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### Pupillometry

Elizabeth Plante

*St. Cloud Hospital, CentraCare Health, elizabeth.plante@centracare.com*

Casey Schmidt

*CentraCare Health, schmidtcas@centracare.com*

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# Pupillometry

Elizabeth Plante, BSN RN CNRN SCR N PCCN and Casey Schmidt, BSN RN CCRN

Saint Cloud Hospital, St. Cloud, Minnesota



## Background

- Measuring pupillary light reflex is a standard part of neurological assessment.
- Changes in pupil reactivity may indicate unfavorable outcomes, such as increased intracranial pressure and brain herniation.
- Physiologic and pharmacologic agents may affect pupil reactivity.
- In some instances, pupillary light reflex is the only piece of neurological assessment readily testable.

## Pupillary Assessment

- Traditional pupil checks are performed subjectively using a light to evaluate pupil size and light reflex.
- Non-standardized terms including “brisk”, “sluggish,” and “nonreactive” are used to describe reactivity.
- Literature shows that consistency of assessment between examiners is limited.
- Studies have shown that nurses may inconsistently assess:
  - pupil size
  - anisocoria
  - pupil reactivity
- Manual pupil assessment can be confounded by:
  - visual acuity of the examiner
  - dark eyes or small pupils
  - ambient light conditions
  - subjectivity or skill/experience level of the examiner



## Quantitative Pupillometry



Figure 1. NeuroOptics Pupillometer

Source: <https://neurooptics.com/>

Bedside pupillometry uses an infrared handheld device to quantify pupil size, rate of reactivity to light, and other parameters.

By quantifying the pupillary response to light consistency is created between evaluators increasing the reliability of measuring pupil reactivity.

Baseline and trending of serial assessments are important to identify changes.

### Nursing Workflow

- Assessment with the Pupillometer takes 15 seconds.
- Readings can be done by trained personnel; however, RNs and providers retain the responsibility to assess the pupil light response by interpreting data.

### Limitations

Assessments may be difficult for:

- Swollen eye lids
- Agitated confused patients
- Ocular surgical procedures (cataract or lens replacements)

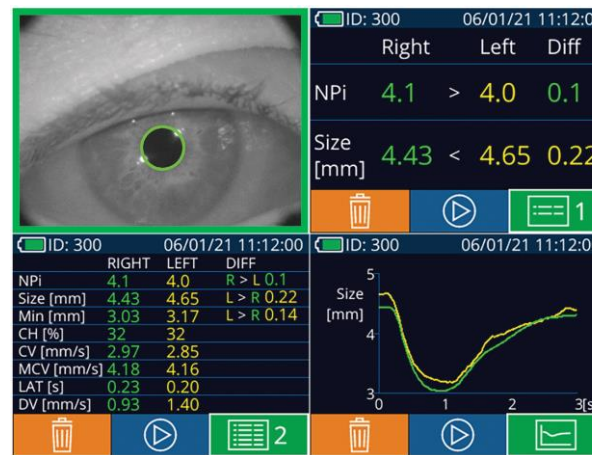


Figure 2. NeuroOptics pupillometer screens. NPi is the Neurological Pupil index used to monitor for pupillary light reflex changes. Source: <https://neurooptics.com/>

## Potential Outcomes

Quantitative Pupillometry has been found to:

- Improve inter-rater reliability of pupillary metrics.
- Increase accuracy of measurement during sedation and pharmacologic paralysis.
- Provide early indication of neurological worsening including:
  - cerebral edema
  - elevation in ICP
  - cerebral ischemia
  - herniation syndromes
- Assist with prognostication after traumatic brain injury, cardiac arrest, and ECMO.

**According to a 2016 study, only 33.3 % of pupils scored as non-reactive by practitioners are scored as non-reactive by pupillometry.**

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Additional references (outcomes): <https://neurooptics.com/clinical-publications-critical-care/>