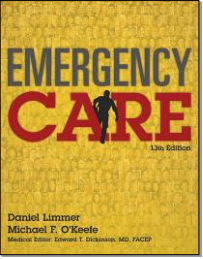


## Emergency Care

THIRTEENTH EDITION



### CHAPTER 13

Vital Signs and  
Monitoring Devices

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## 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.

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## What Are Vital Signs?

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

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## Trending...

- Baseline vital signs
  - First vital signs obtained
- Repeat vital signs
  - Gain further information by establishing trends

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## Pulse

- Palpable pressure of heart beating, causing blood to move through arteries in waves
- Can be felt by placing fingertip over artery where it lies close to body's surface and crosses over bone



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## Pulse Rate

- Assess for 30 seconds, multiply x 2
- Normal Resting Rate = 60-100/minute
- Tachycardia
  - Rate > 100 beats per minute is rapid.
- Bradycardia
  - Rate < 60 beats per minute is considered slow.

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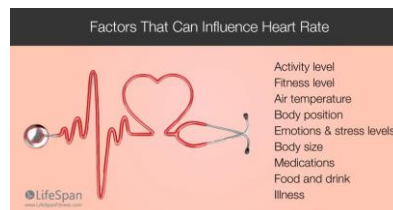
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## Pulse Rate

- Above 120 beats or below 50 beats per minute is considered a serious finding.
- During an emergency, it is not unusual for pulse rate to temporarily be between 100 and 140 beats.

## Think About It

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



## Pulse Quality

- Two factors determine pulse quality.
  - **1. Rhythm**
    - Reflects regularity
      - Regular when intervals between beats are constant
      - Irregular when intervals are not constant

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## Pulse Quality

- Two factors determine pulse quality.
  - **2. Force/Quality**
    - Pressure of pulse wave as it expands artery
    - Pulse should feel strong.
    - Thready
      - When pulse feels weak and barely palpable

## Pulse Quality

- Common pulse locations
  - Radial
    - Used in patients one year and older
    - Wrist pulse
    - Found by placing first three fingers on thumb side of patient's wrist just above the crease



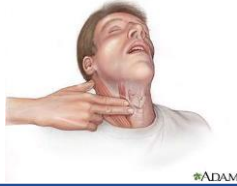
## Pulse Quality

- Common pulse locations
  - Brachial
    - Used in patients one year old or younger
    - Upper arm pulse



## Pulse Quality

- Common pulse locations
  - Carotid
    - Felt along large carotid artery on either side of the neck



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## Pulse Quality

- 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.

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## Respiration

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

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## Respiratory Rhythm

- Count respirations after assessing pulse rate.
- Count number of breaths taken over 30 seconds and multiply by 2.
- Note rate, quality, and rhythm of respiration.

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## Respiratory Rate

- Number of breaths in one minute
- Rate classified as normal, rapid, or slow.
- Rates > 24 (rapid) or < 8 (slow) are potentially serious findings for an adult.

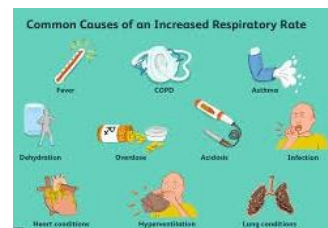
Is My Child Breathing **Too Fast?**

Up to 6 months:	30-60 BREATHS PER MINUTE
6-12 months:	24-30 BREATHS PER MINUTE
1-5 years:	20-30 BREATHS PER MINUTE
6-12 years:	12-20 BREATHS PER MINUTE
12 years and up:	12-20 BREATHS PER MINUTE

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## Respiratory Rate

- Age, sex, size, physical conditioning, and emotional state influence breathing rates.



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## Respiratory Quality

- Four categories
  - Normal
  - Shallow
  - Labored
  - Noisy

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## Skin

- Color, temperature, and condition of skin can provide valuable information regarding circulation

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## Skin

- **Color**
  - Best places to assess skin color
    - Nail beds
    - Inside of cheek
    - Inside of lower eyelids

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## Skin

- **Color**
  - Abnormal skin colors
    - Pale
    - Cyanotic (blue-gray)
    - Flushed (red)
    - Jaundiced (yellow)

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## Skin

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

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## Pediatric Note

- For children under six years, also evaluate 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

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### Capillary Refill


Prolonged capillary refill (10 seconds) in a 3-month-old with cardiogenic shock



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### Pupils

- Black center of eye
- Dim environment
  - Pupil will dilate.
- Bright environment
  - Pupil will constrict.




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### Pupils

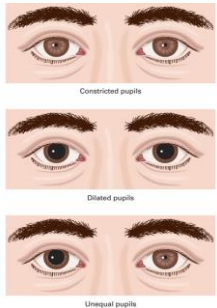
- Assessing
  - Note baseline size
  - Cover one eye and shine a light into other eye
  - Repeat with other eye



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### Pupils

- Assessing
  - Look for:
    - Size
    - Equality
    - Reactivity



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### Blood Pressure

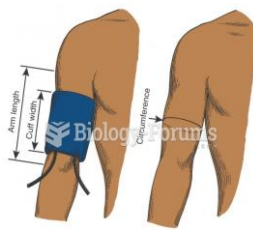
- Force of blood against the walls of the blood vessels
- Normal pressure
  - Systolic no greater than 120 mm Hg
  - Diastolic no greater than 80 mm Hg
- Change can indicate something very significant.

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### Blood Pressure

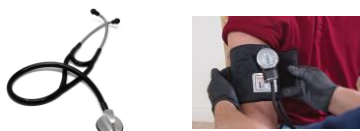
- Measured with a sphygmomanometer and stethoscope
  - Cuff should cover two-thirds of upper arm, elbow to shoulder.



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## Blood Pressure

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



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## Determining Blood Pressure by Auscultation

- Prepare patient.
- Position cuff and stethoscope.
  - Palpate brachial artery at crease of elbow.
  - Position stethoscope.
  - Position diaphragm of stethoscope directly over brachial pulse or medial anterior elbow.

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## Determining Blood Pressure by Auscultation



When measuring blood pressure by auscultation, locate the brachial artery by palpation before placing the stethoscope.

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## Determining Blood Pressure by Auscultation

- Inflate cuff.
  - Listen and inflate until gauge reads 30 mm higher than the point the pulse sound disappeared.
- Obtain systolic pressure.
  - Slowly release air from cuff.
  - When you hear the first of these sounds, note the reading on gauge.

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## Determining Blood Pressure by Auscultation

- Obtain diastolic pressure.
  - Continue to deflate cuff.
  - When sounds turn to dull, muffled thuds, the reading on the gauge is diastolic pressure.
- Record measurements.

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## Determining Blood Pressure by Palpation

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

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## Pediatric Note

- Difficult to obtain on infants and children younger than **three** years
- More useful information about the condition of an infant or very young child comes from observing for conditions such as **sick appearance, respiratory distress, or unconsciousness**

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## Determining Blood Pressure by Blood Pressure Monitor

- Position the cuff.
- Inflate the cuff.
- Obtain and record the systolic pressure.
  - Slowly deflate the cuff.

140/0 versus 140/P

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## Temperature

- 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
  - Environment
  - Where measured



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## Oxygen Saturation

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



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## When to Use a Pulse Oximeter

- Protocol depends on institution.
- Generally includes all patients complaining of respiratory problems or otherwise at risk for hypoxia

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## Interpreting Pulse Oximeter Readings

- Normal
  - 96 to 100 percent
- Mild hypoxia
  - 91 to 95 percent
- Significant or moderate hypoxia
  - 86 to 90 percent
- Severe hypoxia
  - 85 percent or less

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## Interpreting Pulse Oximeter Readings

- Accuracy of reading can be affected by:
  - Shock, hypothermia
  - Carbon monoxide
  - Certain other uncommon types of poisoning
  - Excessive movement
  - Nail polish
  - Anemia

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## Blood Glucose Meters

- Measures quantity of glucose in the bloodstream
- Can help identify some diabetic emergencies



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## Using a Blood Glucose Meter

- 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

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## Using a Blood Glucose Meter

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

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## Using a Blood Glucose Meter

- Normal levels
  - Usually at least 60 to 80 mg/dL
  - No more than 120 or 140 mg/dL

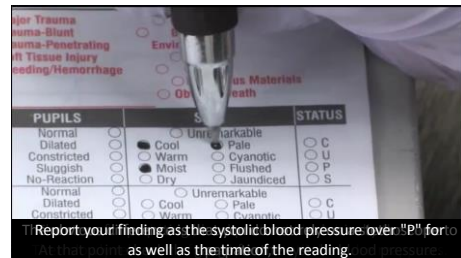
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## Pediatric Note

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

## Patient Assessment Skills: Blood Pressure Video



Click on the screenshot to view a video on the topic of assessing blood pressure.

[Back to Directory](#)

## Chapter Review

## Chapter Review

- You can gain a great deal of information about a patient's condition by taking a complete set of baseline vital signs, including pulse, respirations, skin, pupils, and blood pressure.

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## Chapter Review

- The EMT must become familiar with normal ranges for pulse, respirations, and blood pressure in adults and children.
- Trends in patient's condition will become apparent only when vital signs are repeated, an important step in continuing assessment.

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## Chapter Review

- 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?

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## 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?

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## 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?

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