

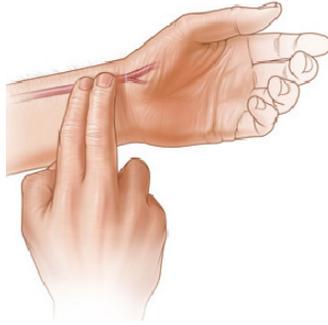
THE VITAL SIGNS

This Encyclopedia takes a broader view of the term “vital signs” than many medical textbooks. Classically heart rate, blood pressure, respiratory rate and temperature are considered to be vital signs. The others included here are all part of a complete basic emergency assessment, and are all listed on DUEMS PCR sheets. When time permits, all of this information should be recorded and reported to DCEMS if they respond. If any of these are found to be abnormal, the prudent EMT will encourage the patient to allow an ALS assessment, and possibly even transport to the Emergency Department, depending on the severity of the abnormal finding.

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Heart Rate



Proper Assessment Technique in Adult Patients

- Heart rate assessment can be included in your initial circulation assessment.
- Palpate radial pulses bilaterally, applying light pressure—they will be on the sides of the wrists closest to the thumbs.
- In a patient whose radial pulse is not palpable, locate a carotid pulse.
- If the pulse seems to be regular count pulses for 15 seconds, then multiply the result by 4 and record the rate.
- If the pulse seems to be irregular count pulses for 30 seconds, then multiply the result by 2 and record the rate.
- Take note of the regularity and strength of the pulse.
- Ensure that the pulses are equal bilaterally—if they are not, take note and record your findings.

Proper Assessment Technique in Pediatric Patients

- In an infant or a child too young/small to obtain a reliable radial pulse, palpate brachial pulses bilaterally, applying light pressure—they are found in the antecubital fossae, under the biceps.
- Assess the rate, rhythm, regularity and strength of the pulse as you would in an adult patient.

Normal Findings by Age Group

Age	Normal Heart Rate Range
Premature	120-170 bpm
0 to 3 months	100-150 bpm
3 to 6 months	90-120 bpm
6 to 12 months	80-120 bpm
1 to 3 years	70-110 bpm
3 to 6 years	65-110 bpm
6 to 12 years	60-95 bpm
≥ 12 years	55-85 bpm
Adult	60-100 bpm

****Note** Any abnormal findings in a pediatric patient should be recorded on the PCR and reported to ALS providers.**

Respiratory Rate

For more complete information on breathing assessment techniques, see the entry on “Breathing Assessment” in the section entitled, “The ‘ABC’s”.



Proper Assessment Technique

- Respiratory rate assessment can be included in your initial breathing assessment.
- Do not alert the patient that you are counting their respirations, as many patients will alter their breathing pattern if they know it is being assessed.
- If the breathing seems to be regular count breaths for 15 seconds, then multiply the result by 4 and record the rate.
- If the breathing seems to be irregular count breaths for 30 seconds, then multiply the result by 2 and record the rate.
- Note the rate, depth and regularity of respirations.

Normal Findings by Age Group

Age	Normal Respiratory Rate Range
Premature	40-70 bpm
0 to 3 months	35-55 bpm
3 to 6 months	30-45 bpm
6 to 12 months	25-40 bpm
1 to 3 years	20-30 bpm
3 to 6 years	20-25 bpm
6 to 12 years	14-22 bpm
≥ 12 years	12-18 bpm
Adult	12-20 bpm

****Note** Any abnormal findings in a pediatric patient should be recorded on the PCR and reported to ALS providers.**

Blood Pressure



Proper Assessment Technique

- If possible, make sure the selected arm is free of clothing. There should be no arteriovenous fistulas for dialysis, scarring from prior brachial artery cut downs, or signs of lymphedema (seen after axillary node dissection or radiation therapy).
- Palpate the brachial artery to confirm that it has a viable pulse.
- Position the arm so that the brachial artery, at the antecubital crease (opposite the elbow), is at heart level—roughly level with the 4th interspace at its junction with the sternum.
- If the patient is seated, rest the arm on a table a little above the patient's waist. If standing, try to support the patient's arm at the midchest level. Some providers hold the patient's arm by clamping it against their sides with the arm being used to pump up the sphygmomanometer.
- Secure the cuff snugly with the lower border of the cuff approximately 1 inch above the antecubital crease.
- Position the patient's arm so that it is slightly flexed at the elbow.
- Pump up the cuff while palpating the brachial pulse until it disappears, noting the pressure at which the pulse is no longer palpable. Add 30 mmHg to this pressure and use the resulting number as the target for subsequent inflations. Deflate the cuff.
- Place the *bell* (not the diaphragm) of your stethoscope, if it has one, over the brachial artery, taking care to make an air seal with its full rim. Because the Korotkoff sounds are relatively low in pitch, they are generally better heard with the bell.
- Inflate the cuff to the pressure you calculated above, and then allow it to drop by 2-3 mmHg per second.

- Record the pressure at which you hear at least two consecutive beats. This is the systolic pressure.
- Continue to lower the pressure until the sounds become muffled and disappear. To confirm the disappearance of sounds and rule out an auscultatory gap (pressure range in which Korotkoff sounds artificially disappear), listen as the pressure falls another 10 to 20 mmHg. The pressure at which sounds first disappeared is the diastolic pressure.
- Read both systolic and diastolic levels to the nearest 2 mmHg.

Normal Findings by Age Group

Age	Normal Blood Pressure Range
Premature	55-75/35-45 mmHg
0 to 3 months	65-85/45-55 mmHg
3 to 6 months	70-90/50-65 mmHg
6 to 12 months	80-100/55-65 mmHg
1 to 3 years	90-105/55-70 mmHg
3 to 6 years	95-110/60-75 mmHg
6 to 12 years	100-120/60-75 mmHg
≥ 12 years	110-135/65-85 mmHg
Adult	90-140/60-90 mmHg

****Note**** Any abnormal findings in a pediatric patient should be recorded on the PCR and reported to ALS providers.

Special Circumstances

Challenge	Solution
Weak/Inaudible Korotkoff Sounds	<ul style="list-style-type: none"> • Consider technical problems such as erroneous placement of your stethoscope, failure to make full skin contact with the bell, and venous engorgement of the patient's arm from repeated inflation of the cuff. • Raise the patient's arm to ensure venous return of the limb's blood supply before and while you inflate the cuff. Then lower the arm and determine the blood pressure. • Inflate the cuff. Ask the patient to make a fist several times, and then determine the blood pressure. • Palpate a radial pulse and inflate the cuff to 30 mmHg higher than the pressure at which the radial pulse disappears. Deflate the cuff slowly and record the pressure at which the radial pulse returns. Report the blood pressure as "systolic/palp."
White Coat Hypertension (False High Reading)	<ul style="list-style-type: none"> • Try to relax the patient and re-measure the blood pressure later in the encounter. • Consider using an automated cuff in the clinics

	<p>or if DCEMS is close to arrival and your reading is falsely high. Make sure to report your reading even if you think it is false. Do not dismiss it.</p>
Obese Patient	<ul style="list-style-type: none"> • Use the bariatric cuff, which should be located in the standard out bag next to the other two cuffs. Determine the blood pressure as you normally would. • If the patient's upper arm is too short to get an accurate reading, or if the bariatric cuff is not large enough, wrap an appropriately sized cuff around the patient's forearm and palpate the radial pulse. Report the result as "systolic/palp."
Very Thin Patients	<ul style="list-style-type: none"> • If the patient's arm is very thin and you cannot fit the regular cuff snugly on the arm, use the pediatric cuff, which should be located in the standard out bag next to the other two cuffs.
Arrhythmias	<ul style="list-style-type: none"> • Irregular rhythms produce variations in pressure and therefore unreliable measurements. • Ignore the effects of an occasional premature contraction (sporadic, non-persistent Korotkoff sounds, often at very high pressures). • With frequent premature contractions or suspected atrial fibrillation, average several measurements and note that this is only an estimate.

****Note**** Using too small a cuff in an obese patient will result in an overestimate of the patient's blood pressure.

****Note**** Using too large a cuff in a very thin patient will result in an underestimate of the patient's blood pressure.

****Note**** Textbooks typically suggest that a patient is unlikely to have a radial pulse if their systolic blood pressure is less than 90 mmHg. This is not a hard-and-fast rule, but it is something to keep in mind.

Pulse Oximetry



Proper Assessment Technique

- Apply the pulse oximeter to the patient's finger, with the monitor against the patient's fingernail. Make sure that the pulse oximeter is securely on the patient's finger.
- Watch the light on the pulse oximeter and ensure that it is green.
- Take the patient's pulse and ensure that it matches the blinking of the green light on the pulse oximeter.
- Record an accurate room air pulse oximetry reading before applying oxygen.
- Give the monitor approximately 2 minutes to plateau after applying oxygen, then record the new reading.
- Report both numbers to ALS providers when they arrive on scene.

Normal Findings

Lower Limit	Upper Limit
97%	100%

- A normal pulse oximetry reading is 97-100%.
- In the Duke University Medical Center Emergency Department, an acceptable pulse oximetry reading is defined as anything above 94%. This is the goal for a patient whose pulse oximetry is below that threshold when you arrive on-scene.

Blood Glucose



Proper Assessment Technique

- Tell the patient you are going to take their blood glucose and ask whether they have had it taken before. If not, explain to them that you are going to prick their finger and take a small drop of blood.
- Prepare for the test before you perform it. Have an alcohol wipe, a 2x2 gauze pad, a bandage, a test strip, a lancet, and the glucometer out before you begin. Some providers place the test strip in the glucometer, but do not press it all the way into place, as the glucometer will time out if the blood is not applied quickly.
- Use the alcohol wipe to clean the patient's finger thoroughly. The recommended contact time is 30 seconds. In practice, most providers do not wait that long, especially if blood glucose is a critical vital sign for the patient in question.
- Use the lancet to prick one of the patient's fingertips. Make sure to press firmly with the lancet to avoid slicing the patient's finger. It may help you to lightly squeeze the patient's finger in order to make their skin taut. This is especially helpful in geriatric patients.
- Waste the first drop of blood on the 2x2 gauze pad.
- Press the test strip into place on the glucometer and hold it to the patient's finger, ensuring that the blood fills the entire chamber on the test strip. The glucometer will count down and then display a reading. Record the patient's blood glucose.

Normal Findings

Lower Limit	Upper Limit
80 mg/dL	120 mg/dL

- Normal blood glucose varies widely from person to person, and depends heavily on the time of day and the person's eating habits.
- Typically, less than 80 mg/dL is considered the lower limit, and 120 mg/dL is considered the upper limit.
- Diabetes is clinically diagnosed when a person has a fasting glucose >126 mg/dL.

- High blood sugars are usually more easily tolerated than low blood sugars, but both can constitute medical emergencies.

Temperature



Proper Assessment Technique

- DUEMS carries a tympanic thermometer. In order to activate the thermometer, apply a disposable cover to the thermometer's earpiece. You may need to press the power button on the thermometer. Ensure that it is on before you attempt to take a patient's temperature.
- Place the earpiece of the thermometer firmly into the patient's ear. Apply pressure, but do not cause the patient any pain. If your patient seems uncomfortable, they probably are, and you should reduce the pressure you are putting on the thermometer.
- Press the button on the back of the thermometer and wait for the thermometer to produce a "beep" and a flashing green light.
- DUMC uses thermometers that can obtain an oral, axillary or rectal temperature. On clinic calls, you may use these thermometers as you see fit.
- Do not obtain a rectal temperature unless you are instructed to do so by a paramedic or a physician.

Normal Findings

- 98.6°F (37°C) is considered normal body temperature, but normal can actually differ from that number substantially.
- DUEMS protocols define hypothermia as 95°F (35°C) or lower.
- DUEMS protocols define a fever as 100.4°F (38°C) or higher.

Pupils



Proper Assessment Technique

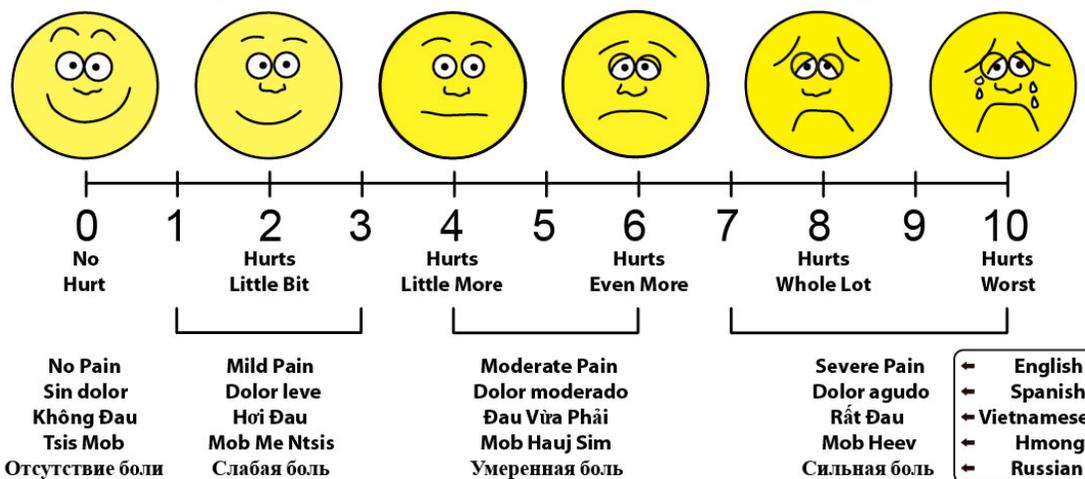
- A proper pupil assessment is called the “swinging flashlight test”, and is a clinical test for functional impairment in the optic nerves.
- In dim light, note the size of the pupils.
- Ask the patient to gaze into the distance and swing the beam of a penlight first into one pupil, then into the other.

Normal Findings

- Pupils should be round and equal in size, not irregular in any way.
- Normally, each illuminated pupil constricts promptly. The opposite pupil normally constricts consensually.
- Normal findings are reported as “pupils equal, round and reactive to light” or PERRL.

Pain

Wong-Baker FACES Pain Rating Scale



From Hockenberry MJ, Wilson D: *Wongs Essentials of Pediatric Nursing*, ed. 8, St. Louis, 2009, Mosby. Used with permission. Copyright Mosby.

Proper Assessment Technique

- Simply ask patients for their pain on a scale from 0 to 10, 0 being no pain at all and 10 being the worst pain they have ever felt in their lives.
- If you are doubtful that the patient is reporting their pain accurately, or you are otherwise unable to communicate with the patient, use the Wong-Baker FACES Pain Rating Scale (reproduced above).
- The Wong-Baker Scale is on the bottom of all the DUEMS paper PCRs you will find in the clipboard.

****Note**** Pain is an important part of a patient assessment, and should not be ignored.