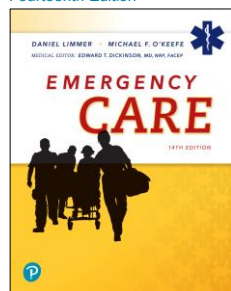


Emergency Care

Fourteenth Edition



Chapter 13

Vital Signs and Monitoring Devices

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Topics

- [Gathering the Vital Signs](#)
- [Vital Signs](#)
- [Monitoring Devices](#)

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Gathering the Vital Signs

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Gathering the Vital Signs

- Vital signs
 - Major components of assessment that will take a few minutes to complete
 - Vast majority of patients should have an assessment that includes vital signs measurement
 - Help indicate important conditions or trends in patient conditions that require particular treatments in the field or that prompt transport to a hospital
 - Taken during secondary assessment after primary assessment to find and treat immediate life threats

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Vital Signs

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What Are Vital Signs? (1 of 2)

- Outward signs of what is going on inside the body
 - Pulse
 - Respiration
 - Skin color, temperature, and condition (plus capillary refill in infants and children)
 - Pupils
 - Blood pressure
- Oxygen saturation not a vital sign but often included with consideration of vital signs

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What Are Vital Signs? (2 of 2)

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



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Pulse (1 of 3)

- 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 (2 of 3)

- Taking a patient's pulse concerns two factors
 - Rate
 - Quality



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Pulse (3 of 3)



Assess pulse rate and quality. Count for 30 seconds and multiply by 2.



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Pulse Rate (1 of 2)

- Number of beats per minute
- Normal rate for adult at rest is between 60 and 100 beats per minute.
- Tachycardia
 - Rate above 100 beats per minute is rapid.
- Bradycardia
 - Rate below 60 beats per minute is considered slow.



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Pulse Rate (2 of 2)

- Above 150 beats per minute, or above 120 beats or below 50 beats per minute across several measurements, is considered a serious finding.
- During an emergency, it is not unusual for pulse rate to temporarily be between 100 and 140 beats.



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Think About It

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



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Pulse Quality (1 of 6)

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



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Pulse Quality (2 of 6)

- Two factors determine pulse quality.
 - Force
 - Pressure of pulse wave as it expands artery
 - Pulse should feel strong.
 - Thready
 - When pulse feels weak and thin



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Pulse Quality (3 of 6)

- Common pulse locations
 - Radial
 - Used in patients 1 year and older
 - Wrist pulse
 - Found by placing first three fingers on thumb side of patient's wrist just above the crease



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Pulse Quality (4 of 6)

- Common pulse locations
 - Brachial
 - Used in patients 1 year old or younger
 - Upper arm pulse



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Brachial Pulse



Palpating a brachial pulse in an infant.



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Pulse Quality (5 of 6)

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



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Pulse Quality (6 of 6)

- 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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Radial Pulse



Assess respiration rate and quality. Count for 30 seconds and multiply by 2.



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Respiration Rate

- Number of breaths the patient takes in one minute
- Rate of respiration is classified as normal, rapid, or slow.
- Normal rate for adult at rest is between 12 and 20 breaths per minute.
- Age, sex, size, physical conditioning, and emotional state influence breathing rates.
- Unusually fast or slow respiratory rates may require oxygen administration or providing ventilations to the patient in respiratory failure.



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Respiration Quality

- Four categories
 - Normal
 - Shallow
 - Labored
 - Noisy



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Respiration Rhythm

- If you observe irregular respirations in an unconscious patient, you should report and document it.
- 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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Skin (1 of 4)

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



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Skin (2 of 4)

- Color
 - Best places to assess skin color in adults
 - Nail beds
 - Inside of cheek
 - Inside of lower eyelids
 - In infants and children
 - Palms of hands
 - Soles of feet
 - In patients with dark skin
 - Lips and nail beds



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Skin (3 of 4)

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



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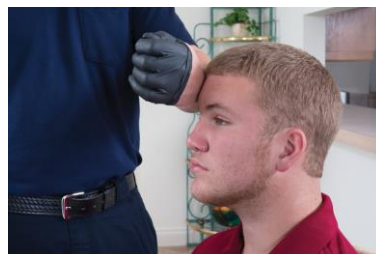
Skin (4 of 4)

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



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Skin Temperature



Determining skin temperature.



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Pediatric Note

- For children under 6 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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Pupils (1 of 3)

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



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Pupils (2 of 3)

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



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Pupils (3 of 3)

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



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Assessing Pupils (1 of 3)



Examining the pupils.



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Assessing Pupils (2 of 3)



(A) Constricted, (B) dilated, and (C) unequal pupils.



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Assessing Pupils (3 of 3)



Unequal pupils can be a sign of the influence of a topical drug (one placed directly on the eye, such as an eye drop) or of head or eye injury.

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Blood Pressure (1 of 3)

- Force of blood against the walls of the blood vessels
 - Systolic pressure created when the heart contracts and forces blood into the arteries
 - Diastolic pressure remaining in the arteries when the left ventricle relaxes and refills
- Normal pressure
 - Systolic no greater than 120 mmHg
 - Diastolic no greater than 80 mmHg
- Change can indicate something very significant.



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Blood Pressure (2 of 3)

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



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Measuring Blood Pressure



Positioning blood pressure cuff.



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Blood Pressure (3 of 3)

- Measured with a sphygmomanometer and stethoscope
 - Wrap cuff around patient's upper arm.
 - Place lower edge of cuff about 1 inch above crease of elbow.
 - Place center of bladder over brachial artery.



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Determining Blood Pressure by Auscultation (1 of 4)

- 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 (2 of 4)



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 (3 of 4)

- 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 (4 of 4)

- 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 1

- 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.



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Temperature (1 of 3)

- 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 (2 of 3)

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



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Temperature (3 of 3)



An electronic thermometer is safer, more hygienic, and quicker to produce a reading than a glass thermometer.



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Monitoring Devices

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Oxygen Saturation (1 of 2)

- Also called SpO_2 , the ratio of the amount of oxygen present in the blood to the amount that could be carried, expressed as a percentage
- Measured with pulse oximeter



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Oxygen Saturation (2 of 2)



A pulse oximeter with sensor applied to the patient's finger.



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When to Use a Pulse Oximeter

- Protocol should govern when to use a pulse oximeter if service has one.
- Generally includes all patients complaining of respiratory problems or otherwise at risk for hypoxia



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Interpreting Pulse Oximeter Readings (1 of 2)

- 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 (2 of 2)

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



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Blood Glucose Meters (1 of 2)

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



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Blood Glucose Meters (2 of 2)



Many EMS systems allow EMTs to use blood glucose meters that are carried on the ambulance.



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Using a Blood Glucose Meter (1 of 3)

- 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 (2 of 3)

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 (3 of 3)

- Normal level
 - Usually at least 70 to 100 mg/dL
 - Depends on the manufacturer's instructions and local protocols



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Capnography (1 of 2)

- Measures amount of carbon dioxide exhaled
 - End-tidal carbon dioxide, or ETCO_2
 - Normal level 35 to 45 mmHg
- Indirectly indicates how well tissues are using oxygen and performing other physiological functions



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Capnography (2 of 2)

- Methods
 - Patient breathing spontaneously has special nasal cannula applied.
 - In the ventilated patient, a plastic "collar" fits between the bag-valve and the mask (or advanced airway).



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Chapter Review



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Chapter Review (1 of 2)

- 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.
- The EMT must become familiar with normal ranges for pulse, respirations, and blood pressure in adults and children.



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Chapter Review (2 of 2)

- 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.



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Remember (1 of 2)

- 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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Remember (2 of 2)

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



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Questions to Consider (1 of 2)

- 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 (2 of 2)

- 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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