



NATIONAL COMPETENCY SKILL STANDARDS FOR PERFORMING AUTONOMIC TESTING

Autonomic testing technologists practice in accordance with the facility policy and procedure manual which details every aspect and type of recording.

ASET - The Neurodiagnostic Society presents this document to provide the national criteria for evaluating competencies for technologists performing autonomic testing. The elements for quality patient care and interaction as well as basic knowledge and technical performance are covered. The technical components include those defined in Phillip A. Low, M.D., Laboratory Evaluation of Autonomic Function, published by the American Association of Neuromuscular & Electrodiagnostic Medicine (AANEM) in 2003.

Section I: Autonomic Testing Core Knowledge Statements

The autonomic testing technologist has the knowledge base to interact with the patient and obtain quality, interpretable autonomic function tests that will yield information about the sympathetic, parasympathetic, and enteric nervous systems. The technologist possesses the appropriate knowledge level of diseases to correlate patient history and clinical symptoms to determine appropriate maneuvers to be performed during the autonomic test.

TECHNICAL SKILLS AND OTHER ABILITIES:

1.1 The autonomic testing technologist provides a safe testing environment by:

- Verifying identity of patient (two patient identifiers).
- Inquiring about any allergies or skin sensitivities prior to procedure.
- Disinfecting pads/plates/straps/capsules and any device used for testing after each procedure according to facility policies and procedures or using disposable products^{1,2}.
- Following standard precautions for infection prevention including sterile techniques according to facility policy and procedures^{1,2}.
- Observes patient safety and comfort protocols as established by facility policy and procedures.

- Recognizing/responding to life-threatening situations.
- Complying with facility policy and procedures for emergency and disaster situations and with hazardous material handling procedures according to safety data sheets (SDS).
- Maintaining instrument/equipment in good working order, including annual biomedical safety checks.
- Taking appropriate precautions to ensure electrical safety making sure no wires are frayed, extension cords are not in use, 3-pronged grounded plugs are in use; and damaged cords and outlets are reported according to facility policy, removed from use until properly repaired according to facility policy and procedure.
- Maintaining certification in Basic Life Support (BLS) and following facility policy and procedures for respiratory or cardiopulmonary crisis.
- Following facility policy and procedures for safety procedures, patient isolation and sedation.
- Maintaining instrument/equipment in good working order, including annual biomedical safety checks.
- Taking appropriate precautions to ensure electrical safety making sure no wires are frayed, extension cords are not in use, 3-pronged grounded plugs are in use, and damaged cords and outlets are reported and removed from use until properly repaired according to facility policy and procedure.
- Following HIPAA policy and facility procedures for cybersecurity and safety of electronic records.

1.2 The autonomic testing technologist establishes rapport with the patient and the patient's family/caretaker by:

- Using personal communication skills to achieve patient relaxation/cooperation.
- Explaining all test procedures.
- Review contraindications before beginning the study.
- Instructing the patient in properly performing breathing techniques for both Heart Rate Deep Breathing (HRDB) and Valsalva Maneuver Ratio (i.e., VR where $VR = \frac{\max HR}{\min HR}$).
- Explaining device application method (ECG leads, blood pressure cuff, belts/ pads/ plates/straps/capsules, etc.).
- Interacting on a level appropriate for patient's age and cognitive ability.
- Maintaining respect and patient confidentiality.

1.3 The autonomic testing technologist evaluates the patient to:

- Assess cognitive abilities, mental state, and comprehension level, such as following commands, understanding the procedure.
- Note the patient's overall physical condition.
- Ascertain the patient's capacity to cooperate with the procedures.
- Determine if any procedure is contraindicated.
- Accommodate for disabilities or special needs.
- Determine the possible need for assistance or emergency intervention.

1.4 The autonomic testing technologist prepares patient demographics that include:

- Patient's information (name, age, ID number, DOB, referring physician, etc.).
- Testing time, date and technologist's name or initials.
- Pertinent patient history and familial medical history.
- Previous autonomic function test reports.
- Current medication(s) and time of last dosage, specifically analgesic, anticholinergic, and parasympathetic agents.
- May note the time of last meal according to lab protocols.
- Time, date, and circumstances of last symptoms.
- Patient's mental, behavioral and consciousness states.
- Documentation of any pacemaker/defibrillator device placement.
- Documentation of any recent invasive eye procedures or chest/abdominal surgical procedures.

1.5 The autonomic testing technologist's test procedures follow a method that includes:

Quantitative Sudomotor Axon Reflex Test (QSART) Distribution:

- Monitoring desiccant filter for moisture capacity and replace as needed based on manufacturer recommendation.
- Checking Q-sweat device channels are within proper parameters and troubleshoot as needed following manufacturer recommendation.
- Preparing recording sites by proper measurement:
 - medial forearm (75% of the distance from the ulnar epicondyle to the pisiform bone)
 - proximal leg (lateral aspect, 5 cm distal to the fibular head)

- distal leg (medial aspect, 5 cm proximal to the medial malleolus)
- proximal foot (on a flat surface over the extensor digitorum brevis muscle)
- Attaching multicompartamental sweat capsules (4 sites) or prepared capsules and ground pads/plates.
- Achieving proper baseline.
- Inserting 10% acetylcholine (Ach) into the proper compartment of the capsules (not applicable if using prepared capsules).
- Applying appropriate stimuli (2 mA) for 5 minutes.
- Recording during stimulus application and for 5 subsequent minutes.

Heart Rate Response to Deep Breathing (HRDB)

- Attaching photoplethysmographic device to patient's finger and ECG electrodes.
- Performing two series of recordings with an intervening 3–5 minutes of supine rest:
 - A series consists of eight deep breaths with five seconds of inhalation and five seconds of exhalation.
- Encouraging and comforting patient to successfully record smooth breaths with maximal inspiration to the top of the bar and total expiration to the bottom of the bar.
- Identifying cardiac rhythms or ECG artifact.

Valsalva Maneuver

- Attaching photoplethysmographic device to patient's finger and ECG electrodes appropriately.
- Achieving proper baseline.
- Performing two maneuverers with an intervening 3–5 minutes of supine rest:
 - A maneuver consists of a patient taking a deep breath and exhaling to maintain a specific pressure for 15 seconds.
- Understanding of waveforms and whether a 20-degree tilt is necessary.
- Replicating waveforms.

Tilt Table

- Attaching photoplethysmographic device to patient's finger and ECG electrodes appropriately.
- Securing straps to patient.
- Correct positioning of patient's arms.
- Provide hand warmth as needed.

- Alerting patient prior to tilt maneuver.

Section II: Instrumentation

2.1 The autonomic technologist documents the working condition of equipment by:

- Checking the Q-Sweat Channel Device Check when required.
- Calibrating and recalibrating continuous noninvasive arterial pressure (CNAP)/blood pressure (BP) initially and as needed throughout testing.
- Scale test windows as needed.

2.2 The autonomic technologist applies the principles of electronics and mathematics to recording by:

- Understanding perfusion and effects on study quality.
- Recognizing artifact.
- Understanding appropriate changes in heart rate (HR) and BP related to specific autonomic procedures.
- Understanding and documentation of stimulus related errors for QSART testing.
- Understanding, documentation, and correction of capsule malfunction for QSART testing.
- Understanding of CNAP and normal BP drift with appropriate recalibration.
- Refilling desiccant when appropriate.

Section III: Recording Principles

3.1 The autonomic technologist obtains standard autonomic function tests that include:

QSART

- A baseline minimum of one minute or ideally until resting sweat is ≤ 50 nanoliters (nl) from each site; or, up to 10 minutes.
- Place marker at the time of insertion of ACh into each capsule.
- Place marker at the time that stimulation of 2 mA is initiated.
- Record for 5 minutes with stimulation remaining at 2 mA.
- Place marker at the 5 minutes of stimulation ended and turn stimulation off.
- Record for 5 additional minutes and place marker again at 5 minutes post stimulation off.
- Run study for one additional minute.

- Mark onset of sweat increase at each site recorded only if directed by lab protocol.

HRDB

- Record 1 minute of baseline while patient is resting quietly utilizing HR, CNAP, normal BP monitors; and respiration monitors if outlined in your individual institutional protocol.
- Mark onset with metronome of first cycle of HRDB.
- Continue recording while patient complete 6–8 consecutive breaths at a rate of 6 breaths per minute, or appropriate rate directed by individual laboratory protocol.
- Continue recording for an additional minute while patient is resting quietly.
- Mark onset of second cycle of HRDB with metronome and continue recording while patient completes another series of the 6–8 consecutive breaths at a rate of 6 breaths per minute, or appropriate rate directed by individual laboratory protocol.
- Repeat for a third trial only if needed and allowed by your laboratory protocol.
- Continue recording for an addition 1 minute while patient is resting quietly.
- Document both effort and symptoms.

Valsalva Maneuver

- Record a minimum of 1–1½ minutes baseline while patient is resting quietly utilizing HR, CNAP, normal BP monitors; and respiration monitors if outlined in your individual institutional protocol.
- Continue recording while patient performs Valsalva maneuver #1 ensuring that exhalation pressure reaches a minimum of 30 mm/Hg to activate marker.
- If exhalation pressure does not reach 30 mm/Hg, technologist should activate manual marker.
- Continue recording once exhalation is completed, instructing the patient to lie quietly and still.
- Approximately 20–60 seconds (i.e., following lab protocol) post exhalation completion, ask patient about symptoms and document both effort and symptoms.
- Continue recording for 2 minutes post Valsalva maneuver completion and instruct patient to repeat maneuver.
- Repeat number of maneuvers based on individual laboratory protocol.
- Record for an additional one minute while the patient is resting quietly.
- If laboratory protocol allows, tilt patient 20 degrees head up tilt and repeat complete study at 20 degrees.
- If laboratory protocol allows, tilt patient 40 degrees to repeat study (you may need to

do so after all other studies are completed, including tilt table)

Tilt Table

- Ensure that patient has been supine for 20 minutes prior to tilting up.
- Record supine resting state for 5 minutes, recording a one-minute and 5-minute supine vitals; or those intervals recommended by your individual laboratory protocol utilizing HR, CNAP, normal BP monitors; and respiration monitors if outlined in your individual facility protocol.
- Continue recording and place marker to indicate tilting up.
- Continue recording and bring tilt table position up to 70 degrees head up tilt while obtaining another CNAP and BP calibration for one-minute head up tilt and document; instruct the patient to rest quietly, relax shoulders, and keep relatively still with eyes open.
- Continue recording and obtain and document vital signs at intervals outlined in your individual laboratory protocol until the patient has been up 10 minutes (you may keep the patient up longer based on physician preference and individual institutional protocol.
- Continue recording and mark when ready to bring table back down to horizontal position.
- Continue recording for a minimum of one minute, obtaining vital signs for one-minute head down position with the patient resting quietly.
- Continue recording for additional time as indicated by individual institutional protocol.
- Stop recording, save study, and provide appropriate documentation of patient symptoms and any related pertinent data.

3.2 The autonomic technologist customizes the recording procedure by:

- Identifying information from the patient history to anticipate, prepare for and correlate study findings with clinical symptoms.
- Utilizing techniques to elicit and/or enhance study.
- Encourage quiet resting during testing.

Section IV: Knowledge Base Statements

4.1 The autonomic testing technologist understands (has a working knowledge of):

- Splanchnic, adrenergic and cardiovascular function
- Anatomical position and directional terms (i.e., proximal, distal, lateral, medial, etc.)

- Anatomy, specifically bones, muscle groups and nerves of arms and legs
- General medical terminology and accepted abbreviations by facility
- General knowledge of perfusion
- Appropriate emergency response
- General knowledge of cardiac rhythms
- Signs, symptoms, and test correlates for autonomic function disorders
- Medication effects on autonomic functioning, specifically anticholinergic, including antidepressant, antihistamine and over-the-counter cough and cold medication, cannabis products, alcohol, sympathomimetic (α - and β -agonists); parasympathomimetic agents; short-acting α - and β -antagonists and analgesics including opioids.

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