



Manual: Patient Care

Section: Care of Patients

Number: F752

☒ Policy ☒ Procedure

Title: Pupillometer (NPi[®]-200) Use

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I. PURPOSE:

To define when and how to use the NPi[®]-200 pupillometer to:

- A. Provide a reliable, objective measurement of pupillary size and reaction
- B. Anticipate potential increases in intracranial pressure (ICP) related to changes in pupillary size or decreases in NPi.

II. DEFINITIONS:

- A. **NPi[®]-200 Pupillometer:** A hand-held portable infrared device which provides quantitative pupillary measurements by taking 30 pictures per second of the pupil's response to light stimulus.
- B. **Neurological Pupil Index[™] (NPi[™]):** An algorithm developed by NeurOptics[®] scientists to remove subjectivity from the pupillary evaluation. A patient's pupil measurement (including variables such as size, latency, constriction velocity, dilation velocity, etc.) is compared against a normative model of pupil reaction to light and automatically graded by the NPi[™] on a scale of 0 to 5.

Measured Value	Assessment
≥ 3	Normal/Brisk
< 3.0	Abnormal/Sluggish
0	Non-reactive or Atypical
A difference in NPI between right and left pupils of ≥ 0.7 can also be considered an abnormal pupil reading	

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- C. NPI®-200 SmartGuard™ Headrest:** Single patient use device with smart-card technology that stores patient data and facilitates data upload into electronic medical record. Each SmartGuard™ will hold as many as 168 individual patient pupil assessments. The NPI®-200 SmartGuard™ attaches to the pupillometer device and is used to position the device at a right angle to the patient's axis of vision.
- D. ECLS:** Extracorporeal Life Support
- E. ECMO:** Extracorporeal Membrane Oxygenation

III. POLICY:

- A.** Use of the NPI®-200 pupillometer does not require a provider order.
- B.** Use of a pupillometer for pupillary assessment may be beneficial in the neurological diagnoses such as:
 - 1. Traumatic brain injury
 - 2. Subarachnoid hemorrhage from aneurysmal rupture or vascular malformation
 - 3. Intracerebral hemorrhage
 - 4. Ischemic stroke
 - 5. Post-op craniotomy
 - 6. Multisystem trauma presenting to the ED unconscious
 - 7. Brain tumor
 - 8. Hydrocephalus (post-op endoscopic third ventriculostomy, pre/post shunt revision, suspected shunt malfunction/failure)
 - 9. Suspected brain death
 - 10. ECLS/ECMO patients
- C.** A baseline pupillometer reading should be obtained as early as possible in the emergency department or upon admission/transfer to the PICU.
- D.** Patients with the above diagnoses and any patient with an external ventriculostomy device (EVD) should routinely have pupillometer readings a minimum of every 2 hours or more frequently as clinically indicated.
- E.** A pupillometer reading should be obtained with any neurologic change or concern.
- F.** For above diagnoses with intracranial pressure (ICP) monitoring in place,
 - 1. Reassessment with the pupillometer should be completed 30 minutes after an intervention to decrease ICP.
 - 2. Once the ICP monitor is removed, pupils should be checked hourly for the first 12 hours following removal. If the patient's status changes (decreased level of consciousness), notify the provider and increase the frequency of pupillometer checks.
- G.** Findings of the pupillometer which should be noted as correlating with increases in ICP include:
 - 1. Increase in size between right and left pupil > 1mm following a baseline assessment of pupils equal in size
 - 2. % change of pupil (before/after light stimulus) < 10%

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3. NPi < 3

- H. In the event that the patient is unable to cooperate with the pupillometer assessment, or a pupillometer reading is unable to be obtained for any reason, pupils should be assessed using the traditional manual flashlight method.
- I. Patients receiving barbiturates or very high doses of propofol may lose pupillary response to light. In these patients, if their pupils no longer react to light, pupillometer assessment should be attempted a minimum of once per shift until barb/propofol therapy is withdrawn.
- J. The NPi[®]-200 SmartGuard™ headrest is designed for single patient use and may be used on that specific patient for as long as he/she is in the hospital.
- K. To comply with HIPAA guidelines, the patient data stored on each SmartGuard must be disabled before being discarded in the regular trash.
 - A.

IV. PROCEDURE:

- A. Use the above criteria to determine proper indication and frequency of use.
- B. Lift the NPi[®]-200 pupillometer out of the charger (tilt forward and then lift up).
- C. The NPi[®]-200 should turn on automatically. If the device was not placed in the charger, then you will need to hard-start it by pressing the upper arrow for 10 seconds.
- D. Open a new SmartGuard™ headrest. Gently squeeze the SmartGuard™ side tabs to position onto the NPi[®]-200. There will be an audible click when the SmartGuard™ is properly positioned.
- E. For the first patient use, in order to properly input the patient ID into the SmartGuard™, select either Barcode Scanner or Manual ID to indicate the patient ID entry method used.
 - 1. Pairing to the Antimicrobial Barcode Scanner
 - a. Connect the barcode scanner and charging cradle to the power supply and plug into a power outlet. Turn on the barcode scanner until an audible beep is heard and a blue light on the device flashes. Position the barcode scanner next to the NPi[®]-200.
 - b. On the NPi[®]-200 select Barcode Scanner. The NPi[®]-200 will display **“Connecting...”** on the touchscreen.
 - c. Once successfully paired, the touchscreen will prompt when the device is ready to scan the patient ID barcode.
 - d. The patient ID will now appear on the NPi[®]-200 touchscreen. Confirm the patient information is correct and select **Accept**.
 - e. The NPi[®]-200 will display the patient ID and ready **“Ready to scan”**.

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2. Manual Entry of the Patient ID
 - a. Press **Manual Entry**. Using the touchscreen, enter the patient financial identification number (FIN). Select **Shift** to toggle from alpha to numeric as required. When the patient's FIN has been manually entered, check for accuracy and press **Enter**.
- F.** Position the NPi[®]-200 with SmartGuard™ at a right angle to the patient's axis of vision, minimizing any tilting of the device.
- G.** Press and hold either the Right or Left button until the eye is centered on the touchscreen and the display shows a green circle around the pupil. Once the green circle appears, release the button, and hold the NPi[®]-200 in place for approximately three seconds until the result screen is displayed.
- H.** Repeat the scan procedure for the patient's other eye to complete the bilateral pupil exam.
- I.** When the bilateral pupil exam is complete, the NPi[®]-200 measurement results will be displayed in yellow for the Left Eye and in green for the Right Eye.
- J.** Using the touchscreen or keypad, select page 1 (1/2) or 2 (2/2) to display the results of the pupil measurement parameters and pupillary light reflex waveform.
- K.** From the Results screen, select the Video icon to view the video playback of the reading.
- L.** Document the NPi and size in the Pupillometer Assessment in the medical record.
- M.** Immediately report the following abnormal values to the provider:
 1. Increase in size between right and left pupil > 1mm following admission assessment of pupils equal in size
 2. % change of pupil (before/after light stimulus) < 10%
 3. NPi < 3
- N.** Compare and trend the values and report any significant change in pupil size/reactivity to the physician immediately.
- O.** To visualize the parameter trend display, use either the keypad or the touchscreen to select the **Chart** icon from the main screen of the NPi[®]-200. Select the Down arrow on the keypad to view a trend display of the patient's NPi[®] and Size measurements. To trend additional parameters, select **Trending Variables** from the **Settings** menu, and choose the desired parameters to trend.
- P.** Remove the SmartGuard™ headrest. Keep the headrest at the patient's bedside for further use. The headrests are for single patient use and may be used on that specific patient for as long as he/she is in the hospital.
- Q.** Once the patient is discharged or transferred out of the ICU, permanently disable the patient data by going to the **Settings** menu, press **Disable SG**

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and follow the prompts. Place the disabled SmartGuard™ in the SmartGuard™ pupillometer bin in the dirty utility room.

- R. Place the pupillometer firmly in the charger when not in use. The touchscreen will display a blue battery icon indicating it is charging. The battery icon will turn green when fully charged.
If the NPi®-200 is not in the charging station, to conserve battery life the pupillometer will:
 1. Go into sleep mode after 5 minutes. Touch the screen to turn on.
 2. Power down after 30 minutes. Press and hold the Up arrow to turn on.
- S. To clean the NPi®-200 device, use the Super Sani-Cloth disinfectant wipes (purple top).

V. EVIDENCE-BASED REFERENCES/BIBLIOGRAPHY:

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