

Patient Assessment and Vital Signs Measurement and Documentation

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SUMMARY

Under the general supervision of a licensed physician, a sleep technologist assists in the evaluation, diagnosing, treatment and follow-up of sleep disorders in patients of all ages. Sleep technologists perform patient assessments by observing the physical signs and symptoms, general behavior and physical responses of the patient. Correctly measuring, monitoring, and documenting vital signs is critical to this assessment process. The ability to perform an accurate assessment and document standard measures and vital signs, i.e., height, weight, BMI, neck circumference, pulse, respiratory rate, blood pressure, and body temperature are an important part of the evaluation and treatment of patients with sleep disorders (1).

KEY DEFINITIONS

Sleep Technologist – Sleep technologist refers to those who have passed the Board of Registered Polysomnographic Technologists (BRPT) examination and are identified by the Registered Polysomnographic Technologist (RPSGT) credential, the American Board of Sleep Medicine (ABSM) examination and are identified by the Registered Sleep Technologist (RST) credential or the National Board of Respiratory Care examination and are identified by the Sleep Disorders Specialist (SDS) credential.

1.0 SCOPE

This technical guideline will address patient assessment and measurements of height, weight, body mass index (BMI) and standard vital signs that are routinely performed as part of the patient's evaluation in accordance with facility guidelines.

1.1 ASSESSMENT

An optimal assessment begins with a careful review of the patients' past medical history, including current medications, as they may impact the assessment as well as normal values. Pre-screening prior to the patient's arrival may be required by the facility and should be performed according to the facility's protocol (ex. phone screening the day of the study or upon arrival at the facility). For sample pre-screening protocols, see [Covid-19 Sleep Lab Guideline](#) (2).

Prior to beginning any assessment:

- Ensure equipment is clean and functional
- Wash hands
- Identify the patient
- Introduce yourself
- Orient the patient to the room

- Explain the procedure

Vital signs can provide a great deal of information about the health of a patient. All vital signs should be assessed when the individual is at rest. Ideally, wait 30 minutes to assess vital signs if a person has just consumed food or drink, smoked, or excessive ambulation. The following are the typical measurements and assessments performed and documented:

- Height
- Weight
- BMI
- Neck circumference
- Heart rate and rhythm
- Respiratory rate
- SpO₂
- Blood pressure
- Body temperature
- Significant symptoms

All measurements and assessments should be accurately documented in the patient's medical record.

2.0 ASSESSMENT TECHNIQUES

2.1 MEASURING HEIGHT

Height measurements are usually taken using a drop down measure attached to a scale or wall. The patient should remove their shoes, be positioned directly underneath the drop down measuring device, stand straight and look directly forward. Lower the measuring device until it rests gently on the top of the head. Note: if the patient cannot stand, the technologist can have the patient extend their arms to each side and measure their arm length from the tip of the middle finger on one end to the tip of the middle finger on the other end. Document the measurement.

2.2 MEASURING WEIGHT

To reliably measure body weight, zero the scale, have the patient remove heavy clothing and items in pockets, and stand still on the scale. Wait for the needle or digital reading to stabilize before recording the measurement. Document the measurement.

2.3 CALCULATING BODY MASS INDEX (BMI)

The BMI calculation is based on a ratio of weight to height. BMI is easy to calculate and the results are repeatable and consistent.

The equation to calculate BMI is:

$$\text{BMI} = \text{Weight (kg)} / \text{Height (m)}^2$$

(Weight in kilograms divided by height in meters squared)

BMI can also be calculated by dividing weight in pounds by the height in inches squared and multiplying by a conversion factor of 703.

$BMI = (\text{Weight (pounds)}/\text{height (inches)}^2) \times 703$

2.4 MEASURING NECK CIRCUMFERENCE

Use a flexible measuring tape, measure the circumference of the neck below the level of the Adam's apple or larynx, which can be located by visualizing or feeling for a protrusion or lump at the anterior surface of the throat. Measure and document the circumference in inches or centimeters.

2.5 MEASURING AND ASSESSING PULSE RATE AND RHYTHM

Pulse can be measured at the radial artery (in the wrist at the base of the thumb), the brachial artery (in the medial humerus/right under the bicep), the carotid artery (on each side of the neck) or apically (over the heart with a stethoscope).

The pulse is generally measured and assessed at the radial artery in the wrist using the index and middle fingers (never the thumb) to feel the artery, pressing just hard enough to feel the pulse. Count beats for 30 seconds using a watch or clock with a second hand. Double the number counted in 30 seconds to obtain the pulse (heart) rate.

A regular pulse rhythm is a steady beat with a regular frequency between beats. An irregular pulse may or may not have a pattern. For example, the patient may have skipped beats and/or and spacing between the beats may vary. If the pulse is irregular, measures of rate should be obtained after counting for one minute.

The pulse is usually strong with easy to feel beats. A weak or thready pulse is more difficult to feel and is often inconsistent.

Document pulse rate, regularity of rhythm, and strength of beats. Report any irregularities. An irregular pulse and/or weak pulse could be a sign of a serious health concern. Observations of irregular rates, rhythms, or strengths should be further investigated according to facility protocols. Refer to the patient's history to determine if the assessment is a new development or if they have known arrhythmias.

2.6 MEASURING AND ASSESSING RESPIRATORY RATE

One respiration, or breath, includes inspiration (or inhalation - equal to the chest expanding) and one expiration (or exhalation - the chest relaxes and recoils). Respiratory rate is reported as the number of breaths in one minute.

Respirations may be counted by observing the number of times the chest rises and falls by placing the hand on the chest or stomach to feel this motion. The measure can also be achieved by observing the movements of breathing.

Count respirations for 60 seconds using a watch or clock with a second hand. It may be helpful to pretend to continue checking the pulse while determining the respiratory rate. Patients may alter their respiratory

rate if they see you are trying to obtain it. Document the respiratory rate and any abnormal findings or irregularities.

2.7 MEASURING AND ASSESSING SpO₂

A pulse oximeter is a non-invasive device which has a sensor, usually placed on a finger, utilizing light and a receiver to estimate the saturation of oxygen carried in the blood. The manufacturer's guidelines and facility protocol should always be followed when using a pulse oximeter. Several steps should be used to obtain an optimal reading.

1. Select a finger for placing the sensor. Some Technologists will use the ring finger of the patient's non-dominant hand to minimize the potential of displacement of the sensor due to movement when the patient is awake or repositioning.
2. Remove fingernail polish (and artificial nail) from the selected finger.
3. Be sure the finger/hand is not cold.
4. Clean the sensor site of any visible dirt.
5. Place the oximeter probe on the finger and assess reading while the patient is awake with the hand relaxed (and not moving). The hand should also be below the level of the heart while obtaining the initial reading to assure accuracy and proper function.
6. Secure cable to the back of the hand. Have the patient make a fist to be sure the cable is loose enough to allow movement. This will help the sensor stay secure as the patient moves through the night.
7. The sensor (if not disposable) and cable should be cleaned according to the manufacturer's recommendations and consistent with the facility protocols.

Be aware that many factors can influence the accuracy of a pulse oximeter's reading. These include:

- Poor circulation
- Hypoxia
- Tobacco use
- Colder skin temperature
- Skin color (i.e., darker pigmentation)
- Skin thickness
- Fingernail polish, artificial or acrylic nails
- Skin cleanliness (visible dirt)
- Disfiguration from arthritis
- Infrared lights in the room

Additionally, accuracy can vary depending on the manufacturer and type of sensor (3).

2.7.1 Documenting SpO₂ Readings

Pulse oximetry will be performed continuously throughout the study. The pulse oximeter value (SpO₂) should be documented as a range, making note of the lowest (nadir) reading obtained. Follow facility protocol as to minimum durations and various situations requiring SpO₂ documentation. Factors to consider for SpO₂ documentation include:

- Stage: Wake, NREM, REM

- Body position
- PAP pressure, mode, back-up rate, and pressure relief used (if applicable).
- Significant PAP leak
- Oxygen flow (lpm) (if used)
- Any patient comments or complaints (i.e., shortness of breath, chest pain, dizziness)
- Any notable circumstances (i.e., ECG arrhythmias, tachycardia, bradycardia, respiratory events, abnormal respiratory rate.)
- Any observations (i.e., cyanosis, pursed-lip breathing, restlessness)

2.8 MEASURING BLOOD PRESSURE

Blood pressure is affected by the time of day (low at night; peak about eight hours after awakening); emotions (stress increases blood pressure); weight (obesity typically increases blood pressure); activity level; excess sodium (salt) intake; excessive alcohol consumption; and use of certain drugs, including birth control pills, steroids, decongestants, and anti-inflammatory medications.

A blood pressure is taken with a stethoscope and a blood pressure cuff (sphygmomanometer) or an electronic blood pressure instrument placed on the finger, wrist, or arm that displays the blood pressure (systolic and diastolic) and pulse reading digitally.

The correct size blood pressure cuff should be $\frac{2}{3}$ rd the width of the upper arm with the cuff encircling the upper arm by approximately 80% of its length.

If no previous blood pressure is documented, measurements should be performed in each arm. Document both readings, noting which arm was used for each reading.

For best measurement, follow these steps:

- Wait 30 minutes after the patient eats, drinks, exercises or smokes
- Have the patient empty their bladder
- Have the patient sit in a comfortable chair that supports their back for at least five minutes
- Ask the patient to uncross their legs and place both feet flat on the floor
- Support the arm being used on a table at chest height

2.8.1 Automatic Blood Pressure Cuff Measurement

- Place the cuff on bare skin and adjust evenly until it is snug, not tight. (You should be able to slide two fingers under the top edge of the cuff.) Make sure the inflating cuff does not pinch the skin.
- If repeat readings are obtained, wait a minimum of one to two minutes between readings (4,5).

2.8.2 Manual Blood Pressure Cuff Measurement

1. Follow the manufacturer's recommended sizing to select the correct size cuff. For general sizing, see above.
 - a. The cuff should be completely deflated before placing it on the patient.
2. Cuff should be placed approximately one inch above the bend of the elbow.
3. Place the diaphragm of the stethoscope under the cuff above the brachial artery (the inner side of the upper arm).
4. Place the stethoscope earpieces facing forward into the ears.

5. The blood pressure gauge should be secured where it is visible.
6. Ensure the adjustment knob is closed (turn knob to the right or clockwise to close).
7. Rapidly squeeze the pump until the gauge reads approximately 30 points higher than the patient's usually systolic pressure (if known) or at least 170, if not known.
8. Slowly turn the knob (usually counterclockwise) to deflate the cuff, letting pressure fall approximately two millimeters per second, while listening for heart sounds. Note the reading when you first hear the heartbeat. This is the systolic pressure.
9. Continue deflating the cuff until you no longer hear heartbeats. Note the reading when the heart sounds cease. This is the diastolic pressure.
10. Deflate the cuff completely after a reading is obtained (4,5).

Follow the manufacturer's instructions for the proper use of digital equipment. Wipe blood pressure instrument cuffs and stethoscope with an approved hospital disinfectant wipe after each use.

2.9 MEASURING TEMPERATURE

Temperature may be measured using a variety of methods. Oral (mouth), aural (ear), temporal artery (forehead) and auxiliary (under the arm) are the most often used sites in the sleep lab. The electronic or digital thermometer is most commonly used, as it is fast, accurate, easy to read and is easily sanitized. Document date, time and temperature as oral (O), forehead (F) axillary (A), or ear (E). Example: 98.6 (O). (6)

2.9.1 Using a Digital Thermometer

Cover the thermometer with a disposable probe cover. Press the button to set the thermometer. Place the thermometer under the tongue and have the patient close mouth and breathe through the nose for several minutes. Take the thermometer out of the individual's mouth and read the temperature when the indicator is seen or heard. Document the instrument reading. Discard disposable probe cover. (6)

An axillary temperature (under the armpit with tip of the thermometer against dry skin and held in place by the arm for 5 minutes) may also be obtained using a digital thermometer. Axillary temperature is the least accurate, however it is a recommended site for small children or patients who are unable to hold an oral thermometer in their mouth (ex. recent oral surgery, mouth breathing patients, or tympanic membrane thermometer is unavailable).

Forehead or temporal readings can be accomplished by holding the device less than 1 inch away from the forehead making sure not to touch the skin. Follow the manufacturer's directions to use the device.

2.9.2 Using a Tympanic Thermometer

Follow manufacturer's directions for use. Attach a disposable ear tip and insert a tympanic thermometer in the ear canal. Document the instrument reading. Discard disposable ear tip after use.

3.0 DOCUMENTATION

Document all vital sign measurements in the patient's electronic medical record in discrete value fields if possible, in the patient's chart, and/or where facility policy dictates. Values outside of normal categories should be noted, verified, and addressed according to facility protocols.

4.0 BMI NORMAL RANGES (7)

BMI severity categories vary with age.

Normal Adult BMI SCALE

- Underweight = <18.5
- Normal = 18.5-24.9
- Overweight = 25.0-29.9
- Obese = >30.0

For children and teens, BMI is age- and sex-specific and is referred to as BMI-for-age. BMI-for-age is calculated using percentiles.

Children ages 2 through 19 years whose BMI is:

- Less than the 5th percentile are considered underweight.
- Between the 5th percentile and less than the 85th percentile are at a healthy weight.
- In the 85th percentile to less than the 95th percentile are considered overweight.
- Equal to, or greater than the 95th percentile are considered obese.

BMI values are not calculated for children under the age of 2 years old. In this case, it is recommended to consult the World Health Organization (WHO) standards. (8)

5.0 NORMAL RANGES FOR ADULT VITAL SIGNS (9)

Pulse:

Wake: 60 – 100 beats per minute (bpm)

Asleep: 50 – 90 bpm

Respiratory Rate: 12 – 18 per minute (min)

Blood pressure: Systolic 90 – 120, Diastolic 60 – 80 mmHg

Temperature: 97.8 to 99.1 (F), 36.6 to 37.3 (C)

6.0 NORMAL RANGES FOR PEDIATRIC VITAL SIGNS (10)

6.1 Age 6 Months to 12 Months

Pulse:

Wake: 100 – 150 bpm

Asleep: 90 – 160 bpm

Respiratory Rate: 30 – 55 per min

Blood pressure: Systolic 80 – 100, Diastolic 55 – 65 mmHg

Temperature: 97.6 to 99.6 (F), 36.5 to 37.6 (C)

6.2 Age 1 Year to 3 Years

Pulse:

Wake: 70 – 110 bpm

Asleep: 80 – 120 bpm

Respiratory Rate: 20 – 30 per min

Blood pressure: Systolic 90 – 105, Diastolic 55 – 70 mmHg

Temperature: 97.6 to 99.6 (F), 36.5 to 37.6 (C)

6.3 Age 3 Years to 5 Years

Pulse:

Wake: 65 – 110 bpm

Asleep: 65 – 100 bpm

Respiratory Rate: 20 – 25 per min

Blood pressure: Systolic 95 – 107, Diastolic 60 – 71 mmHg

Temperature: 97.6 to 99.6 (F), 36.5 to 37.6 (C)

6.4 Age 6 Years to 11 Years

Pulse:

Wake: 60 – 95 bpm

Asleep: 58 – 90 bpm

Respiratory Rate: 14 – 22 per min

Blood pressure: Systolic 95 -119, Diastolic 60 – 76 mmHg

Temperature: 97.6 to 99.6 (F), 36.5 to 37.6 (C)

6.5 Age 12+ Years & Up

Pulse:

Wake: 55 – 85 bpm

Asleep: 50 – 90 bpm

Respiratory Rate: 12 – 18 per min

Blood pressure: Systolic 110 – 124, Diastolic 70 – 79 mmHg

Temperature: 97.6 to 99.6 (F), 36.5 to 37.6 (C)

NOTE: Certain medications may raise or lower normal values. A careful review of current medications is an important part of assessing vital signs.

7.0 ADDITIONAL ASSESSMENTS AND DOCUMENTATION

7.1 Physical Indications for OSA Documentation

There are several additional assessments that are valuable for determining risk of obstructive sleep apnea. These are further described in a separate technical guideline (11) but can include:

- Mallampati
- Neck size (see above)
- Scalloped tongue
- Nasal obstruction
- Abnormal heart sounds

- Lower extremity edema
- Missing teeth/dentures

7.2 Questionnaires

Questionnaires are useful tools to aid in the overall characterization of someone's sleep habits, symptoms, and possible abnormalities. Common standardized questionnaires used with sleep evaluations include:

- STOP-BANG
- Epworth Sleepiness Score (ESS)
- Berlin Questionnaire

These are further described in a separate technical guideline. (11)

Sleep diaries and other questionnaires can also be utilized. (12)

7.3 Determination and Documentation of Other OSA Symptoms

Additional symptoms or observations made by the bed partner are also useful for assessing risk for OSA.

(1) Document if the patient or bedpartner confirms or denies any of the following:

- Witnessed apneas
- Snoring
- Gasping/choking at night
- Non-refreshing sleep
- Abnormal total sleep amount
- Sleep fragmentation/sleep maintenance insomnia
- Nocturia
- Morning headaches
- Decreased concentration
- Memory loss
- Decreased libido
- Irritability
- Any other complaint or symptom which may assist in diagnosis and/or management

The ability to document standard measures and vital signs and perform an accurate overall assessment are an important part of the evaluation and treatment of patients with sleep disorders.

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