

AACN

Procedure Manual *for*
High Acuity, Progressive,
and Critical Care

Edited by

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7th

EDITION

ELSEVIER

AMERICAN
ASSOCIATION
of CRITICAL-CARE
NURSES

Preface

The seventh edition of the *Procedure Manual* has a new title: the *AACN Procedure Manual for High Acuity, Progressive, and Critical Care*. The title has been changed to reflect the expanding use of the procedures in diverse settings. I have worked closely with the section editors, clinical experts, and key AACN and Elsevier staff members to revise and update this edition. We have removed procedures no longer common and added procedures for new technologies, devices, and interventions. Although every attempt was made to capture current clinical practice, we recognize that high acuity, progressive, and critical care clinical practice is dynamic and therefore that any resource to support that practice must be considered a work in progress.

AACN is dedicated to the care of patients with critical illness or injury and their families. AACN's vision is of a healthcare system driven by the needs of patients and their families in which critical care nurses make their optimal contribution. Toward that vision, our hope is that this edition of the *AACN Procedure Manual for High Acuity, Progressive, and Critical Care* will be a useful resource for nurses in providing quality patient care.

The seventh edition of the *AACN Procedure Manual for High Acuity, Progressive, and Critical Care* will be an asset for nurses across the spectrum of acute and critical care practice. The manual includes a comprehensive review of state-of-the-art information on acute and critical care procedures. The following procedures related to new and emerging trends have been added:

- King Airway Insertion and Removal (AP)
- Extracorporeal Life Support (ECLS) and Extracorporeal Membrane Oxygenation (ECMO)
- Defibrillation (Internal) Assist
- External Wearable Cardioverter Defibrillator
- Esophageal Cardiac Output Monitoring (Perform and Assist)
- Noninvasive Cardiac Output Monitoring
- Radial Arterial Sheath Removal
- Thenar Tissue Oxygen Saturation Monitoring
- Midline Catheters
- Cerebral Blood Flow Monitoring
- Cerebral Microdialysis
- Pupilometer
- Focused Assessment with Sonography in Trauma (FAST)
- Nasogastric and Orogastic Tube Insertion, Care, and Removal
- Molecular Adsorbents Recirculation System (MARS)

All procedures have been revised to reflect changes in practice. As with the last edition, this edition of the *AACN Procedure Manual for High Acuity, Progressive, and Critical Care* contains not only procedures commonly performed by critical care nurses but also procedures performed by advanced practice nurses. Each advanced practice procedure has an AP designation in the Table of Contents and a special

AP icon and explanatory footnote on the first page of the procedure.

Because we recognize that the procedures included in this manual are only a portion of the repertoire needed by today's critical care practitioners to skillfully care for critically ill patients, we recommend that it be used in conjunction with the *AACN Core Curriculum for High Acuity, Progressive, and Critical Care Nursing, the Certification and Core Review for High Acuity and Critical Care*, and *AACN Advanced Critical Care Nursing*.

The *AACN Procedure Manual for High Acuity, Progressive, and Critical Care* is designed so that information within each procedure can be found quickly. To provide high-quality care to seriously ill patients, we need resources that provide us with readily available, need-to-know information. The book is organized into units, with most of the units having several sections. All procedures are designed in the same style and begin with the following:

- Purpose of the procedure
- Prerequisite Nursing Knowledge, which includes information the nurse needs before performing the procedure
- Equipment list, which includes equipment necessary to perform the procedure (some of the procedures identify additional equipment that may be necessary based on individual situations)
- Patient and Family Education, which identifies essential information that should be taught to patients and their families
- Patient Assessment and Preparation, which includes specific assessment criteria that should be obtained before the procedure and describes how the patient should be prepared for the procedure

Each step-by-step procedure includes the following:

- Steps, Rationales, and, for some steps, Special Considerations
- Associated research and appropriate figures and tables
- Expected Outcomes, including the anticipated results of the procedure
- Unexpected Outcomes, including potential complications or untoward outcomes of the procedure
- Patient Monitoring, which includes information related to assessments and interventions that should be completed (the rationale for each item is described, and conditions that necessitate notification of an advanced practice nurse, physician, or other healthcare professional are identified)
- Documentation that describes what should be documented after the procedure is performed
- References are included, and the majority of procedures also include Additional Readings

This edition of the *AACN Procedure Manual for High Acuity, Progressive, and Critical Care* includes several icons that are common to many of the procedures. These icons include the following:

PROCEDURE

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Pupillometer

DaiWai M. Olson and John C. Bazil

PURPOSE: The pupillometer is a noninvasive, handheld device that is used to provide an objective measurement of the pupils before and after a light stimulus, as well as the pupillary reactivity to light. The pupillometer is capable of providing automated measurement of one pupil at a time and therefore may not be an adequate substitute for evaluating the presence of anisocoria (unequal pupils). However, after completing paired measurements of both pupils within 30 seconds, the device displays data that allow for comparison of pupillary size and reaction.

PREREQUISITE NURSING KNOWLEDGE

- A fundamental understanding of the neuroanatomy and function of the optic cranial nerve (CN II) and the oculomotor cranial nerve (CN III) provides clinical correlates for interpreting the outcome of readings obtained with the pupillometer.^{1,2}
 - ❖ The pupil is an opening in the center of the iris of the eye. Light passes through the pupil to the lens where images are reversed before going through the vitreous humor to the rods and cones embedded throughout the retina.
 - ❖ Images are then converted into electrical signals that travel along the optic cranial nerve (CN II) to the optic chiasm, optic tracts, and lateral geniculate nucleus where the images are sorted and then relayed to the visual cortex in the occipital lobe.
 - ❖ The size and shape of the pupil determines the amount of light that can enter the eye. The intrinsic muscles in the iris (sphincter pupillae and dilator pupillae) control the size and shape of the eye. The pupillary light reflex is a brisk, protective mechanism (reflex) that triggers the intrinsic muscles in the iris to contract and thereby decrease the size of the pupil and reduce the amount of light reaching the retina. Testing the pupillary light reflex evaluates components of the second and third cranial nerve (Fig. 98-1).² The electrical signal created from light entering the eye travels along CN II (afferent) to the Edinger-Westphal nucleus and triggers an efferent signal to travel along CN III from the Edinger-Westphal nucleus to the intrinsic muscles of both eyes (OU). Thus a normal response to light entering either eye is OU pupil constriction.³
 - ❖ The modern pupillometer is a handheld device that uses video recording to analyze the size and reactivity of the pupil to light.⁴
 - ❖ Proper equipment assembly of the pupillometer requires attaching an aseptic SmartGuard to the device with the knowledge that each device is assigned to and linked with a single patient. The neuropupillary index (NPI) is based on a collection of pupil measurements conducted

on a healthy control population.⁵ All variables representing the pupil dynamics were used to create a multidimensional, normative model. These variables are the maximum size, the latency, the constriction (average and maximum), and the dilation velocity (Fig. 98-2). The NPI quantifies the distance between the single measurement and the model. A normal NPI is >3.0 . An index equal to or above 3 indicates that the pupil measurement falls within the boundaries of the NPI model and is defined as normal. A score below 3 means the reflex falls outside the boundaries and is defined as abnormal—that is, weaker than a normal pupil response as defined by the NPI model. The NPI is reported as zero when no constriction is detected. An NPI less than 3 may be reflective of increasing intracranial pressure.⁶

- ❖ The constriction velocity is measured in mm/sec and calculated as the amount of constriction (size change) divided by the duration (time in seconds) during which the pupil remains constricted. There are medications with known effects on the pupillary response. Alcohol (EtOH) and opioids will generally cause a constriction of the pupil whereas atropine, amphetamines, and many hallucinogens (e.g., psilocybin [mushrooms], LSD) will cause pupillary dilation. It is important to remember that the medication's influence will occur in both pupils. If a patient has had a recent ophthalmological examination, determine whether specific anticholinergic medications such as cyclopentolate (Cyclogyl) have been used to dilate the pupils.⁷
- ❖ The presence of cataracts, or a history of cataract surgery, may influence pupillary reactivity.

EQUIPMENT

- Nonsterile gloves
- Pupillometer device (Fig. 98-3A)
- Pupillometer docking station (see Fig. 98-3A)
- Pupillometer SmartGuard (see Fig. 98-3B)

Additional equipment to integrate data into an Electronic Medical Record (EMR)

- Pupillometer Scanner
- Pupillometer Reader

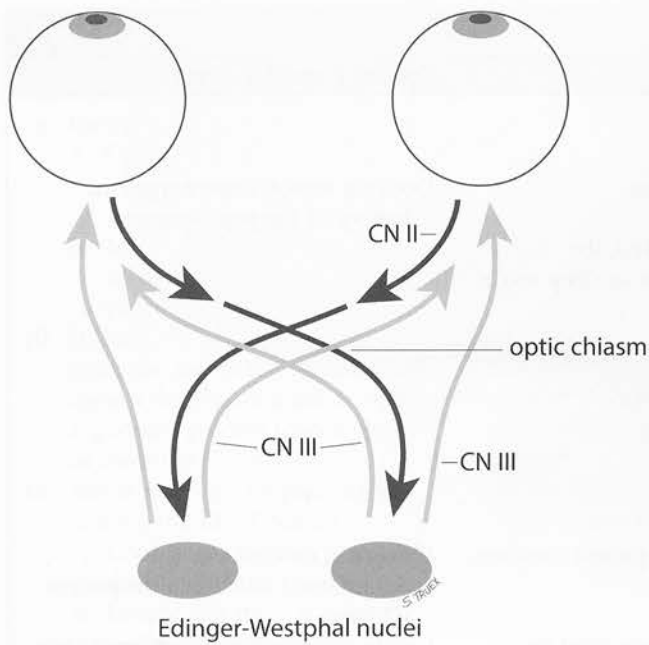


Figure 98-1 CN II and CN III pathways to Edinger-Westphal nuclei.

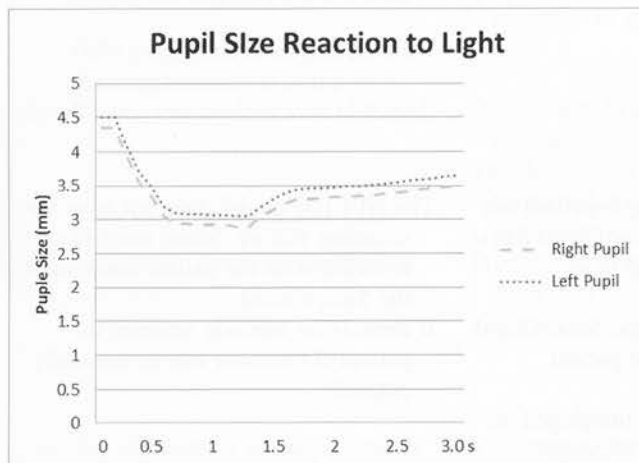


Figure 98-2 Graphic representation of the pupillary light reflex and variables used to calculate the NPi for the left and right pupils.

PATIENT AND FAMILY EDUCATION

- Explain the purpose of serial neurological assessment to the patient and family. **Rationale:** The pupillary examination is a key assessment element performed during serial neurological examinations.
- Provide education that the pupillometer is an automated assessment device that will be used to track how fast the patient's pupils respond to light. **Rationale:** Assessing pupils is a standard component of the neurological examination. However, patient and family may be unfamiliar with automated pupil assessment.

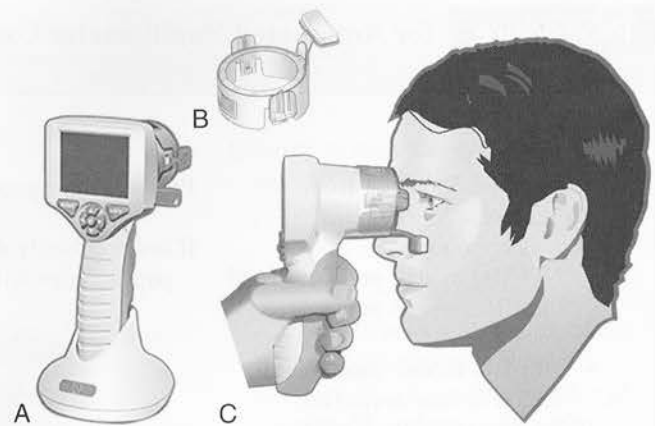


Figure 98-3 NPi-200 Pupillometer shown in docking (A) and with SmartGuard (B) attached and being held in proper position (C) with pad of SmartGuard on zygomatic bone (cheekbone).

- Provide patient and family teaching explaining how the pupillary examination will be completed. **Rationale:** A bright light is used to examine the pupils and may startle or frighten a patient/family if prior instruction is not provided.

PATIENT ASSESSMENT AND PREPARATION

Patient Assessment

- Assess patient and family understanding of information. **Rationale:** Provides an opportunity to clarify information, answer questions, and possibly reduce fear and anxiety associated with a device being used near the face and eyes.
- Assess the patient's ability to maintain eye opening. **Rationale:** The patient must maintain eye opening. If the patient is unable to maintain eye opening during the examination, the provider will be required to manually lift the eyelid and keep the eye open during the examination.
- If the patient is conscious, determine whether photophobia is present. **Rationale:** Patients with photophobia will benefit from instructions and warning that a bright light will be used to assess their pupil reactivity.

Patient Preparation

- Verify that the patient is the correct patient using two identifiers. **Rationale:** Before performing a procedure, the nurse should ensure the correct identification of the patient for the intended intervention. The SmartGuard in the pupillometer will automatically upload data to the EMR based on the code entered into the SmartGuard.
- Identify and confirm the correct SmartGuard is available. **Rationale:** To reduce the risk of cross contamination, a separate reusable SmartGuard is used for each patient. The SmartGuard should remain with the patient.