

Nursing Informatics: NPi® Pupillometer EMR Flowsheet Development



NEUR^{•••}PTICS[®]

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The following information will be important to provide the hospital Nursing Informatics team charged with working with clinical staff to develop new and/or modify existing Electronic Medical Record (EMR) neurological parameter flowsheets for charting pupillary measurements as part of the neurological assessment.

The NPi Pupillometer and Pupillary Measurement Parameters

The NPi Pupillometer provides accurate, reliable, and objective pupil size and reactivity data independent of examiner – reducing the variability and subjectivity of the measurements. The NPi Pupillometer expresses pupil reactivity *numerically* (see [The NPi® Pupil Reactivity Assessment Scale](#) below) so that now both pupil size and reactivity can be accurately trended for changes, just like other vital signs.

Recommended Pupillary Measurement Parameters for EMR Charting

Parameter	Description
Size = Maximum Diameter	Maximum pupil size before constriction
NPi = Neurological Pupil Index	Numerical expression of pupil reactivity

The NPi® Pupil Reactivity Assessment Scale

Measured Value*	Assessment
3.0 – 4.9	Normal
< 3.0	Abnormal
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*

The most effective way to use the NPi Pupillometer is to establish the earliest possible **baseline** NPi and Size measurements when the patient is admitted to the Intensive Care Unit or Emergency Department, and **trend for changes** over time via the hospital's standard pupil assessment protocol.

Please note the NPi Pupillometer records a total of 8 Pupillary Measurement Parameters, although most hospitals record only NPi and Size. Please thoroughly read the Flowsheet Development Instructions and Checklist on Page 2, as it will be important for your Nursing Informatics Team to work with the clinical staff to confirm which Pupillary Measurement Parameters need to be trended. Most facilities chart only NPi and Size as recommended above, but for more information on the other Pupillary Measurement Parameters, please see [Appendix B](#).

EMR Flowsheet Development of NPi Pupillometer Pupillary Measurement Parameters

The hospital Nursing Informatics team plays a pivotal role in allowing the NPi Pupillometer to be used effectively to accurately baseline and trend quantitative reactivity (NPi) and Size (measured precisely to the hundredths of a mm). The NPi Pupillometer display limits for EMR Flowsheet Development must be set such that NPi (scalar value to the 10th of a decimal – see below) and Size (to the hundredths of a mm – see below) are **numerical fields** included in the general Pupil Assessment section of a neurological parameter flowsheet, and that these fields can be accessed by the providers that are notified in the event of an abnormal pupil measurement or trend.

In developing or modifying the hospital's Electronic Medical Record (EMR) neurological parameter flowsheets for charting pupillary measurements, *please follow the instructions below and confirm that all steps in the included "Flowsheet Development Checklist" have been completed.*

Flowsheet Development Instructions

1. Work with the clinical staff to determine which NPi Pupillometer Pupillary Measurement Parameters need to be trended with each pupil assessment. If this isn't defined in the hospital pupillometry protocol, charting only Right & Left "NPi" and "Size" is recommended, as this allows for the simplest transition from charting and performing traditional manual pupil assessments to objective pupil assessments using the NPi Pupillometer. **Please note** this is an important step, because adding parameters from Appendix B to the EMR Flowsheet that the clinical staff has *not* formally decided to trend, other than NPi and Size, can create confusion and be a significant barrier to nursing workflow and pupillometry adaptation.
2. Add fields in the general Pupil Assessment section of the neuro flowsheet for the above defined parameters. If only NPi and Size will be trended, add numerical fields (no additional free-type text should be entered) for Right NPi, Left NPi, Right Pupil Size, and Left Pupil Size with the following low and high display limits.
3. **Add auto-calculated numerical fields for NPi and Size Difference values.** The NPi Difference, exactly like the corresponding R/L NPi values, should be computed precisely to the 10th of a decimal, while the Size Difference should be computed to the 100th of a millimeter. By implementing this feature within the EMR flowsheet, the need for manual transcription of these values can be eliminated, leading to time savings for nursing personnel and a reduction in charting errors.

> Please see Appendix A (back page) for a visual example of NPi Pupillometry flowsheet rows for NPi, Size, and Difference values included within the "Pupil Assessment" section in the EMR.
4. Optional (recommended): Allow for viewing of two trending charts (simple line graphs) for NPi and Size. The x-axis should be time of measurement, and the y-axis should be NPi (on a scale of 0-4.9) and Size in mm (on a scale of 0.80-10.00), respectively.

PROGRAMMING PRECISION TIP:

It is critical that NPi is entered as a number to the 10th of a decimal, and Pupil Size is entered as a number to the 100th of a mm. The Right eye measurements should be set up in the flowsheet to be entered before the Left eye measurements (i.e. Right above Left as seen in Appendix A), because this is the order of results on the NPi Pupillometer when reading across the screen and will help to reduce transcription errors in the patient record.

NPi Pupillometer Display Limits for Electronic Medical Record (EMR) Flowsheet Development

The following low and high display limits are included to inform hospital staff of the specific parameter display limits for consideration in the development of neurological parameter flow sheets.

Parameter	LOW	HIGH
NPi	0.0	4.9
Size (mm)	0.80	10.00

Flowsheet Development Checklist

- ☐ Clinical Staff on unit has confirmed which NPi Pupillometer Pupillary Measurement Parameters will be charted and trended in the EMR with each pupil assessment.
- ☐ Right eye measurements are set up in the flowsheet to be entered before Left eye measurements to reduce transcription errors from the NPi Pupillometer.
- ☐ NPi and Size Difference values are auto calculated from NPi Right eye measurements and Left eye measurements.
- ☐ Rows with numerical entry fields have been added for the above parameters in the general Pupil Assessment section, according to the pupillometer display limits in the Display Limit Table above.
- ☐ NPi Right, Left, and Difference rows allow the nurse to enter any number between 0.0 and 4.9 (ex. 4.3), but do not allow for other text entry.
- ☐ Pupil Size (mm) Right, Left, and Difference rows allow the nurse to enter any number between 0.80 and 10.00 (ex. 5.52), but do not allow for other text entry.
- ☐ NPi Pupillometer Measurement Parameters can be viewed by any clinician with access to the neurologic assessment section of the patient's electronic health record.
- ☐ Optional (recommended): Trending charts (simple line graphs) can be viewed for NPi and Pupil Size, with time of measurement on the x-axis and NPi (0.0-4.9) or Size in mm (0.80-10.00), respectively, on the y-axis.

Appendix A: Example of NPi Pupillometer Flowsheet Rows in Epic

Documentation of the NPi Pupillometer readings will be completed in Complex Assessment of Doc Flowsheets.

	6/1/2024		
	1300	1400	1500
NPi Pupillometry			
NPi Right	4.1	3.8	
NPi Left	4.0	3.5	
NPi Difference Calculation	0.1	0.3	
Pupil Size Right (mm)	4.43	4.89	
Pupil Size Left (mm)	4.65	5.16	
Pupil Size Difference Calculation	0.22	0.27	

Appendix B: All Pupillary Measurement Parameters with EMR Display Limits

Pupillary Measurement Parameters

Parameter	Description
NPi® Pupil Reactivity Assessment Scale	Numerical expression of pupil reactivity. Please refer to the The NPi® Pupil Reactivity Assessment Scale (Page 2) for additional information.
Size = Maximum Diameter	Maximum pupil size before constriction
MIN = Minimum Diameter	Pupil diameter at peak constriction
CH = % Change	% of change (Size-MIN) / Size as a %
CV = Constriction Velocity	Average of how fast the pupil diameter is constricting measured in millimeters per second
MCV = Maximum Constriction Velocity	Maximum velocity of pupil constriction of the pupil diameter responding to the flash of light measured in millimeters per second
LAT = Latency of constriction	Time of onset of constriction following initiation of the light stimulus
DV = Dilation Velocity	The average pupillary velocity when, after having reached the peak of constriction, the pupil tends to recover and to dilate back to the initial resting size, measured in millimeters per second

Pupillometer Display Limits for Electronic Medical Record (EMR) Flowsheet Development

The following low and high display limits are included to inform hospital staff of the specific parameter display limits for consideration in the development of neurological parameter flow sheets.

Parameter	LOW	HIGH
NPi	0.0	4.9
Size (mm)	0.80	10.00
MIN (mm)	0.80	10.00
CH (%)	0	50
CV (mm/s)	0.00	6.00
MCV (mm/s)	0.00	6.00
LAT (sec)	0.00	0.50
DV (mm/s)	0.00	6.00

