

TITLE: VITAL SIGNS PROTOCOL (BODY TEMPERATURE, PULSE RATE, RESPIRATION RATE, BLOOD PRESSURE & SPO2)

INTRODUCTION:

Vital signs are an important component of client care. They determine which treatment protocols to follow, provide critical information needed to make life-saving decisions, and confirm feedback on treatments performed.

WHAT ARE VITAL SIGNS?

Vital signs are measurements of the body's most basic functions. The four main vital signs routinely monitored by medical professionals and health care providers include the following:

- Body temperature
- Pulse rate
- Respiration rate (rate of breathing)
- Blood pressure (Blood pressure is not considered a vital sign, but is often measured along with the vital signs.)

Vital signs are useful in detecting or monitoring medical problems.

WHAT IS BODY TEMPERATURE?

The normal body temperature of a person varies depending on gender, recent activity, food and fluid consumption, time of day, and, in women, the stage of the menstrual cycle. Body temperature may be abnormal due to fever (high temperature) or hypothermia (low temperature). Body temperature is a measure of your body's ability to make and get rid of heat. The body is very good at keeping its temperature within a safe range, even when temperatures outside the body change a lot.

- When you are too hot, the blood vessels in your skin widen to carry the excess heat to your skin's surface. You may start to sweat. As the sweat evaporates, it helps cool your body.

- When you are too cold, your blood vessels narrow. This reduces blood flow to your skin to save body heat. You may start to shiver. When the muscles tremble this way, it helps to make more heat.

Normal body temperature can range from **36.5 degrees C** (97.8 degrees F equivalent) to **37.2 degrees C** (99 degrees F) for a healthy adult.

Fever or high temperature

In most adults, a fever is an oral temperature above 38°C (100.4°F) or a rectal or ear temperature above 38.3°C (101°F). A child has a fever when his or her rectal temperature is (38°C) (100.4°F) or higher.

Low body temperature (hypothermia)

A very low body temperature (hypothermia) can be serious or even deadly. Low body temperature usually happens from being out in cold weather. But it may also be caused by alcohol or drug use, going into shock, or certain disorders such as diabetes or low thyroid.

A low body temperature may occur with an infection. This is most common in newborns, older adults, or people who are frail. A very bad infection, such as sepsis, may also cause an abnormal low body temperature.

A person's body temperature can be taken in any of the following ways:

- **Orally.** Temperature can be taken by mouth using either the classic glass thermometer, or the more modern digital thermometers that use an electronic probe to measure body temperature.
- **Rectally.** Temperatures taken rectally (using a glass or digital thermometer) tend to be 0.5 to 0.7 degrees F higher than when taken by mouth.
- **Axillary.** Temperatures can be taken under the arm using a glass or digital thermometer. Temperatures taken by this route tend to be 0.3 to 0.4 degrees F lower than those temperatures taken by mouth.

- **By ear.** A special thermometer can quickly measure the temperature of the ear drum, which reflects the body's core temperature (the temperature of the internal organs).
- **By skin.** A special thermometer can quickly measure the temperature of the skin on the forehead.

NORMAL TEMP	ABNORMAL TEMP
<p>The average normal temperature is 37°C (98.6°F). But that may not be normal for you. Your temperature also changes during the day. It is usually lowest in the early morning. It may rise as much as 0.6°C(1°F) in the early evening. Your temperature may also rise by 0.6°C(1°F) or more if you exercise on a hot day.</p> <p>A woman's body temperature often changes by 0.6°C(1°F) or more through her menstrual cycle. It peaks around the time she ovulates.</p>	<p>Oral, ear, rectal, or temporal artery temperature</p> <ul style="list-style-type: none"> • Fever: 38°C(100.4°F) to 39.9°C (103.9°F) • High fever: 40°C (104°F) and higher <p>Armpit temperature</p> <ul style="list-style-type: none"> • Fever: 37.4°C (99.4°F) to 39.4°C(102.9°F) • High fever: 39.5°C(103°F) and higher <p>A rectal or ear temperature of less than 36.1°C (97°F) is a low body temperature (hypothermia).</p>

WHAT IS THE PULSE RATE?

The pulse rate is a measurement of the heart rate, or the number of times the heart beats per minute. As the heart pushes blood through the arteries, the arteries expand and contract with

the flow of the blood. Taking a pulse not only measures the heart rate, but also can indicate the following:

- Heart rhythm
- Strength of the pulse

The normal pulse for healthy adults ranges from 60 to 100 beats per minute. The pulse rate may fluctuate and increase with exercise, illness, injury, and emotions. Females ages 12 and older, in general, tend to have faster heart rates than do males. Athletes, such as runners, who do a lot of cardiovascular conditioning, may have heart rates near 40 beats per minute and experience no problems.

Approximate Age Range	Rate
Newborn	100-160
0-5 months	90-150
6-12 months	80-140
1-3 years	80-130
3-5 years	80-120
6-10 years	70-110
11-14 years	60-105
15-20 years	60-100
Adults	50-80

How to check your pulse

As the heart forces blood through the arteries, you feel the beats by firmly pressing on the arteries, which are located close to the surface of the skin at certain points of the body. The pulse can be found on the side of the neck, on the inside of the elbow, or at the wrist. For most people, it is easiest to take the pulse at the wrist. If you use the lower neck, be sure not to press too hard, and never press on the pulses on both sides of the lower neck at the same time to prevent blocking blood flow to the brain. When taking your pulse:



- Using the first and second fingertips, press firmly but gently on the arteries until you feel a pulse.
- Begin counting the pulse when the clock's second hand is on the 12.
- Count your pulse for 60 seconds (or for 15 seconds and then multiply by four to calculate beats per minute).
- When counting, do not watch the clock continuously, but concentrate on the beats of the pulse.

WHAT IS THE RESPIRATION RATE?

The respiration rate is the number of breaths a person takes per minute. The rate is usually measured when a person is at rest and simply involves counting the number of breaths for one minute by counting how many times the chest rises. Watch the patient's shoulders and chest and count each inhalation as one breath. Count the number of breaths in 15 seconds and multiply the number by four to get the number of respirations per minute. Note whether the breathing is labored or normal and record the number and observation of the respirations. Respiration rates may increase with fever, illness, and with other medical conditions. When checking respiration, it is important to also note whether a person has any difficulty breathing.

Normal Respiratory Rate by Age (Breaths/Minute)	
Age	Normal Respiratory Rate
Infants (<1 y)	30-53
Toddler (1-2 y)	22-37
Preschool (3-5 y)	20-28
School-age (6-11 y)	18-25
Adolescent (12-15 y)	12-20

WHAT IS BLOOD PRESSURE?

Blood pressure, measured with a blood pressure cuff and stethoscope. It is the force of the blood pushing against the artery walls. Each time the heart beats, it pumps blood into the

arteries, resulting in the highest blood pressure as the heart contracts. Electronic blood pressure monitors may also measure the heart rate, or pulse.

Two numbers are recorded when measuring blood pressure. The higher number, or systolic pressure, refers to the pressure inside the artery when the heart contracts and pumps blood through the body. The lower number, or diastolic pressure, refers to the pressure inside the artery when the heart is at rest and is filling with blood. Both the systolic and diastolic pressures are recorded as "mm Hg" (millimeters of mercury). This recording represents how high the mercury column in an old-fashioned manual blood pressure device (called a mercury manometer) is raised by the pressure of the blood.

High blood pressure, or hypertension, directly increases the risk of coronary heart disease (heart attack) and stroke (brain attack). With high blood pressure, the arteries may have an increased resistance against the flow of blood, causing the heart to pump harder to circulate the blood.

According to the National Heart, Lung, and Blood Institute (NHLBI) of the National Institutes of Health, high blood pressure for adults is defined as:

- 140 mm Hg or greater systolic pressure
- or
- 90 mm Hg or greater diastolic pressure

In an update of NHLBI guidelines for hypertension in 2003, a new blood pressure category was added called prehypertension:

- 120 mm Hg – 139 mm Hg systolic pressure
- or
- 80 mm Hg – 89 mm Hg diastolic pressure

The NHLBI guidelines now define normal blood pressure as follows:

- Less than 120 mm Hg systolic pressure

and

- Less than 80 mm Hg diastolic pressure

These numbers should be used as a guide only. A single elevated blood pressure measurement is not necessarily an indication of a problem. Your doctor will want to see multiple blood pressure measurements over several days or weeks before making a diagnosis of hypertension (high blood pressure) and initiating treatment. A person who normally runs a lower-than-usual blood pressure may be considered hypertensive with lower blood pressure measurements than 140/90.

Before you measure blood pressure:

- Rest for three to five minutes without talking before taking a measurement.
- Sit in a comfortable chair, with your back supported and your legs and ankles uncrossed.
- Sit still and place your arm, raised level with your heart, on a table or hard surface.
- Wrap the cuff smoothly and snugly around the upper part of your arm. The cuff should be sized to fit smoothly, while still allowing enough room for one fingertip to slip under it.
- Be sure the bottom edge of the cuff is at least one inch above the crease in your elbow.

It is also important, when taking blood pressure readings, that you record the date and time of day you are taking the reading, as well as the systolic and diastolic measurements. This will be important information for your doctor to have. It is also important to make sure the tubing is not twisted when you store it and keep it away from heat to prevent cracks and leaks.

WHAT DOES SPO2 MEAN?

WHAT IS A NORMAL SPO2 LEVEL?

SpO2 stands for peripheral capillary oxygen saturation, an estimate of the amount of oxygen in the blood. More specifically, it is the percentage of oxygenated haemoglobin (haemoglobin containing oxygen) compared to the total amount of haemoglobin in the blood (oxygenated and non-oxygenated haemoglobin).

SpO2 is an estimate of arterial oxygen saturation, or SaO2, which refers to the amount of oxygenated haemoglobin in the blood.

Haemoglobin is a protein that carries oxygen in the blood. It is found inside red blood cells and gives them their red colour.

SpO2 can be measured by pulse oximetry, an indirect, non-invasive method (meaning it does not involve the introduction of instruments into the body). It works by emitting and then absorbing a light wave passing through blood vessels (or capillaries) in the fingertip. A variation of the light wave passing through the finger will give the value of the SpO2 measurement because the degree of oxygen saturation causes variations in the blood's colour.

This value is represented by a percentage. If your Pulse Ox says 98%, this means that each red blood cell is made up of 98% oxygenated and 2% non-oxygenated haemoglobin. **Normal SpO2 values vary between 95 and 100%.**

Good blood oxygenation is necessary to supply the energy your muscles need in order to function, which increases during a sports activity. If your SpO2 value is below 95%, that could be a sign of poor blood oxygenation, also called hypoxia. Although they can vary from person to person, the most common hypoxia symptoms are:

- Changes in the color of your skin, ranging from blue to cherry red
- Confusion
- Cough

- Fast heart rate
- Rapid breathing
- Shortness of breath
- Sweating
- Wheezing

What causes lack of oxygen in the blood?

Lung diseases such as chronic obstructive pulmonary disease (COPD), emphysema, bronchitis, pneumonia, and pulmonary edema (fluid in the lungs) Strong pain medicines and other drugs that hold back breathing. Heart problems. Anemia (a **low** number of red **blood** cells, which carry **oxygen**)



You can easily measure your SpO2 with the Pulse Ox.

Hypoxia should be reported immediately to the treating doctor.

PEDIATRIC CLIENTS

What Are Normal Ranges of Vital Signs for CHILDREN

The following charts summarize the range of age-based normal vital signs.

Normal Heart Rate by Age (Beats/Minute)		
Age	Awake Rate	Sleeping Rate

Normal Heart Rate by Age (Beats/Minute)		
Age	Awake Rate	Sleeping Rate
Neonate (<28 d)	100-205	90-160
Infant (1 mo-1 y)	100-190	90-160
Toddler (1-2 y)	98-140	80-120
Preschool (3-5 y)	80-120	65-100
School-age (6-11 y)	75-118	58-90
Adolescent (12-15 y)	60-100	50-90

Respiratory rate

Table 2. Normal Respiratory Rate by Age

Approximate Age Range	Respiratory Rate
Newborn	30-50
0-5 months	25-40
6-12 months	20-30
1-3 years	20-30
3-5 years	20-30

6-10 years	15-30
11-14 years	12-20
15-20 years	12-30
Adults	16-20

Blood pressure

Normal blood pressure in children and adolescents varies by age.

Table 3. Normal Blood Pressure by Age in Children and Adolescents

Approximate Age Range	Systolic Range	Diastolic Range
1-12 months	75-100	50-70
1-4 years	80-110	50-80
3-5 years	80-110	50-80
6-13 years	85-120	55-80
13-18 years	95-140	60-90

Temperature

The average normal core temperature is generally considered to be between 36.6°C (98.0°F) and 37°C (98.6°F) when measured orally and about 1°F higher when measured

rectally. The following chart will tell you if a child has a fever. The normal temperature range varies and depends on the way you took the child's temperature.

Method Normal temperature range

Rectum 36.6°C to 38°C (97.9°F to 100.4°F)

Mouth 35.5°C to 37.5°C (95.9°F to 99.5°F)

Armpit 36.5°C to 37.5°C (97.8°F to 99.5°F)

Ear 35.8°C to 38°C (96.4°F to 100.4°F)

The degree (height) of a fever does not tell you how serious your child's illness is—how your child is acting is usually a better sign. A child with a mild infection can have a high fever, while a child with a severe infection might have no fever at all.

Pulse Oximetry

Normal pediatric pulse oximetry (SPO₂) values have not yet been firmly established. SPO₂ is lower in the immediate newborn period. Beyond this period, normal levels are stable with age. Generally, a SPO₂ of <92% should be a cause of concern and may suggest a respiratory disease or cyanotic heart disease. Report to a doctor once you see a child with SPO₂ less than 92%.

