pediatric Note

- For children under 6 years, also evaluate capillary refill



Skin Temperature



- Feel patient's skin with back of hand
- Note if skin feels normal (warm), hot, cool, or cold

Skin Condition

- Normal
 - Dry
- Abnormal
 - Skin is wet or moist (clammy), or very dry
- Abnormal could be indication of poor perfusion or other serious medical event

Pupils

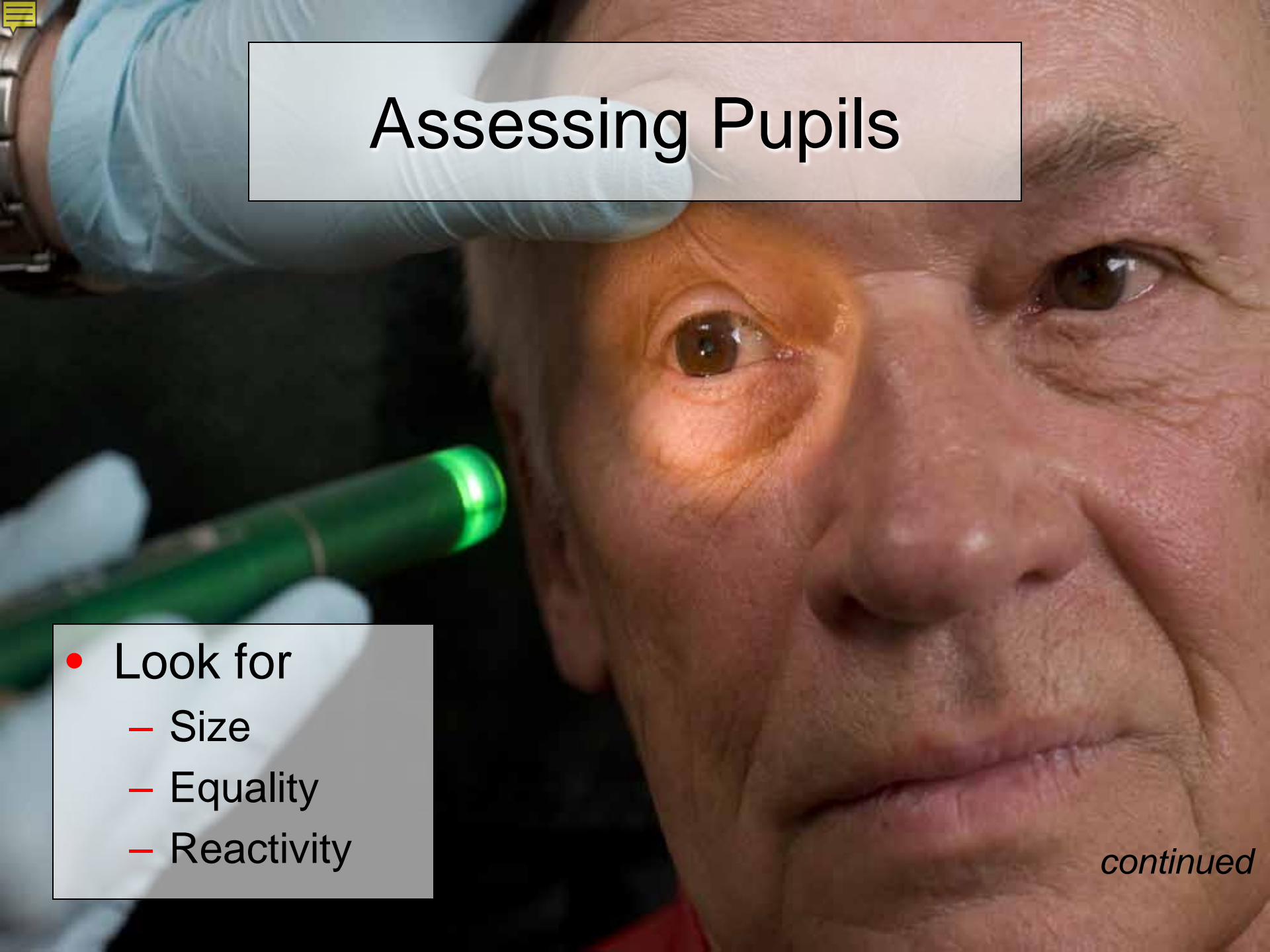
- Black center of eye
- Dim environment—pupil will dilate
- Bright environment—pupil will constrict
- Certain conditions will not allow pupils to dilate (unreactive)



Assessing Pupils

- Note baseline size
- Cover one eye and shine a light into other eye
- Repeat with other eye

continued



Assessing Pupils

- Look for
 - Size
 - Equality
 - Reactivity

continued

Assessing Pupils



Constricted pupils



Dilated pupils



Unequal pupils

Blood Pressure

- Change is more significant than one measurement
- Normal pressure
 - Systolic (top number) no greater than 120 mmHg
 - Diastolic (bottom number) no greater than 80 mmHg

Measuring Blood Pressure

- Measured with a sphygmomanometer and stethoscope
- Cuff should cover two thirds of upper arm



continued

Measuring Blood Pressure

- Wrap cuff around patient's upper arm
- Lower edge of cuff placed about 1 inch above crease of elbow
- Center of bladder placed over brachial artery

Methods of Obtaining BP

ASCULTATION

- The EMT-B will listen for the systolic and diastolic sounds
- Requires use of stethoscope
- Should always be first attempt

PALPATION

- EMT-B will feel for the return of pulse with deflation of the cuff
- Does not require use of stethoscope
- Will only produce systolic reading

Assessing Blood Pressure by Auscultation

- Position cuff and stethoscope
- Palpate brachial artery at crease of elbow
- Position stethoscope

continued

Assessing Blood Pressure by Auscultation

- Place diaphragm of stethoscope directly over brachial pulse or medial anterior elbow

continued

Assessing Blood Pressure by Auscultation

- Inflate cuff
- Listen and inflate until gauge reads 30 mm higher than the point the pulse sound disappeared

continued

Assessing Blood Pressure by Auscultation

- Obtain systolic pressure
 - Slowly release air from cuff
 - When you hear the first of these sounds, note the reading on the gauge
- Systolic Pressure Definition:

The degree of force when the heart is pumping
(contraction)

continued

Assessing Blood Pressure by Auscultation

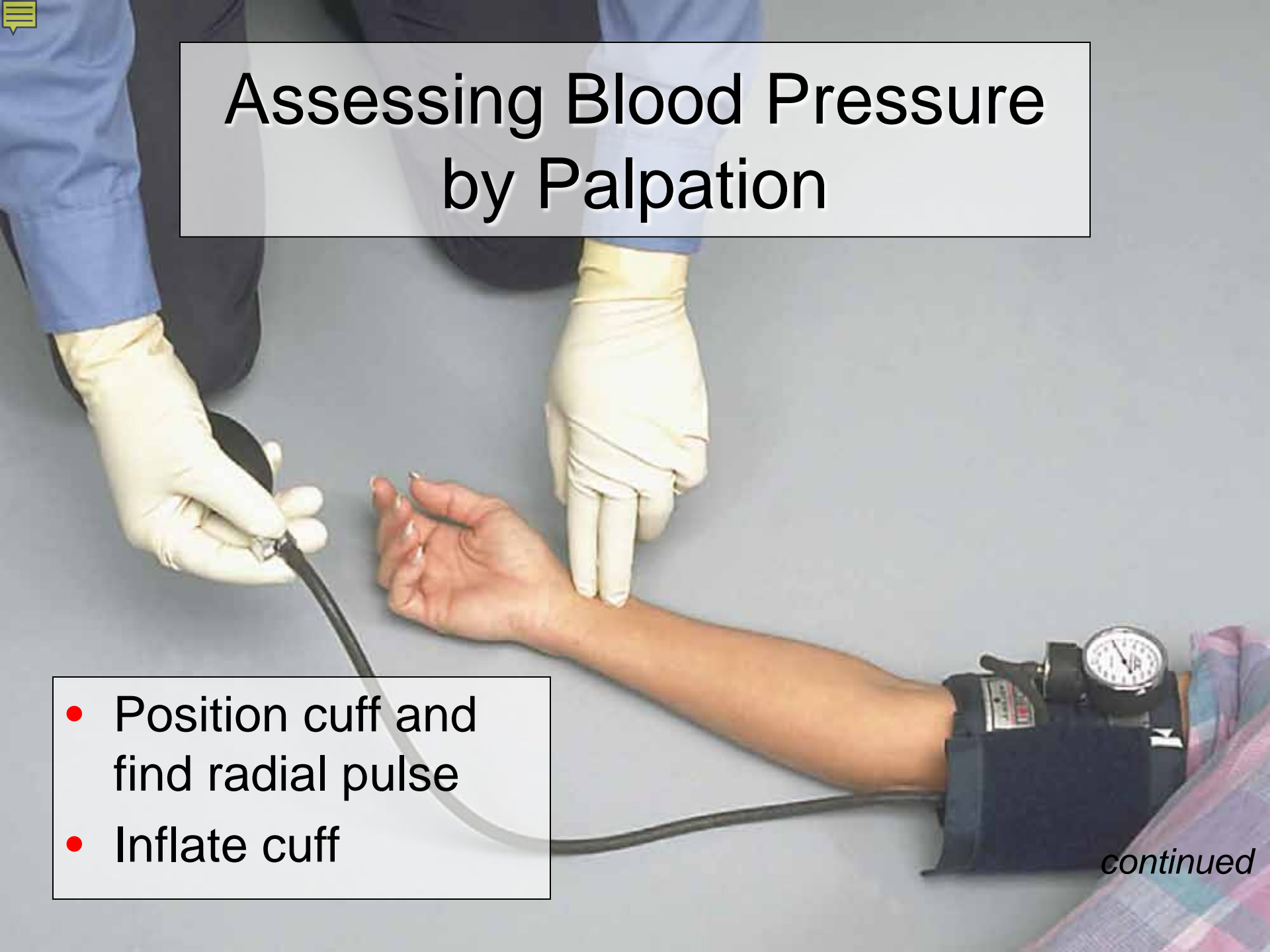
- Obtain diastolic pressure
 - Continue to deflate cuff
 - When sound turns to dull, muffled thuds, record the number on the gauge
 - If you can't hear the change, the point when the sound disappears should be recorded
- Diastolic Pressure Definition

The degree of force when the heart is relaxed (deflation)

Assessing Blood Pressure by Palpation

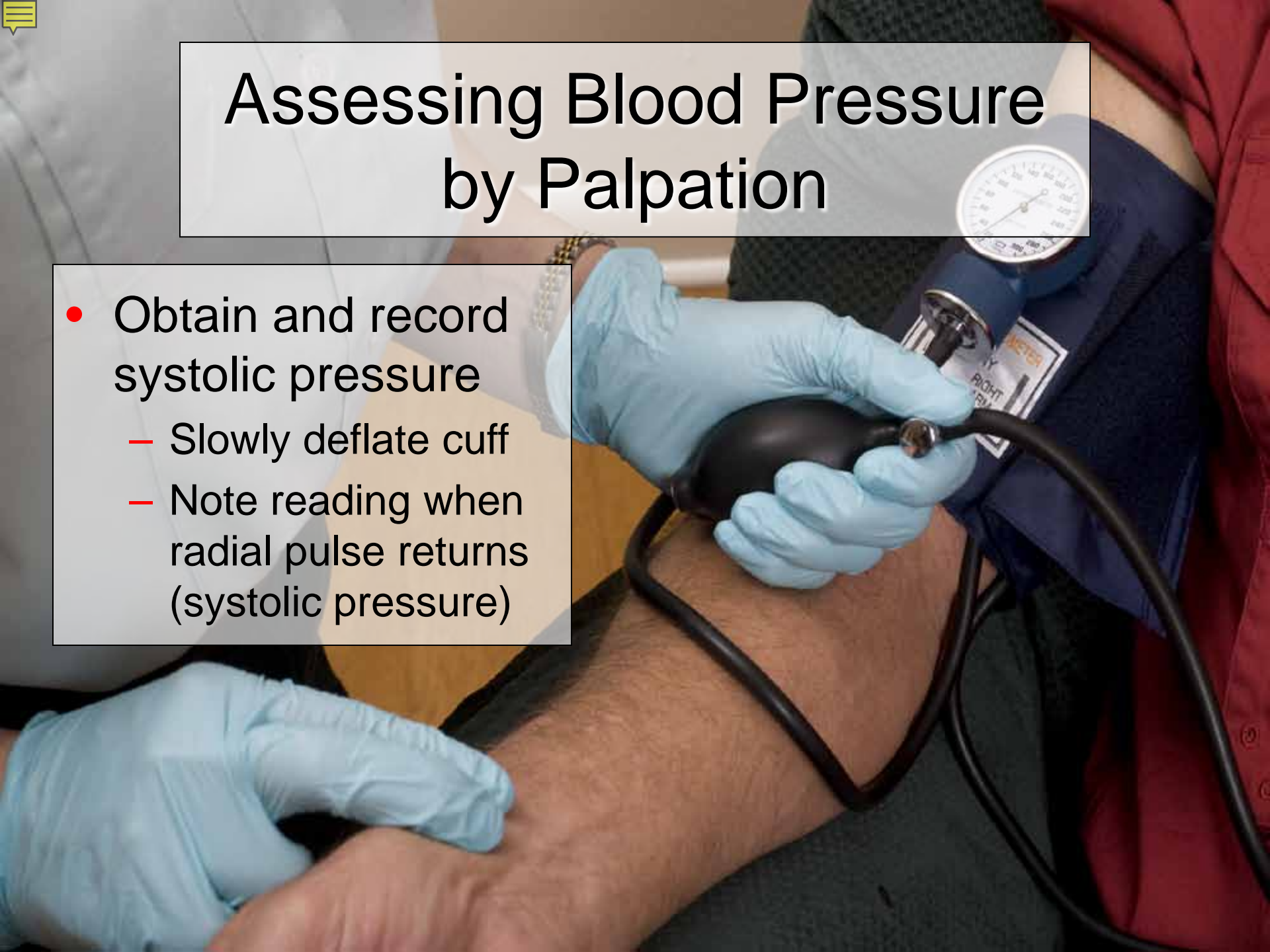
- Position cuff and find radial pulse
- Inflate cuff

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Assessing Blood Pressure by Palpation

- Obtain and record systolic pressure
 - Slowly deflate cuff
 - Note reading when radial pulse returns (systolic pressure)



Pediatric Note: Blood Pressure

- Difficult to obtain on infants and children younger than 3 years
- Use age/size-appropriate cuff

Temperature

- Not a required Vital Sign
- Narrow range of temperature allows chemical reactions and other activities to take place inside the body
- Core temperature reflects level of heat inside trunk

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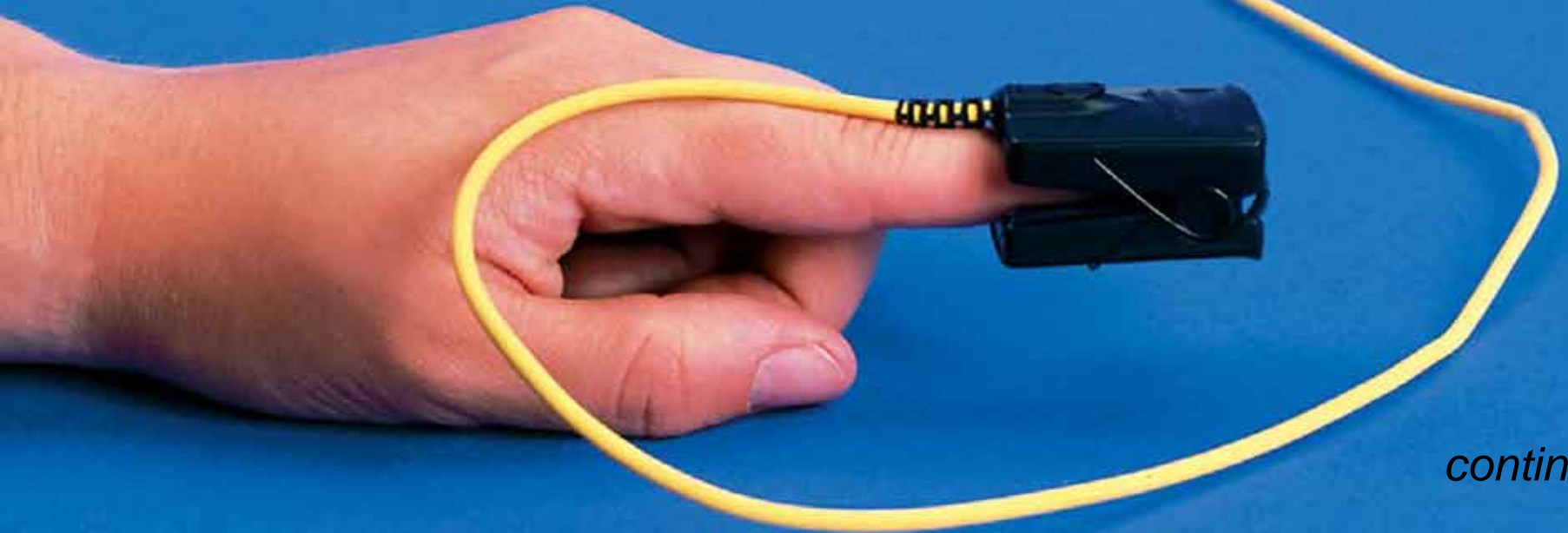
Temperature

- Normal temperature depends on
 - Time of day
 - Activity level
 - Age
 - Where measured



Oxygen Saturation

- Measurement of proportion of oxygen attached to hemoglobin
- Measured with pulse oximeter



continued

Oxygen Saturation

- Normal: 96%–100%
- Mild hypoxia: 91%– 95%
- Significant or moderate hypoxia: 86%–90%
- Severe hypoxia: 85% or less – will usually be visible upon physical exam

continued

Oxygen Saturation

- Accuracy of reading can be affected by
 - Shock, hypothermia
 - Carbon monoxide, certain other uncommon types of poisoning
 - Excessive movement, nail polish, anemia
 - Poor perfusion

Blood Glucose

- Not considered a required vital sign
- Measures quantity of glucose in the bloodstream
- Can help identify some diabetic emergencies
- Measured in milligram per deciliter (mg/dL)

Blood Glucose Monitor



MADE IN CHINA

Blood Glucose Measurement

- Permission from medical direction or by local protocol is required to perform blood glucose monitoring using a blood glucose meter
- Monitors must be calibrated and stored according to manufacturer's recommendations

Acquiring Blood Glucose Measurement

1. Prepare device, test strip, and lancet
2. Cleanse patient's finger with alcohol
3. Perform finger stick with lancet
4. Wipe away first drop of blood
5. Apply blood to test strip
6. Use glucose meter to analyze sample and provide reading

Blood Glucose Levels

- Normal level
 - Usually at least 60–80 mg/dL
 - No more than 120 or 140 mg/dL
 - Over 140 mg/dL will not necessarily indicate a medical emergency

Vital Signs Reassessment

- When to reassess:
 - Every **15** minutes for a **stable** patient (at minimum)
 - Every **5** minutes for an **unstable** patient
 - Following all medical interventions

Vital Signs: Pediatric Note

- Age is one of the most important factors determining normal range
- Infants and children: faster pulse and respiratory rates, and lower blood pressures than adults



Chapter Review

Chapter Review

- Can gain a great deal of information about patient's condition by taking complete set of baseline vital signs, including pulse, respirations, skin, pupils, and blood pressure.
- EMT must become familiar with normal ranges for pulse, respirations, and blood pressure in adults and children.

continued

Chapter Review

- Trends in patient's condition will become apparent only when vital signs are repeated, an important step in continuing assessment.
- How often you repeat vital signs will depend on patient's condition: at least every 15 minutes for stable patients and at least every 5 minutes for unstable patients.

Remember

- Consider if there is time to obtain vital signs or if you must wait to obtain them en route to the hospital.
- Consider when to apply a pulse oximeter. Should you apply it to a patient with difficulty breathing? Without difficulty breathing?

continued

Remember

- Consider whether abnormal vital signs are a result of an illness or injury or the result of some other factor.

Questions to Consider

- Name the vital signs.
- Explain why vital signs should be taken more than once.
- How much time should the EMT spend looking for a pulse when the radial pulse is absent or extremely weak?

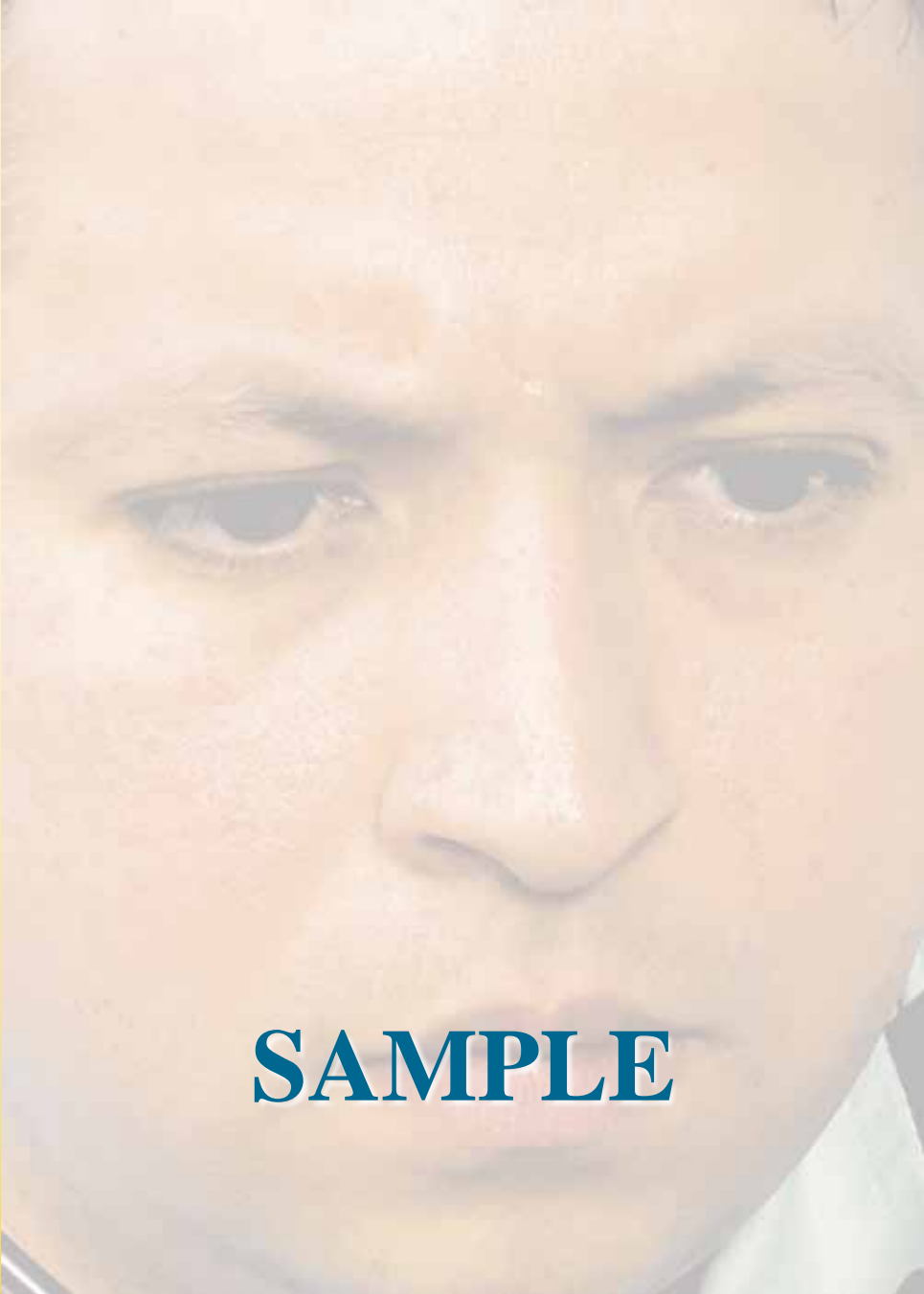
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Questions to Consider

- How should you react when the blood pressure monitor gives a reading that is extremely different from previous readings?
- How can you get an accurate pulse oximeter reading on a patient with thick artificial nails?

Critical Thinking

- Sometimes a patient's heart will have an electrical problem and beat more than 200 times a minute. Why is the pulse so weak in such a patient?



SAMPLE

SAMPLE

Signs and Symptoms

Allergies

Medications

Pertinent Past History

Last Oral intake

Events leading to illness

Signs and Symptoms “S”

- Sign-any medical or trauma condition displayed by the patient and identifiable by the EMT-B
 - Hearing: respiratory distress, etc
 - Seeing: Bleeding, cyanosis, physical behavior
 - Feeling: Skin temperature and condition
- Symptom – any condition described by the patient
 - Example: Shortness of breath, pain, discomfort

Allergies “A”

- Medications
- Food
- Environmental allergies
- Consider medical identification tag

Medications “M”

- Prescription
 - Current
 - Recent
 - Birth Control Pills
- Non-prescription
 - Current (ex; Aspirin “ASA”)
 - Recent
- Consider Identification Tag

Pertinent Past History “P”

- Medical
- Surgical
- Trauma
- Consider medical identification tag

Last Oral Intake “L”

- Solid or Liquid
- Time
- Quantity

Events Leading to Injury/Illness

- What the patient was doing during and prior to onset of symptoms (potential cause)
- Can the patient do anything to change the symptoms

SAMPLE

- Extremely important in assessing your patient
- Will provide direction to your treatment
- Used on every conscious patient
- Attempt to obtain through bystanders for unconscious patients