

Reducing Clinical Risk and Increasing Clinical Confidence: Automated Pupillometry in Critical Care and Emergency Medicine

Manual pupil exams are too subjective for high-acuity care

Assessment of pupil size and the pupillary light reflex are critical components of the neurological exam for critically ill patients. Yet manual pupil assessment with a traditional penlight is highly subjective and prone to inter-examiner variability. Terms like *brisk* and *sluggish* are based on subjective judgment and lack standardized definitions.



Automated pupillometry reduces clinical risk and increases clinical confidence in the pupil assessment

In contrast, automated pupillometry provides accurate, reliable, and objective pupil size and reactivity data, independent of the examiner. Like other advances in bedside assessment, such as thermometers and pulse oximeters, a pupillometer turns the exam from a subjective bedside assessment into an objective, trendable vital sign for the brain that clinicians can use to detect subtle changes, track neurological status over time, and support earlier intervention for high-risk patients, reducing clinical risk, and increasing clinical confidence in the pupil assessment.



What is NPi Pupillometry?

The NeurOptics NPi Pupillometer is the only pupillometer that measures the Neurological Pupil index (NPi) and is used in adults and children. The easy-to-use handheld device delivers a consistent light stimulus, digitally analyzes the full pupillary light reflex, measures pupil size and multiple reactivity parameters, and then calculates the Neurological Pupil Index (NPi). NPi provides an objective, reproducible measure of pupil reactivity as a biomarker of brain function.

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Right	Left	Diff	
NPi	4.1	>	4.0 0.1
Size [mm]	4.43	<	4.65 0.22
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Measured Value*	Assessment
3.0 – 4.9	Normal/“Brisk”
< 3.0	Abnormal/“Sluggish”
0	Non-Reactive, Immeasurable, or Atypical Response

*A difference in NPi between Right and Left pupils of ≥ 0.7 may also be considered an abnormal pupil reading

*Per the Neurological Pupil Index (NPi) algorithm

Scored on a scale of 0–4.9, an NPi of 3.0 or higher reflects a normal pupillary light reflex, while less than 3.0 is considered abnormal.

Research and Adoption of Pupillometry as Best Practice

Scientific evidence supports quantitative pupillometry as best practice in pupillary assessment. Hundreds of peer-reviewed clinical studies have demonstrated its ability to improve the neurological assessment by providing accurate, reliable and dependable pupil size and reactivity data independent of examiner.

A growing number of published peer-reviewed clinical studies demonstrate the clinical utility of NPi pupillometry specifically in both the critical care and ED.

More than 1,100 hospitals have adopted NPi pupillometry in critical care, stroke, trauma, and the ED, as well as for transplant, PACU, and ECMO patients. According to the 2026 U.S. News & World Report, 45 out of the top 50 neurology and neurosurgery centers use NPi pupillometry.

Pupillometry and NPi are now in Global Guidelines as Best Practice Recommendations

Global guidelines are increasingly embracing automated pupillometry and NPi, including post-cardiac arrest guidance, stroke guidance, and the [2024 American College of Surgeons Trauma Quality Improvement Program](#) best practice guidelines for traumatic brain injury.

NPi Pupillometry: International Guidelines and Best Practice Recommendations



2020 Japanese Resuscitation Guidelines Advanced Life Support for Adults	2020/2025 American Heart Association Guidelines CPR and Emergency Cardiovascular Care	2021/2025 European Resuscitation Council and ESICM Post Resuscitation Care	2023 Neurocritical Care Society Guidelines Neuroprognostication in Comatose Survivors of Cardiac Arrest	2024 American College of Surgeons Best Practice Guidelines for the Management of TBI	2024 ELSO Consensus Guidelines Neurological monitoring and management of adult ECMO patients
					

Clinical Practice Guidelines on the NeurOptics website

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