

Introduction

The Neuroscience Intensive Care Unit (NSICU) at Rush University in Chicago implemented a new practice of using an infrared pupillometer to assist in pupil assessment. A nurse-guided protocol was developed and a limited number of devices were made available to nursing staff for use in January of 2016. However, adoption of the protocol was slow. Informal feedback from nursing staff indicated this was related to the complexity of the protocol and number of available devices. Nursing leadership led a quality improvement project to evaluate protocol use compliance and solicit nursing feedback on the protocol and device.



Pupillometry in the NSICU

The infrared pupillometer is a hand-held device that provides objective data on pupil size and constriction velocity to light. The neurological pupil index (NPI), a value provided by the pupillometer, may correlate with neurologic decline. (Fountas, 2006)

Pupillometry is a useful adjunct to manual pupil assessment, which is often inaccurate.

- Meeker et al. (2005) found that interrater disagreement on pupillary reactivity between disciplines is 39%
- Olson et al. (2015) found that agreement between disciplines was high (95%) when pupils were normal but low (49.7%) when pupils were fixed
- Kerr et al. (2016) found that RN subjective estimations of pupil size and reactivity to light were inaccurate and that anisocoria was not identified
- Pupillary asymmetry of 0.5mm or more was proven to correlate with an ICP over 30mm Hg; this degree of pupillary asymmetry was only found by RNs using a handheld light source 22% of the time (Taylor et al., 2003)



Objectives

- Discuss the use of infrared pupillometry to improve pupil assessment
- Review RUMC protocol for pupillometer assessment of patients with stroke
- Identify common pitfalls when implementing a pupillometry protocol and strategies to address these concerns

Methods

Initial pupillometry program launch included:

- Purchase of 2 pupillometry devices
- Development of a nurse-driven protocol to assess patients based on diagnosis, acuity and risk for neurologic deterioration

Protocol compliance was evaluated through an audit on 2 consecutive shifts to assess the number of patients who were eligible according to the protocol and the number of patients who received pupillometry assessments. The compliance audits were performed 3 and 8 months after protocol implementation.

Nurse knowledge and understanding of the technology and protocol were assessed through several focus groups consisting of a total of 40 nurses with representation from all shifts. Questions included;

- What is the biggest challenge to using the pupillometer and RUMC NSICU protocol?
- Do you feel the pupillometer is beneficial? Why/how?
- What additional information or training do you need on the pupillometer technology or RUMC protocol?
- What additional feedback do you have regarding the current use of pupillometry in the NSICU?

Results

3 month compliance with the pupillometry protocol was 77% (10 of 13 patients)

8 month compliance with the pupillometry protocol was 47% (9 of 19 patients)

19% of patients had a delay in initiation of pupillometry assessment of greater than 24 hours despite meeting protocol eligibility (6 of 32 patients)

Themes identified in nursing discussions:

- Staff reported pupillometry removed the subjectivity from pupil assessment
- Staff identified at least one case where pupillometry assessment abnormality preceded clinical exam changes, and resulted in a change in the plan of care for that patient
- Additional devices are needed to integrate pupillometry into routine nursing workflow
- Staff struggled to remember when to implement pupillometry assessment because the protocol is diagnosis and acuity specific, particularly if the patient did not meet the criteria on admit but had a clinical change and did meet criteria for monitoring at some point during their care in the NSICU

Discussion

Compliance with the RUMC pupillometry protocol dropped over time as measured by quality audits. Nurses reported that they struggled to remember when to use pupillometry, particularly if the patient did not meet the restricted criteria on admission. This finding was validated on quality audits. Additionally, limited devices contributed to nursing workflow challenges

The project resulted in the following changes:

- Purchase of additional devices
- Inventory change to improve availability of disposable guards
- Addition of RN super-users to serve as resources and monitor protocol compliance
- Broader protocol and process evaluation to streamline clinical criteria in protocol for pupillometer use



Conclusion

Pupillometry technology can be useful for pupil assessment in the NSICU. However, acquisition of technology and protocols for pupillometry use should take into consideration nursing workflow and avoid complicated clinical criteria in order to maximize compliance and use.

References

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