FACT SHEET

A New View of Pupillary Examination: Providing Accurate, Objective, Reliable Results Using Automated Pupillometry

Information gained from pupillary assessment is used in decision-making regarding patient triage, diagnosis, treatment, and prognosis. For more than 100 years, clinicians have evaluated pupil size and reactivity to light in patients with brain injury or impaired consciousness to monitor neurological status and trends.[1] Images of a physician or nurse shining a penlight into the eyes of a patient to assess pupil reactivity are universal.

NeurOptics® NPi® Pupillometers provide accurate, reliable and objective pupil size and reactivity data, independent of the examiner, to support neurological examination in adult and pediatric patients with brain injury across a broad spectrum of diagnoses. Patients with primary neurological diagnoses such as traumatic brain injury (TBI), stroke, or seizure, along with patients suffering neurological consequences after cardiac arrest, ECMO and other medical conditions can benefit from automated pupillometry.

The Challenges

- Early detection of neurological injury is critical for effective and timely diagnosis and treatment.[2]
- Traditionally, pupil reactivity is manually measured by penlight or flashlight, and pupil size is visually estimated using a pupil gauge.
- These manual methods are subjective, inaccurate, and prone to variability and error.[2-9]
- A variety of factors can affect the validity of manual pupil assessment and increase inter-examiner disagreement, including poor lighting conditions, the examiner's visual acuity, and the strength, distance, and orientation of the light stimulus with respect to the patient's eye.[5,8]
- Studies show inter-examiner disagreement in the manual evaluation of pupillary reaction to be as high as 39 percent.[4,7,8,10]
- With manual assessment, errors during documentation, recording, and reporting of pupillary data can occur.

An Automated Approach to Pupillary Evaluation

- Automated assessment of the pupillary light reflex provides an objective way of measuring pupillary reactivity across a broad spectrum of neurological disease.
- Automated pupillometry overcomes the limitations of manual assessment and offers quantitative infrared technology to objectively and accurately measure and trend pupil size and reactivity.
- Removing variability and subjectivity, NeurOptics NPi Pupillometers express pupil reactivity numerically as the Neurological Pupil index™ (NPi®) on a scale of 0 to 4.9. This numeric value allows a more rigorous and objective interpretation of the pupillary light reflex by comparing the patient's measurement to scaled normative data.
- By automatically deriving whether the patient's pupillary reactivity, measured by NPi, falls within the normal range ("brisk") or outside of the normal range ("sluggish," "atypical," or "non-

reactive"), the NPi Pupillometers provide a reliable and effective way to quantitatively classify and trend the pupillary light reflex for the first time ever.[3,4,10,11]

- The most effective way to use the Pupillometer is to establish the earliest possible baseline measurement when the patient is admitted into the critical care unit or emergency department, and then trend for changes over time via standard assessment protocols.
- Numerous studies and medical associations have validated the importance of pupillometry and NPi in the clinical setting.
- Automated assessment of pupillary reactivity, measured by the NPi, provides a standard, reproducible measurement of pupil size and reactivity to help support the prognosis of poor neurological outcome in patients who remain comatose hours after cardiac arrest.[12-14]
- It has been shown that quantitative NPi can predict a poor outcome in patients with cardiac arrest from day 1 after VA-ECMO insertion, with no false positives. Combining NPi and 12-h PREDICT-VA ECMO score increased the sensitivity of outcome prediction, while maintaining 100% specificity.[15]
- Researchers also concluded that the use of NPi provides important supplementary diagnostic, therapeutic, and prognostic information to guide the management of nonconvulsive status epilepticus and severe TBI patients.[16,17]
- A case study series published in the *Journal of Neuroscience of Nursing* revealed that automated infrared pupillometry is an accurate tool that provides reliable data in patients with a poor baseline neurological examination after stroke.[18]
- A study in *World Neurosurgery* showed that automated pupillometry can improve triage and expedite treatment for patients with traumatic brain injuries.[19]

Key Highlights

- According to the new American Heart Association guidelines, most deaths attributable to post-cardiac arrest brain injury are due to active withdrawal of life-sustaining treatment based on a predicted poor neurological outcome.[12]
- The NeurOptics Neurological Pupil index™ (NPi®) and automated pupillometry have recently been included in the updated 2020 American Heart Association (AHA) Guidelines for Cardiopulmonary Resuscitation (CPR) and Emergency Cardiovascular Care (ECC) as an object measurement supporting brain injury prognosis in patients following cardiac arrest. [12]

The New NPi®-300 Automated Pupillometer

- The NeurOptics NPi®-300 Pupillometer is the newest model of handheld optical scanner measuring pupil size and reactivity in patients requiring neurological pupil examinations.
- The NPi-300's Wireless Charging technology offers improved reliability for the clinician.
- The NPi-300 Incorporated Barcode Scanner eliminates the need for external barcode scanners and allows clinicians to scan a new 1D or 2D patient ID accurately, instantaneously, and easily.
- The NPi-300 features an ergonomic handle design—the texturized plastic and improved grip help prevent dropping and discoloration.
- The updated Graphical User Interface (GUI) features modern icon-based navigation, NPi and Size trends graphed over 12-hour time windows, and an easy-to-read LCD touchscreen that enhances the visibility of the results screen.
- The NPi-300 is designed to upload into any hospital electronic medical record (EMR) system using the SmartGuard® Reader, which eliminates the possibility of data entry error and saves valuable nursing time.

Key Highlights

- NeurOptics' NPi Pupillometers have been adopted in more than 700 hospitals in the U.S.
- Pupillometry and NPi have been included in more than 130 clinical studies, and NPi Pupillometers are represented in more than 40 countries worldwide.

Conclusion

The clinical neurological exam is a cornerstone of providing care to patients with a wide variety of neurological injuries,[2,3] and pupillary examination is a key component of this neurological assessment. Unlike manual pupillary evaluations using a penlight, NeurOptics NPi Pupillometers offer accurate and objective pupil data, resulting in a significant quality improvement for this important component of the neurological examination.

Company Background

Headquartered in Irvine, Calif., NeurOptics® is the leader in the science of pupillometry. Driven by a passion to help clinicians improve patient outcomes, NeurOptics develops and markets innovative technology for use in critical care medicine, neurology, neurosurgery, emergency medicine, and research. NeurOptics NPi® Pupillometers have been included in more than 130 clinical studies, adopted in over 700 hospitals in the United States, and are represented in more than 40 countries worldwide.

**Note: High-resolution product images are available upon request.*

NPi®-300 Pupillometer

Incorporated Barcode Scanner

- Instantaneous scanning of 1D or 2D patient barcodes

Modern User Interface

- Simple and intuitive icon-based navigation
- Simplified trending screen displaying NPi and Size trends over 12-hour time windows

SmartGuard®

- Single patient-use device with RFID memory chip

Upgraded Keypad

- Easy-to-press buttons designed for fast and simple navigation with or without gloves

New On/Off Button

Texturized Plastic Handle

- Ergonomic grips for easy handling

NPi-300 Wireless Charging Station

- Completely enclosed wireless charging system with no metal pins or blades for improved reliability and ease of charging
- Durably withstands cleaning with hospital cleaning agents

An accurate, reliable and objective system that enhances pupillary assessment to **assist in detecting cerebral insult, guiding treatment and informing prognosis**

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NPi-300 Infographic Rev A (HOMA-C4AQFA)

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