

## Neurologic Workshop: Clinical Pearls of Neuro Assessment for the School Nurse

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## Disclosures

- Speaker Bureau: Sanofi-Pasteur, Merck, Pfizer
- Consultant: Sanofi-Pasteur, Pfizer, Merck, Arbor

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## Objectives

- Upon completion of this lecture, the participant will be able to:
  - Discuss the screening neurologic examination
  - Identify work-up for common neurologic complaints
  - Discuss case studies of individuals with neurologic complaints

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## History

- As with every other body system, history is the most crucial component of the neurologic examination
- Provides clinician with the diagnosis 80-90% of the time
- With neuro examination: clinician must determine if the individual is capable of providing the history
  - Or... must we rely on other members of the family for this information because of dementia or delirium

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## Most Common Neurological Complaints

- Headaches
- Syncope
- Traumatic head injuries
- Dizziness

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## The Screening Neurologic Exam

Devinsky, O., Feldmann, E., Weiner, H. (2000) Neurologic Pearls, Philadelphia: FA Davis. Pp. 277-279

Perkin, G.D., (2002) Mosby's Color Atlas and Text of Neurology; 2<sup>nd</sup> edition.

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## Cranial Nerves

- I: Olfactory
- II: Optic
- III: Oculomotor
- IV: Trochlear
- V: Trigeminal
- VI: Abducens
- VII: Facial
- VIII: Acoustic
- IX: Glossopharyngeal
- X: Vagus
- XI: Spinal Accessory
- XII: Hypoglossal

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## Cranial nerves

### ■ Cranial Nerve I, olfactory

- Sniff each side
  - Have patient close both eyes, occlude 1 nare and determine etiology of a scent being placed beneath the unoccluded nare
  - Non-astringent odor
    - Astringent odor (alcohol) stimulates CN V

Inability to detect smell (anosmia)

Elders have a decreased ability to smell (hyposmia) which may result in an increased risk of food poisoning

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## Differential Diagnoses

- Disorders confined to CN I are rare
  - Upper respiratory infection
  - Closed head injury
  - Subfrontal meningioma
  - Dementia
- Olfactory hallucinations occur in simple and complex seizures
- Can also occur in the patient with migraines-olfactory hallucination can be the aura

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## Cranial nerves

### ■ Cranial Nerve II, optic

- Visual acuity
- Visual fields
  - Test each eye separately then together by confrontation
- Funduscopic exam
- Some clinicians include color vision testing as part of the CN II examination
  - Can use Ishihara color test

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## Visual Acuity

- Visual Acuity
  - Test of central vision
  - Controlled by cranial nerve II (Optic)
  - Use a Snellen Chart (wall or hand-held)
    - Stand 20 feet from wall chart
    - Place hand held Snellen 13 inches from face

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## Visual Acuity

- Infants
  - Central vision is present, may just see light
  - Optimum distance for visualization: 8-12 inches
  - Assess by checking direct and consensual response to light, blinking, extending the head in response to a bright light (Optical blink reflex) and blinking in response to a quick movement of an object toward the eye
    - 2-4 weeks, should be able to fixate on objects
    - 5-6 weeks, coordinated eye movements

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## Visual Acuity

- Child
  - Vision: 20/200 at 1 year old, 20/40 at 3, 20/30 at 4-5 years of age
  - No test that accurately measures acuity in child < 3
  - Can test using a hand-held Snellen chart or a wall chart
  - Letters and Lazy E are the best tests
- Older Child and Adult
  - Adult visual acuity is reached at approximately 6 years of age

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## Visual Acuity

Visual Acuity is \_\_\_\_ OD, \_\_\_\_ OS, and \_\_\_\_ OU (corrected or uncorrected)

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## Abnormalities of Visual Acuity

- Absence of a direct or consensual response to light, absence of blinking, negative optical blink reflex, or failure to blink when an object is moved quickly toward the eye: Blindness
- Asymmetric Visual Acuity: Amblyopia

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## Visual Fields

- Visual Fields
  - Entire area that can be seen by the eye when its gaze is focused on a central point
  - Normally limited above by the eyebrows, below by the cheeks, and medially by the nose
- Procedure
  - Visual fields by confrontation
    - Patient covers one eye. Examiner covers eye directly opposite
    - Position yourself directly in front of the patient approximately 1 meter from the patient

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## Visual Fields by Confrontation

- Procedure (continued)
  - Eyes should be level
  - Have patient look directly into your eye
  - Slowly bring your fingers in from the periphery
  - Ask the patient to tell you when fingers can be seen
  - You and patient should see your fingers at the same time
  - Repeat on the opposite side
  - **\*\*Visual Fields are intact by confrontation.**

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## Abnormalities

- Loss of peripheral vision
  - Abnormality of cranial nerve II
  - Glaucoma
  - Occlusion of superior branch of the retinal artery
  - Lesion of the optic chiasm
  - Migraines

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## I Want To Take A Moment And Review Some Terminology

- Definitions of visual field defects
  - Central scotoma: defect centered on fixation
  - Altitudinal defect: defect in the upper or lower half field
  - Bitemporal hemianopsia: a defect in the temporal parts of both fields
  - Homonymous Hemianopsia: A defect in the temporal half of one field and the nasal half of the other

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## Techniques for the Fundoscopic Examination

- Turn off lights in exam room
- Use large, white light
- Begin at 0 diopters
- Right hand/right eye; left hand/left eye
- Use your thumb to hold eyelid open and brace yourself
- Ask patient to focus on a point in the distance
- Begin from 1 foot away; 45 degree angle

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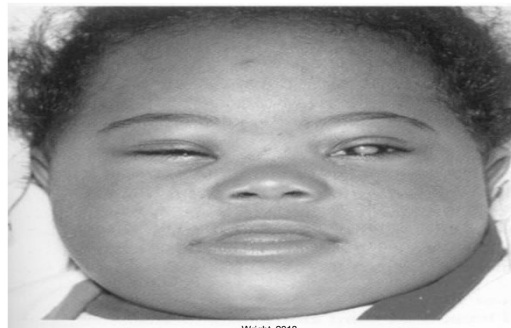
## Fundoscopy

- Red Reflex
  - Presence
    - \*\*Absence: Cataracts, Detached Retina
    - \*\*White Reflex: Retinoblastoma
- Lens and Vitreous
  - Lens: Transparent, egg-shaped body behind the pupil
  - Vitreous body: Transparent mass of gelatinous material
  - Helps to maintain the shape of the eyeball
- Color
- Opacities or Floaters

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## Leukocoria



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## Retina, Arteries and Veins

- Retina, Arteries, and Veins
  - Retina: Receives the images and is connected to the brain via the optic nerve
    - Appears pink
  - Identify arteries and veins
    - Arteries
      - Light red, smaller, bright light reflex
    - Veins
      - Dark red, larger, inconspicuous or absent

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## Normal Retina

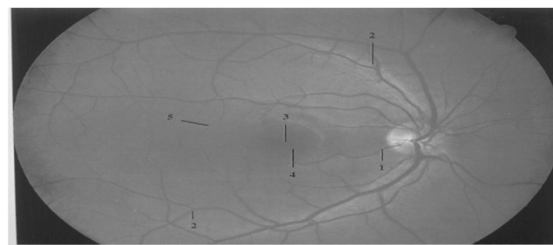


Fig. 9-1 Normal fundus. A normal, pink optic nerve, cup-to-disk ratio of 0.1, normal A/V ratio of 2:3, and a cilioretinal artery (1) extending from the optic nerve and inferior to the fovea. Note the branching points of the blood vessels "point" (2) toward the optic nerve. The foveolar reflex (3), fovea (4), and macula (5) are seen.

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## Optic Disc

- Optic Disc
  - Yellowish, orange or pink; oval or round structure
  - Nearsighted patient-rotate diopter disk counterclockwise (negative diopters)
  - Farsighted patient-rotate diopter disk clockwise (positive diopters)
  - Inspect
    - Clarity of the outline
    - Color
    - Presence of pigmented rings around the disk
    - Size of physiologic cup

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## Physiologic Cup

- Physiologic cup is a small depression in the center of the optic disc
- It is the location from which the retinal vessels emerge
- Normally 1/2 to 1/3 the size of the optic disc

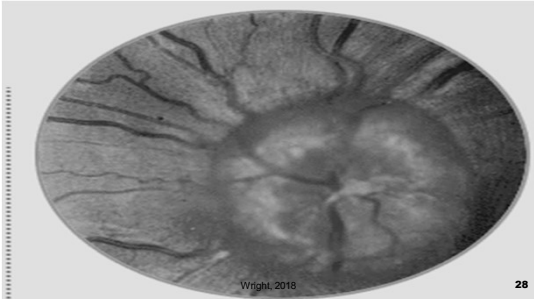
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## Abnormalities of the Optic Disc

- Rings or Crescents
  - Normal variation
- Optic Atrophy
  - Absence of tiny disc vessels
  - Color: white
- Papilledema
  - Disk vessels more visible
  - Color: pink-slightly erythematous
  - Disc swollen and margins blurred
  - Physiologic cup not visible

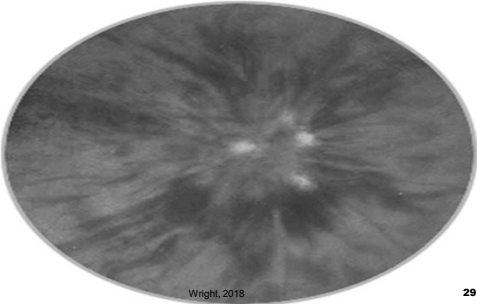
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## Papilledema



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## Papilledema

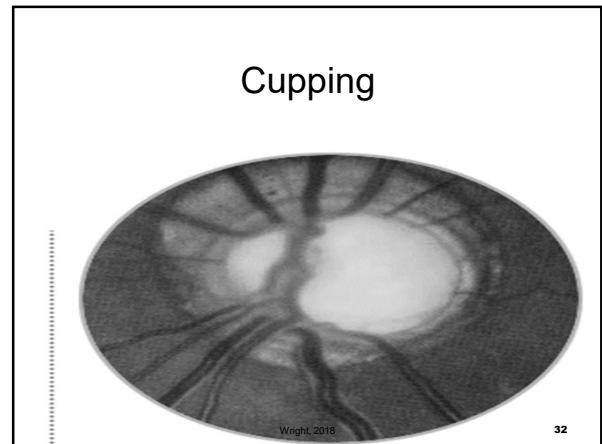
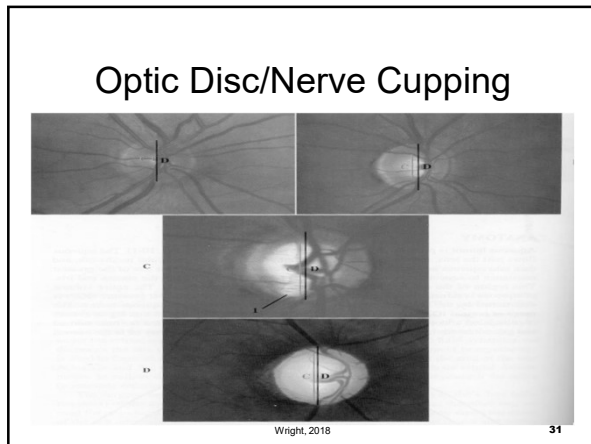


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## Abnormalities of the Cup

- Cupping
  - Increased pressure within the eye caused by glaucoma
  - Causes a backward depression of the disc giving the appearance that the cup is coming out at you
  - Appearance
    - Cup is enlarged (More than 1/2 the size of the disc)
    - Retinal vessels sink in and under the cup

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- ### Cranial nerve III: Oculomotor
- III, Oculomotor
    - This is the motor nerve to the five extrinsic eye muscles
      - Levator palpebrae superioris, medial rectus, superior rectus, inferior rectus, inferior oblique
    - Assessment
      - Symmetry of Lid closure
      - Pupillary size and symmetry
      - Response to direct and consensual light
      - EOM's in 6 cardinal fields of gaze
        - Elevate, depress, adduct eye
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- ### Eyelids
- Lids should close in unison to cover the entire eye
    - Upper lid margin rests on the superior border of the iris
    - Lower lid margin rests on the inferior border of the iris
    - Palpebral fissure: Space between the upper and lower lid
- \*\* Lids close in unison to cover entire eye. The upper lid margin is at the superior border of the iris and the lower lid is at the inferior border of the iris.*
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- ### Abnormalities of Eyelids
- Widening of the palpebral fissure
    - Hyperthyroidism (Exophthalmus)
  - Decrease in palpebral fissure size
    - Dehydration (Endophthalmus)
  - Ptosis
    - Cranial Nerve III Dysfunction
    - Muscular Dystrophy
    - Horner's syndrome
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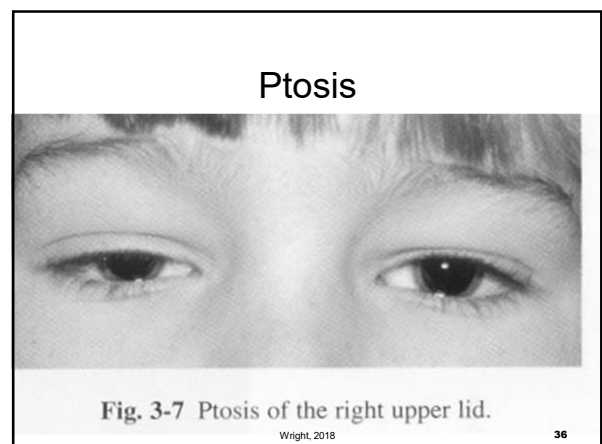


Fig. 3-7 Ptosis of the right upper lid.

## Pupils

- Pupils
  - Normally round
  - Range in size from 3-7 mm
  - Allow images and light to enter
  - They change in size to adjust for light and to focus on an image
- Note
  - Size
  - Shape
  - Regularity

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## Pupils

- Note
  - Symmetry
  - Newborn
    - Response to direct light
  - Older child
    - Response to direct and consensual light

\*\* Pupils are \_\_\_\_mm, round, regular and equal bilaterally and respond briskly to direct and consensual light.

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## Accommodation

- 3 things occur when a person changes focus from a distant to a near object
  - The pupils constrict
  - The eyes converge
  - The lenses become convex (can not view this)
- Procedure
  - Have person focus on an object on a distant wall. Then place an object 10 cm in front of the face. Have the individual switch focus from the distant object to the near object. Have them continue to follow the object as it is brought in toward the nose.

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## Abnormalities of the Pupils

- Anisocoria: Inequality of the pupils
  - Normal Variation: Respond normally to light
    - Found in 20% of the population
    - Defined as a variation of more than 2 mm between the pupils
  - Increase in Intracranial Pressure

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## Abnormalities of the Pupils

- Anisocoria: Inequality of the pupils
  - Acute Angle Closure Glaucoma
    - Severe pain
    - Decreased vision
    - Pupil is dilated
    - Cornea is cloudy
    - Increase in intraocular pressure

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## Abnormalities of the Pupils

- Miosis
  - Equally constricted pupils
  - Drugs, morphine, bright light
- Mydriasis
  - Equally dilated pupils
  - Anticholinergic agents, mushrooms, increased intracranial pressure
- Inability to accommodate
  - Cranial nerve defect (III, IV, VI)

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## Extraocular Movements

- Extraocular Movements
  - Movement of each eye is controlled by 6 muscles and 3 nerves
  - The function of each muscle and nerve that innervates it can be tested by asking the patient to move the eye in the direction controlled by the muscle and nerve
- Procedure
  - Infant: Cover/Uncover test
  - Older Child and Adult: Assess EOM's by moving an object through the six cardinal fields of gaze

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## Extraocular Movements

- Procedure
    - Infant: Cover/Uncover test
    - Older Child: Assess EOM's by moving an object through the six cardinal fields of gaze
- \*\*EOMs are intact; no nystagmus or strabismus.  
\*\*Negative Cover/Uncover test

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## Abnormalities of EOM's

- Positive Cover/Uncover: Strabismus
- Abnormal EOM's: Strabismus
- Nystagmus: Fine, rhythmic oscillation of the eyes
  - A few beats at lateral gaze are normal
  - Causes:
    - Increased intracranial pressure
    - Labyrinthitis

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## Abnormalities of Cranial Nerve III

- Tic douloureux can be caused by a Cranial Nerve III dysfunction
- Can also see abnormalities in patients with an increased IOP or subarachnoid hemorrhage

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## Cranial nerves

- IV, Trochlear
  - Depression, adduction, intorsion of eye
- VI- Abducens
  - Abduction (lateral movements) of eye

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## Cranial nerve V: Trigeminal

- Trigeminal Nerve Has 2 Components:
  - Sensory
    - To assess: assess light touch and pain along the 3 branches
  - Ophthalmic branch (1<sup>st</sup> division)
    - Cornea, ciliary body, conjunctiva, nasal cavity and sinuses, skin over eyebrow, forehead, nose
  - Maxillary branch (2<sup>d</sup> division)
    - Side of nose, lower and upper lid
  - Mandibular branch (3<sup>rd</sup> division)
    - Lower lip and face, anterior 2/3 of tongue, mandibular gums and teeth

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## Second Component of Trigeminal Nerve

### ■ Motor

- Palpate temporal and masseter muscles
- Ask patient to clench teeth
- Corneal Reflex
  - Touch cornea with a wisp of cotton
  - Patient should blink

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## Abnormalities of Cranial Nerve V

- Trigeminal neuralgia
- Temporal and masseter muscle weakness may be seen in ALS and myasthenia gravis

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## Cranial nerve VII: Facial

### ■ Assessment:

- Examine symmetry of the facial structures at rest and while smiling
- Have patient frown, close both eyes tightly, and resist examiner opening them; smile, puff out cheeks, raise eyebrows and show upper and lower teeth
- 2 Components
  - Motor: Muscles of scalp, face, auricula
  - Sensory: Taste on anterior 2/3 of tongue, sensation of ear canal and behind ear

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## Abnormality of Cranial Nerve VII

- Bell's Palsy
- 1/3 of cases of Bell's Palsy has been linked to Lyme disease
- Now considered standard of care to check a Lyme titer in any individual with Bell's

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## Cranial nerve VIII: Acoustic

### ■ Assessment: Patient exhibits auditory acuity to whispered voice at 2 feet

- Weber: No lateralization: Using a 512 tuning fork
- Rinne: AC > BC
- 2 Components:
  - Cochlear portion: Hearing
  - Vestibular portion: Sensory endings to semicircular canal

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## Abnormalities of Cranial Nerve VIII

- Acoustic neuroma: benign tumor arising in part from CN VIII
- Conductive hearing loss:
  - Weber: lateralizes to the affected ear
  - Rinne: BC > AC
- Sensorineural hearing loss:
  - Weber: Lateralizes to the unaffected ear
  - Rinne: AC > BC

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## Vestibular Portion of CN VIII

- Vestibular function:
  - Can be assessed using the head impulse test
  - Have patient focus on a distant object; Head is then turned rapidly to about 15 degrees from side to side
  - Eyes should remain fixed on the distant target even as the clinician moves the patients head
  - Failure to remain focused on distant target may be indicative of a vestibular lesion

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## Cranial nerve IX and X: Glossopharyngeal and Vagus

- These 2 cranial nerves are often evaluated together
- Cranial nerve IX:
  - Gag reflex: assess to see if it is intact
  - This nerve also supplies the taste buds in the posterior 1/3 tongue, however, this is not testable in clinical practice

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## Cranial nerve

- X- Vagus
  - Vagus nerve should be assessed by asking the patient to say ah; the uvula and soft palate should rise symmetrically and centrally
    - In a patient with a unilateral palatal palsy, the palate deviates to the intact side
    - The patient with a vagal lesion may also have hoarseness of the voice
  - This nerve also governs the autonomic fibers to esophagus, stomach, small intestine, heart, trachea
  - Sensation from ear, viscera

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## Cranial nerves

- XI- Spinal accessory
  - Motor control of sternocleidomastoid and trapezius
  - To assess the sternocleidomastoid, assess the bulk of the muscle and then have the patient rotate the head against resistance
  - Trapezius: observe the position of the shoulders and then test elevation with and without resistance

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## Cranial nerves

- XII- Hypoglossal
  - Motor control of tongue
  - First inspect the tongue as it lies on the floor of the mouth
    - Tongue should be of normal size; without excessive bulk or wasting
  - Ask patient to protrude tongue
    - Any deviation?
      - Deviates to the paralyzed side in patients with a unilateral hypoglossal paresis and slightly to the paralyzed side in some patients with hemiplegia
  - Move tongue side to side

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## Motor Examination

- Gait
- Heel to Toe Ambulation
- Strength
- Pronator Drift

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### Motor Examination

- Arm movement
- Gait: Gait should be smooth and coordinated
  - Arms swing at sides without instability or incoordination
  - No fasciculations, tremors or muscle atrophy
  - Fasciculations: erratic, unpredictable movements

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### Abnormalities of Gait

- Midline cerebellar syndromes:
  - Patient has truncal instability
  - Uses a wide-based gait
- Parkinson's Disease
  - Stride length decreases
  - More steps needed; causes individual to appear like he/she is shuffling
  - Less arm swinging
- Unilateral cerebellar syndrome
  - Patient deviates to the affected side

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### Motor Examination: Heel-Toe Ambulation

- Heel-Toe ambulation
  - Assess for instability or impaired coordination
    - This is called ataxia
    - Best test for ataxia is the heel-toe ambulation; also called the tandem gait
  - Abnormalities:
    - Parkinson's
    - Hemiplegia
    - Frontal lobe abnormalities
    - Cerebellar abnormalities

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### Strength

- Assess Upper and Lower Extremity Strength
  - Performed by having patient push against your hands with arms/legs etc.
  - Rate: 0-5+ (upper) and 0-5+ (lower)

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### Motor examination

- 0 Absence of movement
- 1+ Flicker
- 2+ Movement on horizontal plane w/ gravity removed
- 3+ Movement against gravity but with no resistance
- 4+ Movement against gravity w/ resistance that cannot be overcome
- 5+ Movement against gravity w/ resistance that can be overcome

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### Pronator Drift

- Have patient stand, feet together, eyes closed, arms extended anteriorly and palms upward
- Monitor for a slow fall and concurrent pronation of one of the arms/hands
- Positive pronator drift: lesion of the spinal tract

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## Reflexes

- Deep Tendon Reflexes
  - Biceps
  - Triceps
  - Brachioradialis
  - Patellar
  - Ankle

Rate: 0 – 4+: 0-absent, 4+ hyperreflexia: Reflexes should be equal bilaterally

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## Reflexes Continued

- Plantar response:
  - Using opposite end of the reflex hammer, run the handle along the lateral aspect of the foot moving anteriorly
  - + Plantar response (Babinski) is indicated when the 1<sup>st</sup> toe dorsiflexes and the remaining toes fan
    - Indicates a CNS lesion or CNS disease

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## Sensory Neuro Examination

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## Sensory Neuro Screening Exam

- Assessment: assess for sensation to light touch, pain, vibratory and position sense
  - Light touch and pain: assess all dermatomes using cotton swab and pin
    - May be absent with a nerve root injury
    - May also be absent in individuals with diabetic neuropathy or peripheral neuropathy

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## Sensory Continued

- Vibratory: Assess most distal bony prominence of each extremity using a 128 Hz tuning fork (patient should have eyes closed)
  - Absent in neuropathy (especially with diabetes) as this is often the first sensation lost
  - Estimated that neuropathy (to some degree) may be present in up to 40 - 75% of patients with diabetes at the time of initial diagnosis

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## Sensory Continued

- Position
  - Assess great toe and index finger of each hand and foot
  - May be absent with a nerve root injury

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### Screening Neuro Exam: Equilibrium and Coordination

- Rapid Alternating Movements
  - Assess upper and lower extremities with rapid alternating movements
  - Abnormal movements: cerebellar disease
  
- Can also check this by having patient run heel down shin to other heel

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### Equilibrium and Coordination

- Romberg
  - Have patient stand, feet together, eyes closed, and with arms at sides
  - Monitor for swaying
  
- + Romberg: suggests cerebellar disease

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### Concussions and Traumatic Brain Injuries

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### Millions of Young Athletes

- Millions of young athletes are involved in a variety of activities
- Thousands of head injuries occur annually



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### Concussion Statistics

- Estimates of sports-related mild traumatic brain injury (mTBI) range from 1.6–3.8 million affected individuals annually in the United States, many of whom do not obtain immediate medical attention.
- Variability in care provider experience and training, coupled with an explosion of published reports related to sports concussion and mTBI, has led to some uncertainty and inconsistency in the management of these injuries.

[https://www.aan.com/uploadedFiles/Website\\_Library\\_Assets/Documents/3Practice\\_Management/5Patient\\_Resources/1For\\_Your\\_Patient/6\\_Sports\\_Concussion\\_Toolkit/slides.pdf](https://www.aan.com/uploadedFiles/Website_Library_Assets/Documents/3Practice_Management/5Patient_Resources/1For_Your_Patient/6_Sports_Concussion_Toolkit/slides.pdf)  
 Accessed 02-01-2014

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### What Is A Concussion?

- A concussion is a disturbance in brain function caused by a direct or indirect force to the head
- Results in a variety of non-specific signs and / or symptoms and most often does not involve loss of consciousness
- Should be suspected in the presence of **any one or more** of the following:
  - Symptoms (e.g., headache), or
  - Physical signs (e.g., unsteadiness), or
  - Impaired brain function (e.g. confusion) or
  - Abnormal behavior (e.g., change in personality)

<http://bjsm.bmj.com/content/47/3/259.full.pdf> accessed 05-18-2013

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### No Universal Definition of Concussion

- Complex pathophysiological process affecting the brain
  - Result of an acceleration/deceleration or torque/twisting injury of the brain
  - Often referred to as the neurometabolic cascade of concussion
    - Characterized by microscopic axonal dysfunction
    - Decreased cerebral blood flow
- It is a functional injury, not a structural one
- Rarely are abnormalities detected on standardized imaging

<http://www.cdc.gov/concussion/HeadsUp/clinicians/index.html> accessed 02-08-2014

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### Statistics


- 65% of all concussions occur in children between 5 and 18 years of age
- Why?
  - Child’s brain development is not complete and tissue does not recover as well
  - More susceptible to neurochemical and metabolic changes
  - Axons are not as myelinated
  - Musculature is not as strong (cervical and shoulder regions)

<http://www.cdc.gov/concussion/HeadsUp/clinicians/index.html> accessed 08-18-2017

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### Sports Associated with Most Concussions

- Football
- Rugby
- Hockey
- Soccer



<http://www.aan.com/globals/axon/assets/10722.p>

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### Symptoms of Concussion:

- Divided into four groups:
  - Somatic
  - Cognitive
  - Affective
  - Sleep

<http://www.cdc.gov/concussion/HeadsUp/clinicians/index.html> accessed 02-01-2014

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### Symptoms of Concussion:

- Divided into four groups:
  - Somatic:
    - Headache
    - Dizziness
    - Nausea
    - Vomiting
    - Visual disturbances
    - Phonophobia and photophobia

<http://www.cdc.gov/concussion/HeadsUp/clinicians/index.html> accessed 02-01-2014

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### Symptoms of Concussion:

- Divided into four groups:
  - Cognitive:
    - Confusion
    - Antegrade and retrograde amnesia
    - LOC
    - Disorientation
    - Decreased ability to focus
    - Decreased responsiveness
    - Difficulty with speech and word finding

<http://www.cdc.gov/concussion/HeadsUp/clinicians/index.html> accessed 02-01-2014

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### Symptoms of Concussion:

- Divided into four groups:
  - Affective:
    - Irritability
    - Anxiety
    - Depression
    - Sadness
    - Emotional lability

<http://www.cdc.gov/concussion/HeadsUp/clinicians/index.html> accessed 02-01-2014

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### Symptoms of Concussion:

- Divided into four groups:
  - Sleep:
    - Increased fatigue
    - Decreased ability to fall asleep
    - Difficulty awakening in am

<http://www.cdc.gov/concussion/HeadsUp/clinicians/index.html> accessed 02-01-2014

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### Concussions

- Confusion and amnesia will often occur immediately after event
  - Often accompanied by headache, dizziness, nausea and/or vomiting
  - Initial dizziness and vestibular symptoms are predictors of protracted symptoms
- Symptoms following a concussion may last up to 3 months or longer
  - Even when symptoms are gone, microscopic changes/damage is still occurring
- Concussions are more likely to occur within 10 days of a previous concussion

<http://emedicine.medscape.com/article/92095-followup#e6> accessed 08-18-2017


Wright, 2018 87

### Good News: With Most Children...

# Symptoms resolve within 3 weeks of injury

<http://pediatrics.aappublications.org/content/early/2013/10/23/peds.2013-2867.full.pdf+html>  
Accessed 02-01-2014

Wright, 2018 88



## Concussion Guidelines

<http://www.aan.com/globals/axon/assets/10722.pdf> access 05-18-2017

Wright, 2018 89

### On Field Emergency...

- Takes 20-30 minutes for subdural hematoma symptoms to often appear
- 911 activation for:
  - Cervical pain/point tenderness/numbness extremities
  - Focal neurologic abnormality
  - Worsening neurologic status

<http://www.cdc.gov/concussion/HeadsUp/clinicians/index.html> accessed 02-01-2014

Wright, 2018 90

## Biggest Take-Away:

**\*\*No Same Day  
Return to Play\*\***

<http://www.cdc.gov/concussion/HeadsUp/clinicians/index.html> accessed 02-01-2014

Wright, 2018

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## Slogan:

**“If In Doubt, Sit It Out”**

<http://www.cdc.gov/concussion/HeadsUp/clinicians/index.html> accessed 02-01-2014

Wright, 2018

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## When Performing Your Evaluation

- You want to hone in on the four different groups of symptoms
- Document symptoms and severity
- Perform a comprehensive neurological and cervical examination:
  - A/A/O
  - Eyes
  - CN's
  - Gait/Motor
  - Memory
  - Balance – heel/toe/tandem walking
  - Reflexes
  - Strength
  - Sensory
  - MS – cervical evaluation
- Will become the basis for future comparison

Wright, 2018

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## Clinical Evaluation

- Focus your attention on following:
  - Cognitive functioning
  - Note any deteriorating neurologic function
  - Focal neurologic abnormalities
  - Abnormal cervical testing

<http://www.cdc.gov/concussion/HeadsUp/clinicians/index.html> accessed 02-01-2014

Wright, 2018

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**Number of  
Clinical  
Assessment Tools  
Exist**

Wright, 2018

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## ACE Tool

### **ACUTE CONCUSSION EVALUATION (ACE) PHYSICIAN/CLINICIAN OFFICE VERSION**

Gerard Gioia, PhD<sup>1</sup> & Micky Collins, PhD<sup>2</sup>

<sup>1</sup>Children's National Medical Center  
<sup>2</sup>University of Pittsburgh Medical Center

<http://www.cdc.gov/concussion/HeadsUp/pdf/ACE-a.pdf> accessed 02-01-2014

Wright, 2018

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### Part One: ACE

- Injury Characteristics

**A. Injury Characteristics** Date/Time of Injury \_\_\_\_\_ Reporter: \_\_\_ Patient \_\_\_ Parent \_\_\_ Spouse \_\_\_ Other \_\_\_\_\_

1. Injury Description \_\_\_\_\_

1a. Is there evidence of a forcible blow to the head (direct or indirect)? \_\_\_ Yes \_\_\_ No \_\_\_ Unknown  
 1b. Is there evidence of intracranial injury or skull fracture? \_\_\_ Yes \_\_\_ No \_\_\_ Unknown

1c. Location of Impact: \_\_\_ Frontal \_\_\_ Lt Temporal \_\_\_ Rt Temporal \_\_\_ Lt Parietal \_\_\_ Rt Parietal \_\_\_ Occipital \_\_\_ Neck \_\_\_ Indirect Force

2. Cause: \_\_\_ MVC \_\_\_ Pedestrian-MVC \_\_\_ Fall \_\_\_ Assault \_\_\_ Sports (specify) \_\_\_\_\_ Other \_\_\_\_\_

3. Amnesia Before (Retrograde) Are there any events just BEFORE the injury that you/ person has no memory of (even brief)? \_\_\_ Yes \_\_\_ No Duration \_\_\_\_\_

4. Amnesia After (Anterograde) Are there any events just AFTER the injury that you/ person has no memory of (even brief)? \_\_\_ Yes \_\_\_ No Duration \_\_\_\_\_

5. Loss of Consciousness: Did you/ person lose consciousness? \_\_\_ Yes \_\_\_ No Duration \_\_\_\_\_

6. EARLY SIGNS: \_\_\_ Appears dazed or stunned \_\_\_ Is confused about events \_\_\_ Answers questions slowly \_\_\_ Repeats Questions \_\_\_ Forgetful (recent info)

7. Seizures: Were seizures observed? No \_\_\_ Yes \_\_\_ Detail \_\_\_\_\_

<http://www.cdc.gov/concussion/HeadsUp/pdf/ACE-a.pdf> accessed 02-01-2014  
 Wright, 2018 97

### Please note....

- Loss of consciousness occurs in < 10% of all concussions
- It is not the only marker of severity but...when present...often suggests more severe injury

<http://www.cdc.gov/concussion/HeadsUp/pdf/ACE-a.pdf> accessed 02-01-2014  
 Wright, 2018 98

### Part Two: ACE

- Symptom Check List

**B. Symptom Check List:** Since the injury, has the person experienced any of these symptoms any more than usual today or in the past day? Indicate presence of each symptom (0=No, 1=Yes).  
Levin & Collins, 1989 JHTP

PHYSICAL (10)		COGNITIVE (4)		SLEEP (4)	
Headache	0 1	Feeling mentally foggy	0 1	Drowsiness	0 1
Nausea	0 1	Feeling slowed down	0 1	Sleeping less than usual	0 1 N/A
Vomiting	0 1	Difficulty concentrating	0 1	Sleeping more than usual	0 1 N/A
Balance problems	0 1	Difficulty remembering	0 1	Trouble falling asleep	0 1 N/A
Dizziness	0 1	<b>COGNITIVE Total (0-4)</b>		<b>SLEEP Total (0-4)</b>	
Visual problems	0 1	<b>EMOTIONAL (4)</b>		Exertion: Do these symptoms <u>worsen</u> with:	
Fatigue	0 1	Irritability	0 1	Physical Activity ___ Yes ___ No ___ N/A	
Sensitivity to light	0 1	Sadness	0 1	Cognitive Activity ___ Yes ___ No ___ N/A	
Sensitivity to noise	0 1	More emotional	0 1	Overall Rating: How <u>different</u> is the person acting compared to his/her usual self? (circle)	
Numbness/Tingling	0 1	Nervousness	0 1	Normal 0 1 2 3 4 5 6 Vary Different	
<b>PHYSICAL Total (0-10)</b>		<b>EMOTIONAL Total (0-4)</b>			
(Add Physical, Cognitive, Emotion, Sleep totals)					
<b>Total Symptom Score (0-22)</b>					

<http://www.cdc.gov/concussion/HeadsUp/pdf/ACE-a.pdf> accessed 02-01-2014  
 Wright, 2018 99

### Part Three: ACE

- Risk Factors for Protracted Recovery

**C. Risk Factors for Protracted Recovery (check all that apply)**

Concussion History? Y ___ N ___	Headache History? Y ___ N ___	Developmental History	Psychiatric History
Previous # 1 2 3 4 5 6+	Prior treatment for headache	Learning disabilities	Anxiety
Longest symptom duration: Days ___ Weeks ___ Months ___ Years ___	History of migraine headache: ___ Personal ___ Family	Attention-Deficit/Hyperactivity Disorder	Depression
If multiple concussions, less force caused reinjury? Yes ___ No ___		Other developmental disorder	Sleep disorder
Other psychiatric disorder			

List other comorbid medical disorders or medication usage (e.g., hypothyroid, seizures).

Previous history of migraines, headaches, learning disabilities, ADHD, Developmental disorders, psychiatric history  
 – All increase risk of protracted recovery

<http://www.cdc.gov/concussion/HeadsUp/pdf/ACE-a.pdf> accessed 02-01-2014  
 Wright, 2018 100

### Additional Risk Factors For Prolonged Symptomatology

- History of previous concussion
- Early posttraumatic headache
- Fatigue or fogginess
- Early amnesia, altered mental status, disorientation
- Younger age....i.e. peeewee hockey/body checking

<http://www.aan.com/globals/axon/assets/10722.pdf> accessed 02-01-2014  
 Wright, 2018 101

### Part Four - Six: ACE

- Red Flags, Diagnosis and Follow-up Plan

**D. RED FLAGS** for acute emergency management: Refer to the emergency department with sudden onset of any of the following:  
 \* Headaches that worsen \* Looks very drowsy/ can't be awakened \* Can't recognize people or places \* Neck pain  
 \* Seizures \* Repeated vomiting \* Increasing confusion or irritability \* Unusual behavioral change  
 \* Focal neurologic signs \* Slurred speech \* Weakness or numbness in arms/legs \* Change in state of consciousness

**E. Diagnosis (ICD):** \_\_\_ Concussion w/o LOC 850.0 \_\_\_ Concussion w/ LOC 850.1 \_\_\_ Concussion (Unspecified) 850.9 \_\_\_ Other (854) \_\_\_  
 No diagnosis

**F. Follow-Up Action Plan** Complete ACE Care Plan and provide copy to patient/family.  
 No Follow-Up Needed  
 Physician/Clinician Office Monitoring: Date of next follow-up: \_\_\_\_\_  
 Referral:  
 \_\_\_ Neuropsychological Testing  
 \_\_\_ Physician: Neurosurgery \_\_\_ Neurology \_\_\_ Sports Medicine \_\_\_ Physiatrist \_\_\_ Psychiatrist \_\_\_ Other \_\_\_\_\_  
 \_\_\_ Emergency Department

ACE Completed by: \_\_\_\_\_ © Copyright G. Gioia & M. Collins, 2006  
This form is part of the "Heads Up: Brain Injury in Your Practice" tool kit developed by the Centers for Disease Control and Prevention (CDC).

<http://www.cdc.gov/concussion/HeadsUp/pdf/ACE-a.pdf> accessed 02-01-2014  
 Wright, 2018 102

## Rules for Admission

- Signs of intracranial injury
- Fluctuating or deteriorating neurologic status
- If better observation is needed than what can be provided at home

<http://www.cdc.gov/concussion/HeadsUp/clinicians/index.html> accessed 02-01-2014

Wright, 2018 103

## Other Concussion Assessment Tools

- Post-Concussion Symptom Scale/Graded Symptom Checklist (GSC)
- Standardized Assessment of Concussion (SAC)
- SCAT Testing
- ImPACT Testing (prior to season and after injury)

Wright, 2018 104

## Concussion

### Graded Symptom Scale Checklist

*Modified from various published symptom checklists<sup>1-36</sup>*

Evaluate all signs and symptoms, ranking each on a scale of 0-6. Establish baseline score prior to the start of the athletic season. After a concussive injury, re-assess the athlete for each symptom. Add columns and compare to baseline score. Only consider return to activity if scores are comparable to baseline score. Continue testing every 2-3 days if symptoms do not resolve. Use with SAC and/or BESS to determine appropriate time for return to play.

	None		Moderate		Severe		
Score According to Severity	0	1	2	3	4	5	6

Administer prior to season; administer immediately after injury.  
Return to play when symptoms are consistent with baseline score

[http://knowconcussion.org/wp-content/uploads/2011/06/graded\\_symptom\\_checklist.pdf](http://knowconcussion.org/wp-content/uploads/2011/06/graded_symptom_checklist.pdf)  
accessed 05-19-2013

105 Wright, 2018

## New Laboratory Test

- Banyan BTI (Brain Trauma Indicator)
- New test measures levels of two protein biomarkers -- ubiquitin carboxy-terminal hydrolase-L1 and glial fibrillary acidic protein
- These are released from the brain into blood within 12 hours of head injury
- Banyan BTI accurately predicted the presence of intracranial lesions on CT scan in patients who had them 97.5 percent of the time; the test also predicted the absence of such lesions in those who didn't have them 99.6 percent of the time.

<https://www.aafp.org/news/health-of-the-public/20180223concussiontest.html>

Wright, 2018 106

## Return to Play

### SCAT3™

Sport Concussion Assessment Tool – 3rd Edition  
For use by medical professionals only

This tool is not used alone but provides guidance for return to play  
Should NOT be returned to play on day of concussion  
More of a side line assessment tool

<http://bjsm.bmj.com/content/47/5/259.full.pdf> accessed 05-18-2013

Wright, 2018 107

## Clinicians

- Need to have close follow-up and monitoring
- May be appropriate to reevaluate in 48 hours – 1 week.
- Should continue to follow-up regularly until symptoms have resolved
- In general, 24 – 48 hours out of activity is considered norm with a gradual return to play

Wright, 2018 108

### Return to Play

- An athlete with a suspected concussion should:
  - Be immediately removed from play
  - Not be allowed to return to play until evaluated by a Licensed Healthcare Provider who deems concussion has resolved
  - Two schools of thought regarding return to play

<http://www.cdc.gov/concussion/HeadsUp/clinicians/index.html> accessed 02-01-2014

Wright, 2018

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### School 1: When You Allow Athlete to Start the Return to Play Protocol....

- Recommendation is a 5 step progression:
  - May begin step 1 when athlete has been 24 hours without symptoms and then advance when 24 hours into step and without symptoms
  - Step 1:
    - Light aerobic activity
    - 5 – 10 minutes
    - Goal is to increase heart rate only
    - NO WEIGHT LIFTING
    - i.e. simple stationary bike

<http://www.cdc.gov/concussion/HeadsUp/clinicians/index.html> accessed 02-01-2014

Wright, 2018

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### Step 2 and 3

- Step 2: Moderate exertion
  - Goal: limited body/head movement
  - Activities: light jogging, stationary bike, walking
- Step 3: Non-contact exercise
  - Goal: more intense, non-contact exercise
  - Time: close to typical routines
  - Activities: running, weight lifting

<http://www.cdc.gov/concussion/HeadsUp/clinicians/index.html> accessed 02-01-2014

Wright, 2018

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### Step 4 and 5

- Step 4: Practice
  - Goal: reintegrate into full practice, including contact
- Step 5: Return to Full Play

<http://www.cdc.gov/concussion/HeadsUp/clinicians/index.html> accessed 02-01-2014

Wright, 2018

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### Important

- If symptoms recur or increase in any of these steps, you must:
  - Stop and not restart until asymptomatic for 24 hours
  - Restart at previous level

<http://www.cdc.gov/concussion/HeadsUp/clinicians/index.html> accessed 02-01-2014

Wright, 2018

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### School 2

- Study of 2400 children
- Ages 5 – 18 with concussions
- Return to physical activity within 7 days was associated with a significant reduction in persistent post-concussive symptoms when compared with athletes who were put on full physical rest until symptom free (25% vs. 44% with symptoms at day 28)

Wright, 2018

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### What About Returning To School

- Athlete should be advised to rest cognitively
  - Avoid/minimize cognitive activities that increase symptoms
  - May need time off from school
  - Reduced work load
  - No significant classroom or standardized testing until child is recovered
  - NO evidence that absolute rest improves outcomes

<http://www.cdc.gov/concussion/HeadsUp/pdf/ACE-a.pdf> accessed 02-01-2014  
Wright, 2018

### Guidelines: When to Stay Home

- If a student/athlete experiences symptoms enough to affect his or her ability to concentrate or tolerate stimulation for even up to 30 minutes, the student should likely remain at home.
- The student may consider light mental activities, such as watching TV, light reading, and interaction with the family, until they provoke symptoms. Computer use, texting, and video games should remain at a minimum.

<http://pediatrics.aappublications.org/content/early/2013/10/23/peds.2013-2867.full.pdf+html> accessed 02-01-2014

### Return to School

- When the student/athlete is able to tolerate symptoms comfortably for up to 30 to 45 minutes, the parent may consider returning him or her back to learning, either through home tutoring or in-school instruction with programming adjustment as needed

<http://pediatrics.aappublications.org/content/early/2013/10/23/peds.2013-2867.full.pdf+html> accessed 02-01-2014

### AAP Recommendations for

CIRCLE ONE FOR EACH LISTED	NONE	MILD	MODERATE	SEVERE			
Headaches	0	1	2	3	4	5	6
Nausea or lightheaded	0	1	2	3	4	5	6
Blurred vision	0	1	2	3	4	5	6
Nausea or vomiting	0	1	2	3	4	5	6
Dizziness	0	1	2	3	4	5	6
Head or neck pain	0	1	2	3	4	5	6
Loss of balance	0	1	2	3	4	5	6
Loss of consciousness	0	1	2	3	4	5	6
Double vision	0	1	2	3	4	5	6
Head or neck pain	0	1	2	3	4	5	6
Loss of consciousness	0	1	2	3	4	5	6
Double vision	0	1	2	3	4	5	6
Head or neck pain	0	1	2	3	4	5	6
Loss of consciousness	0	1	2	3	4	5	6
Double vision	0	1	2	3	4	5	6
Head or neck pain	0	1	2	3	4	5	6
Loss of consciousness	0	1	2	3	4	5	6
Double vision	0	1	2	3	4	5	6
Head or neck pain	0	1	2	3	4	5	6
Loss of consciousness	0	1	2	3	4	5	6
Double vision	0	1	2	3	4	5	6
Head or neck pain	0	1	2	3	4	5	6
Loss of consciousness	0	1	2	3	4	5	6
Double vision	0	1	2	3	4	5	6
Head or neck pain	0	1	2	3	4	5	6
Loss of consciousness	0	1	2	3	4	5	6
Double vision	0	1	2	3	4	5	6

FIGURE 1 Example postconcussion symptom score checklist (recommended for seventh grade and up).<sup>8</sup> Use of the postconcussion symptom scale: the student should complete the form, on his or her own, by circling a subjective value for each symptom. This form can be used with each encounter to track progress toward symptom resolution. Many students may have some of these reported symptoms at a baseline, such as concentration difficulties in the patient with attention-deficit disorder or sadness in a student with underlying depression. This must be taken into consideration when interpreting the score. Students do not need a total score of 0 to return to school if they had symptoms before their

<http://pediatrics.aappublications.org/content/early/2013/10/23/peds.2013-2867.full.pdf+html> Accessed 02-01-2014

### CT Scan Recommendations

- CT scan should not be used routinely
- Consider in the following individuals:
  - Loss of consciousness
  - Posttraumatic amnesia
  - Persistently altered mental status (GCS < 15)
  - Focal neurologic deficit
  - Evidence of skull fracture on X-ray
  - Clinical deterioration

### Glasgow Coma Scale

- Persons with GCS scores of 3 to 8 are classified with a severe TBI, those with scores of 9 to 12 are classified with a moderate TBI, and those with scores of 13 to 15 are classified with a mild TBI

### What Other Additional Tests May Be Beneficial?

- MRI:
  - Prolonged neurologic abnormalities
- Neuropsychological Testing
  - Will focus on issues of executive function

<http://www.cdc.gov/concussion/HeadsUp/pdf/ACE-a.pdf> accessed 02-01-2014  
Wright, 2018

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### Medication

- There is no evidence that medication improves recovery
- Acutely:
  - Acetaminophen has been shown to be effective in reducing symptoms and discomfort
  - Topiramate may be used for chronic daily headaches
  - Ondansetron for 1 – 2 days is appropriate for nausea
  - Melatonin for sleep; trazodone if no improvement

<http://emedicine.medscape.com/article/92095-followup#e6> accessed 08-18-2017

Wright, 2018

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### Additional Treatments

- Dizziness: Some evidence that physical therapy can be helpful in reducing dizziness
- Consider antidepressants if depression persists and individual meets diagnostic criteria

Wright, 2018

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### When To Refer to Specialty

- Symptoms persist for 10-14 days
- Symptoms are worsening
- Person has had multiple concussions or has risk factors for prolonged recovery

<http://www.cdc.gov/concussion/HeadsUp/pdf/ACE-a.pdf> accessed 02-01-2014

Wright, 2018

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### Post-Concussive Syndrome

- Definition: symptoms which persist for several weeks – months from injury
- Occurs in 5-8% of individuals, most with history of multiple concussions
- Needs referral to concussion specialist
- Consider initiating a 504 plan for this individual

<http://www.cdc.gov/concussion/HeadsUp/clinicians/index.html> accessed 02-01-2014

Wright, 2018

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### Recurrent Concussions

- Individuals with repeated/recurrent concussions should be provided with counseling regarding retirement from play
- Chronic Traumatic Encephalopathy (CTE) remains significant concern
  - Progressive degenerative disease
  - Degenerative changes, which can begin months to decades after the patient's last brain trauma, include atrophy of the cerebral hemispheres, medial temporal lobe, thalamus, mammillary bodies, and brainstem.

<http://emedicine.medscape.com/article/92095-clinical#b3> accessed 08-19-2017

Wright, 2018

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### CTE and Famous Athletes

- Aaron Hernandez (age 27): Neuropathologists identified brain atrophy (shrinking of the brain) and "large perforations" in addition to Stage 3 CTE



Wright, 2018

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### Research

- No evidence that one helmet is better than another
- Risk factors linked to chronic neurobehavioral impairment in professional athletes include prior concussion, longer exposure to the sport, and having the ApoE4 gene

<http://emedicine.medscape.com/article/92095-followup#6> accessed 08-18-2017

Wright, 2018

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### Great Resources

- <http://www.cdc.gov/concussion/HeadsUp/clinicians/index.html>
- <http://pediatrics.aappublications.org/content/early/2013/10/23/peds.2013-2867.full.pdf+html>
- <https://www.aan.com/Guidelines/home/GetGuidelineContent/583>

Wright, 2018

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## Headaches

Wright, 2018

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### JJ

- 17 year-old female with a 5-7 year history of headaches
  - Headaches occur 1 –2 x/week; last 24 hours
  - Pain always starts in "my sinus"; (Frontal-either side)
  - Occurs whenever the "weather changes"
  - 8 on 1-10 scale, pulsating; associated with nausea, photophobia; relieved by sleep and Advil 800 mg x 2 doses
  - Presents for a "sinus evaluation"

Wright, 2018

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### Physical Examination


- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>■ VSS</li> <li>■ General Appearance:           <ul style="list-style-type: none"> <li>□ Affect: variable, appropriate</li> <li>□ Dress/Grooming: normal</li> <li>□ Posture, Facial expressions, manner, attention span: normal</li> <li>□ Speech: spontaneous, smooth, articulate</li> <li>□ Judgment: intact</li> <li>□ MMSE: 29</li> </ul> </li> <li>■ Skin</li> <li>■ HEENT: normal</li> <li>■ Lungs: clear</li> <li>■ Heart: S1, S2: RRR</li> <li>■ PV: normal</li> </ul> | <ul style="list-style-type: none"> <li>■ Neuro:           <ul style="list-style-type: none"> <li>□ CN's intact</li> <li>□ Gait smooth and coordinated</li> <li>□ Heel/toe: intact</li> <li>□ Strength: 5+/5+</li> <li>□ Pronator drift: negative</li> <li>□ Reflexes: 2+ bilaterally and equal</li> <li>□ Negative babinski</li> <li>□ Sensory intact</li> <li>□ Equilibrium/coordination: intact</li> <li>□ Negative romberg</li> </ul> </li> </ul> |
|--|--|

Wright, 2018

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### Migraine Prevalence (American Migraine Study II)

- There are currently 28 million migraine sufferers age 12+ in the United States
  - 21 million females
  - 7 million males
- Migraine prevalence peaks in the 25-55 age range
- One in 4 households has at least 1 migraine sufferer



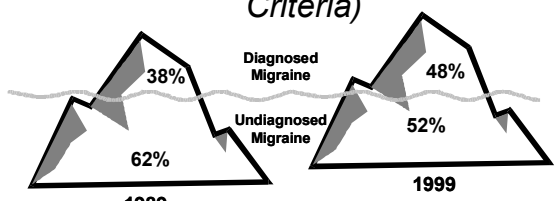
Lipton et al. *Headache*. 2001;41:638-657. Wright, 2018 133

### Prevalence of Migraines

- Women suffer from migraine at a 3:1 ratio over men
- 1 in 6 American women suffer from migraines
- Familial disorder-up to 90% of patients have a family history

Wright, 2018 134

### The Diagnosis of Migraine Has Increased Modestly (Using IHS Criteria)

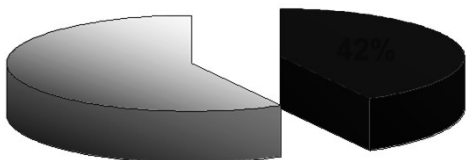


1989: 38% Diagnosed Migraine, 62% Undiagnosed Migraine  
1999: 48% Diagnosed Migraine, 52% Undiagnosed Migraine

**14.6 million migraine sufferers remain undiagnosed**

Lipton et al. *Headache*. 2001;41:638-645. Wright, 2018 135

### Undiagnosed Patients Often Report Receiving a Diagnosis of Sinus Headache

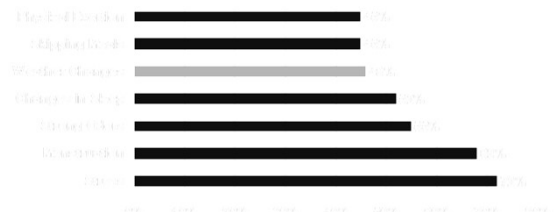


Other/No diagnosis | Diagnosed with Sinus Headache

Adapted from Lipton et al. *Headache*. 2001;41:638-645. Wright, 2018 136

### Migraine Can Be Triggered by Weather

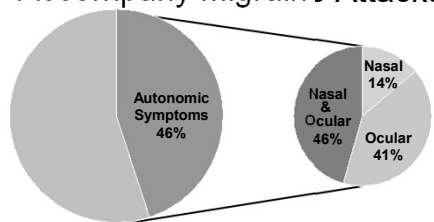
% of Migraine Patients with Triggers (n = 69)



Trigger	% of Patients
Temperature	75%
Humidity	70%
Wind	65%
Barometric Pressure	60%
Lightning	55%
Thunder	50%

Scharff et al. *Headache* 1995; 35:397-403. Wright, 2018 137

### Nasal and Ocular Symptoms Can Accompany Migraine Attacks



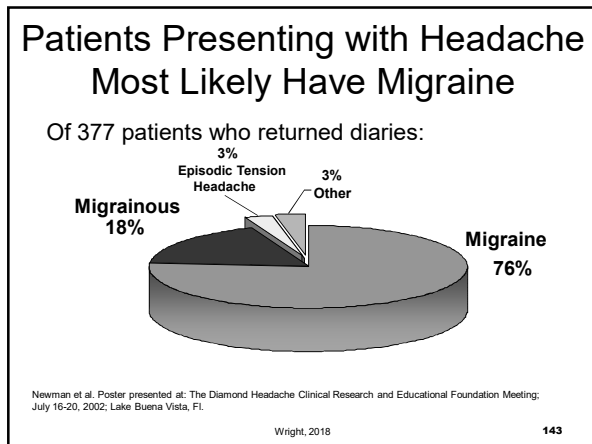
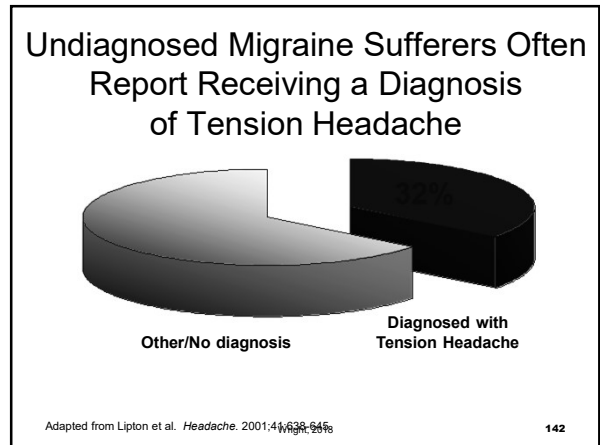
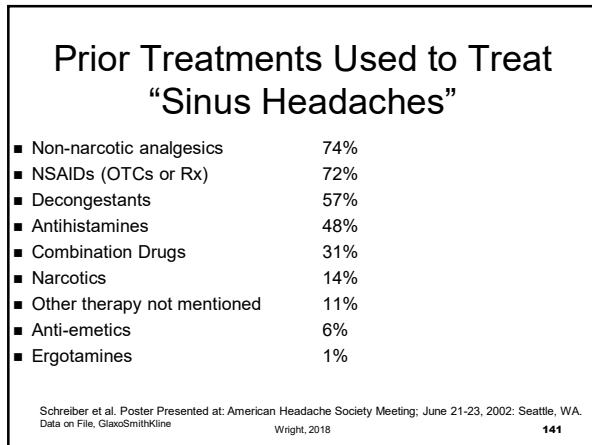
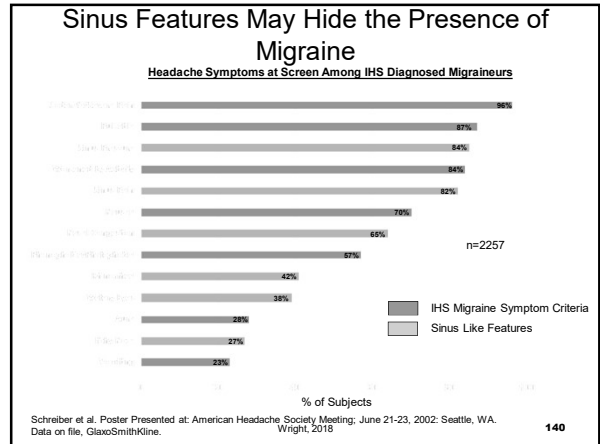
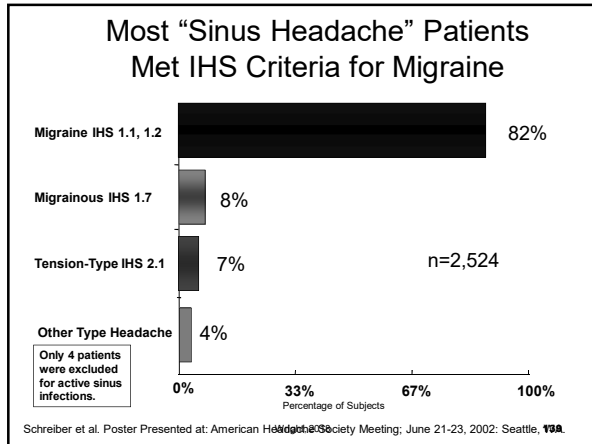
Autonomic Symptoms 46%  
Nasal & Ocular 46%  
Nasal 14%  
Ocular 41%

46% of patients had at least 1 autonomic symptom during migraine attacks

Of these . . .

- 46% had both nasal & ocular symptoms
- 14% had only nasal symptoms
- 41% had only ocular symptoms

Barbanti et al. *Cephalalgia*. 2002;22:256-259. Wright, 2018 138



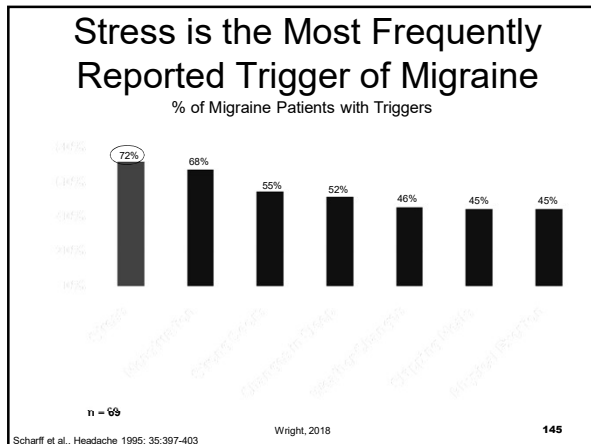
### Is it Really Tension Headache? Take a Closer Look

#### Factors Potentially Confounding Diagnosis

- Triggers
- Location and Quality of Head Pain
- Presence of Neck Pain

Migraine Physician Segmentation Study, July 2001. Data on File. Wright, 2018





### Migraine Pain Can Be Bilateral and Non-Pulsating

- 41% of migraine patients had bilateral pain.<sup>1</sup>
- 50% of the time, pain was non-pulsating.<sup>2</sup>

1. Lipton et al. *Headache*. 2001;41:646-657.  
 2. Pryse-Phillips et al. *Can Med Assoc J*. 1997;156(9):1273-287.

Wright, 2018

146

### Neck Pain Can Occur with Migraine

**Study Objective**

- To document the clinical features of neck pain as a component of migraine

**Study Design**

- Retrospective chart analysis (n=378)
- Patients who met inclusion criteria and agreed to be interviewed (n=144)
- Inclusion criteria:
  - Diagnosis of IHS migraine 1.1 or 1.2
  - Age 18 - 75 years old
  - 1 - 8 migraines per month
  - Absence of:
    - significant trauma history
    - second IHS diagnosis
    - interval neck pain

Kaniecki et al. Poster presented at: 10th IHC, June 29-July 2, 2001; New York, NY.

Wright, 2018

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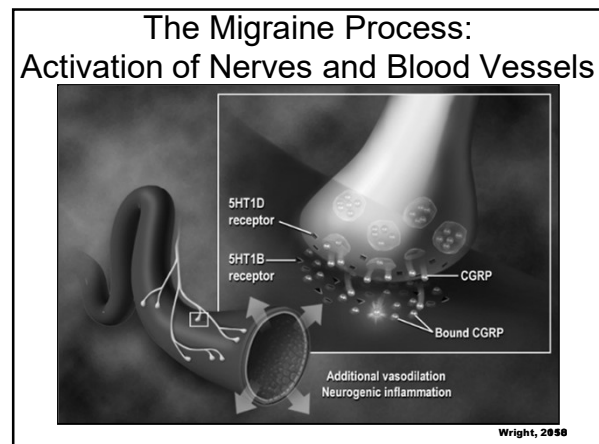
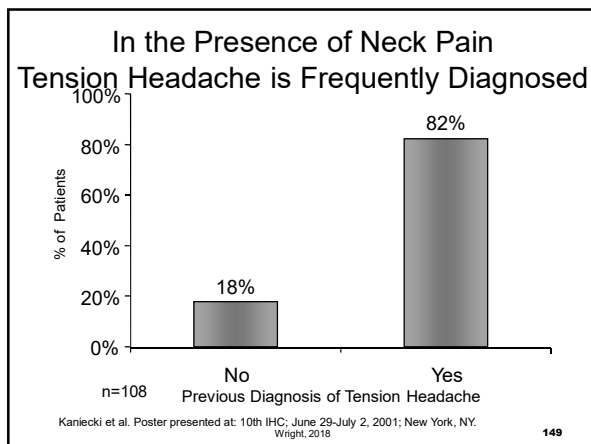
### Migraine Pain Can Be Felt in Peripheral Locations Such as the Neck

- In Kaniecki's study of 144 patients with migraine
  - 75% reported neck pain with their migraine
  - 43% described neck pain as bilateral and 57% as unilateral
  - 69% described the neck pain as "tightness" and 17% as stiffness"

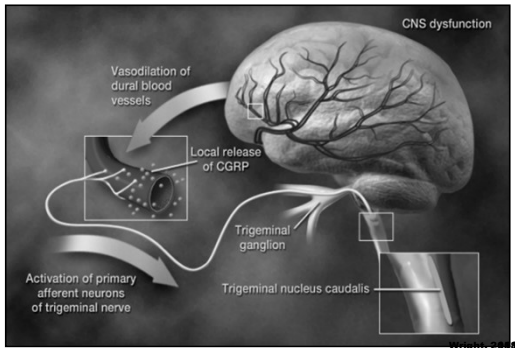
Wright, 2018

Kaniecki et al. Poster presented at: 10th IHC, June 29-July 2, 2001; New York, NY.

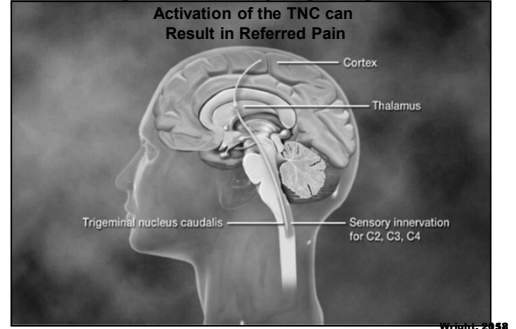
148



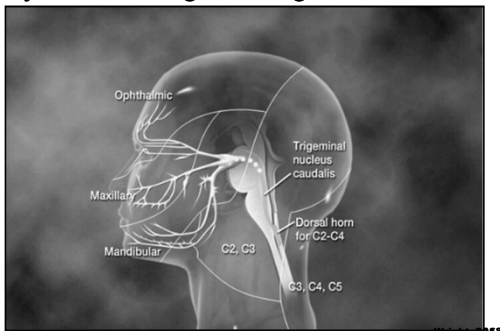
### The Migraine Process: Activation of the Trigeminal Nucleus Caudalis (TNC)



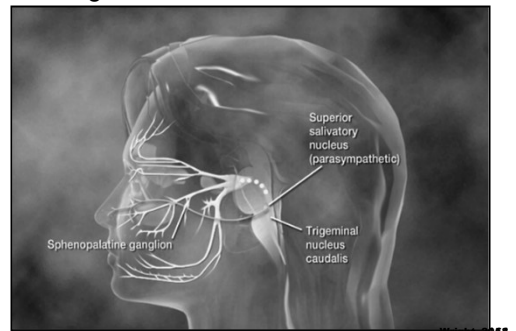
### Trigeminal Nucleus Caudalis (TNC): Processing and Relaying Migraine Pain



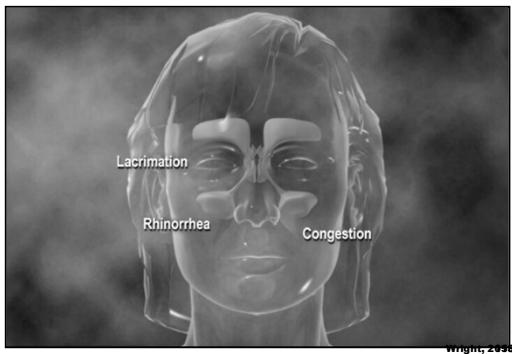
### Activation of the TNC May Result in Referred Pain that Could be Perceived Anywhere along the Trigemino-cervical



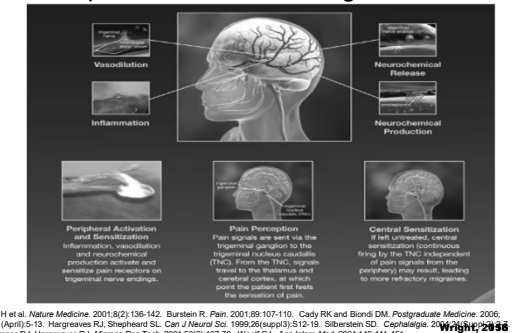
### Activation of the TNC May Result in Reflex Activation of Cranial Parasympathetic Nerves Extending into Sinus Cavities and Tear Ducts



### Cranial Parasympathetic Activation May Explain "Sinus-Like" Symptoms in Migraine



### Pathophysiology of Migraine is No Longer Just Neurovascular: Multiple Mechanisms of Migraine Exist



### Episodic Migraine Without Aura: Diagnostic Criteria

*At Least 5 Attacks Fulfilling the Criteria Below*

<input checked="" type="checkbox"/> Headache attack lasting 4 to 72 hours (untreated or unsuccessfully treated)	AND	<b>Description of Headache</b> <input checked="" type="checkbox"/> Two of the Following: <input type="checkbox"/> Unilateral location <input type="checkbox"/> Pulsating quality <input type="checkbox"/> Moderate or severe intensity (inhibits or prohibits daily activities) <input type="checkbox"/> Aggravated by or causing avoidance of routine physical activity (eg, walking or climbing up stairs)	AND	<b>Associated Symptoms</b> <input checked="" type="checkbox"/> One of the Following: <input type="checkbox"/> Nausea and/or vomiting <input type="checkbox"/> Photophobia and phonophobia
---	-----	---	-----	--

Not attributable to another disorder

Olesen J et al. *Cephalalgia*. 2004;24(suppl 1):1-151. 157

### Episodic Migraine with Aura: Diagnostic Criteria

*At Least 2 Attacks Fulfilling the Criteria Below*

<input checked="" type="checkbox"/> Meets the IHS criteria for migraine without aura	AND	<b>Description of Headache</b> <input checked="" type="checkbox"/> Three of the Following: <input type="checkbox"/> Recurrent one or more fully reversible visual, sensory, and/or speech symptoms (focal neurological symptoms) <input type="checkbox"/> At least 1 aura symptom develops gradually over ≥ 5 minutes, or different symptoms occur in succession over ≥ 5 minutes <input type="checkbox"/> Each aura symptom lasts ≥ 5 minutes and ≤ 60 minutes <input type="checkbox"/> Migraine headache begins during or within 60 minutes of aura
--	-----	--

Not attributable to another disorder

Olesen J et al. *Cephalalgia*. 2004;24(suppl 1):1-151. 158

### Episodic Tension-Type Headache: Diagnostic Criteria

*At Least 10 Episodes Occurring < 1 Day/mo*

<input checked="" type="checkbox"/> Headache lasting 30 minutes to 7 days	AND	<b>Description of Headache</b> <input checked="" type="checkbox"/> Two of the Following: <input type="checkbox"/> Pressing/tightening quality (nonpulsating) <input type="checkbox"/> Mild or moderate intensity (may inhibit, does not prohibit activities) <input type="checkbox"/> Bilateral location <input type="checkbox"/> Not aggravated by physical activity such as walking or climbing stairs	AND	<b>Associated Symptoms</b> <input checked="" type="checkbox"/> Both of the Following: <input type="checkbox"/> No nausea or vomiting (anorexia may occur) <input type="checkbox"/> Either photophobia or phonophobia
---	-----	---	-----	---

Not attributable to another disorder

Olesen J et al. *Cephalalgia*. 2004;24(suppl 1):1-151. 159

### Episodic Cluster Headache: Diagnostic Criteria

*At Least 5 Attacks Fulfilling the Criteria Below*


<input checked="" type="checkbox"/> Frequency of attacks: 1 every other day to 8 per day	AND	<b>Description of Headache</b> <input checked="" type="checkbox"/> All of the Following: <input type="checkbox"/> Severe or very severe <input type="checkbox"/> Unilateral orbital, supraorbital, and/or temporal pain <input type="checkbox"/> Lasts 15 to 180 minutes (untreated)	AND	<b>Associated Symptoms</b> <input checked="" type="checkbox"/> One of the Following Present on the Pain Side: <input type="checkbox"/> Conjunctival injection and/or lacrimation <input type="checkbox"/> Nasal congestion or rhinorrhea <input type="checkbox"/> Eyelid edema <input type="checkbox"/> Forehead and facial sweating <input type="checkbox"/> Miosis or ptosis <input type="checkbox"/> A sense of restlessness or agitation
--	-----	--	-----	---

Not attributable to another disorder

Olesen J et al. *Cephalalgia*. 2004;24(suppl 1):1-151. 160

### Treatments for Migraines Look How Far We Have Come

- BC: trephination
- 1850: bromide
- 1883: ergotamine
- 1897: aspirin
- 1963: methysergide
- 1975: DHE
- 1993: triptans



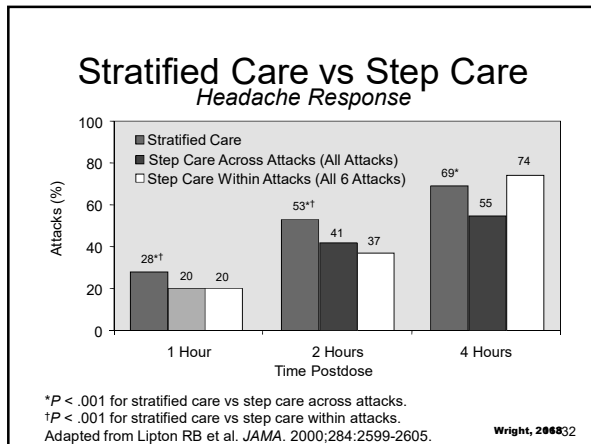
Trephination

Wright, 2008

### Acute Migraine Management Evidence-Based Guidelines

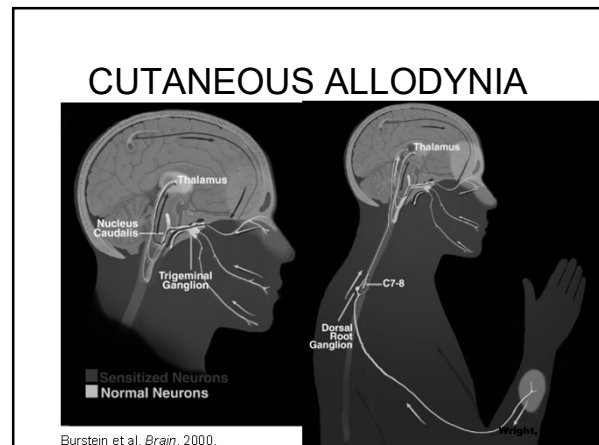
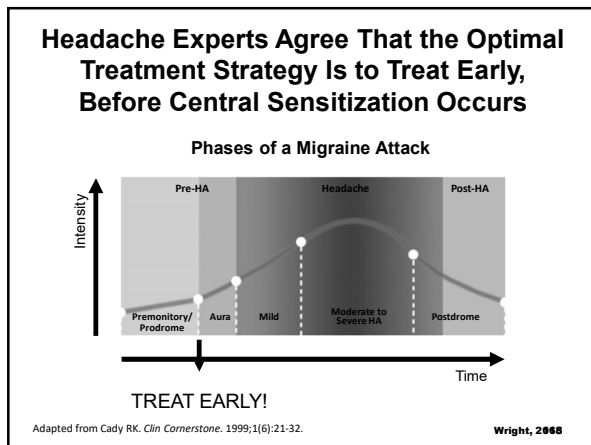
- Adopted by AAFP, ACP-ASIM, AAN
  - **NSAIDs** as first-line therapy
  - **Triptans** (or **dihydroergotamine**) indicated for those who fail to tolerate or respond to NSAIDs
  - **No evidence** to support the use of butalbital compounds in acute migraine
  - **Little evidence** to support the use of isometheptene compounds in migraine
  - Opioids “**reserved** for use when other medications cannot be used”

Snow V, et al. *Ann Intern Med* 2002;137:840-849. Wright, 2008



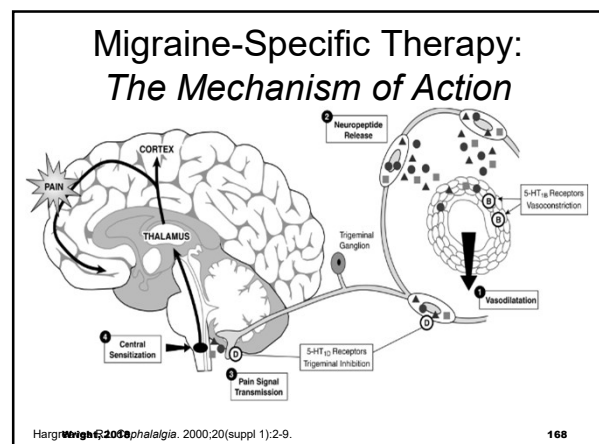
Early Treatment:  
*Abortive Medications*

Wright, 200834



Selective 5-HT<sub>1</sub> agonists (the triptans) have emerged as the gold standard for acute migraine therapy.

Cady R, Dodick DW. *Mayo Clin Proc*. 2002;77:255-261.



### 5 HT 1B/1D Antagonists

- Sumatriptan (Imitrex)
  - SC, Nasal Spray and tablet
- Zolmitriptan (Zomig)
  - Tablet (2.5 and 5.0mg tablets); MLT
- Naratriptan (Amerge)
  - Tablet (1mg and 2.5 mg)
- Frovatriptan (Frova)
  - Tablet (2.5 mg)
- Rizatriptan (Maxalt)
  - Tablet and MLT (5 and 10 mg)
- Almotriptan (Axert)\*\* 12 and up
  - Tablet (6.25mg and 12.5 mg)
- Eletriptan (Relpax)
  - Tablet (20 mg and 40 mg)

Wright, 2018

### Too Much of a Good Thing....

- Use of any product more than 2- 3 times per week will result in rebound headaches
- Medication overuse headache
  - Worsening of head pain caused by frequent and excessive use of immediate relief medications
  - Bilateral, diffuse headache
  - Waxes and wanes
  - Associated with fatigue, n/v, restlessness
  - Will never get better on any medications until rebounding is eliminated

Wright, 2018

## AHS/AAN Migraine Prevention Guidelines

<http://www.headachejournal.org/SpringboardWebApp/userfiles/headache/file/AHS-AAN%20Guidelines.pdf> accessed 12-30-2012

Wright, 2018

### Level A Recommendations: Effective

Drug	Dosage
Divalproex/sodium valpoate	400 – 1000 mg/day
Metoprolol	47.5 – 200 mg/day
Petasites (butterbur)	50-75 mg two times daily
Propranolol	120 – 240 mg/day
Timolol	10 – 15 mg two times daily
Topiramate	25 – 200 mg/day

<http://www.headachejournal.org/SpringboardWebApp/userfiles/headache/file/AHS-AAN%20Guidelines.pdf> accessed 12-30-2012

Wright, 2018

### Level B Recommendations: Probably Effective

Drug	Dosage
Amitriptyline	25 - 150 mg/day
Fenoprofen	200 - 600 mg three times daily
Feverfew	50 mg – 300 mg two times daily
Histamine	1 – 10 ng subcutaneously twice weekly
Ibuprofen	200 mg two times daily
Ketoprofen	50 mg three times daily
Magnesium	600 mg daily
Naproxen/naproxen sodium	550 mg two times daily

<http://www.headachejournal.org/SpringboardWebApp/userfiles/headache/file/AHS-AAN%20Guidelines.pdf> accessed 12-30-2012

Wright, 2018

### Level B Recommendations: Probably Effective

Drug	Dosage
Riboflavin	400 mg daily
Venlafaxine	150mg ER once daily
Atenolol	100 mg daily

<http://www.headachejournal.org/SpringboardWebApp/userfiles/headache/file/AHS-AAN%20Guidelines.pdf> accessed 12-30-2012

Wright, 2018

### Level C Recommendations: Possibly Effective

Drug	Dosage
Candesartan	16mg once daily
Carbamazepine	600 mg daily
Clonidine	0.75 mg daily
Guanfacine	0.5-1.0 mg/day
Lisinopril	10 – 20 mg daily
Nebivolol	5 mg daily
Pindolol	10 daily
Flurbiprofen	200 mg daily

<http://www.headachejournal.org/SpringboardWebApp/userfiles/headache/file/AHS-AAN%20Guidelines.pdf> accessed 12-30-2012 Wright, 2018

### Level C Recommendations: Possibly Effective

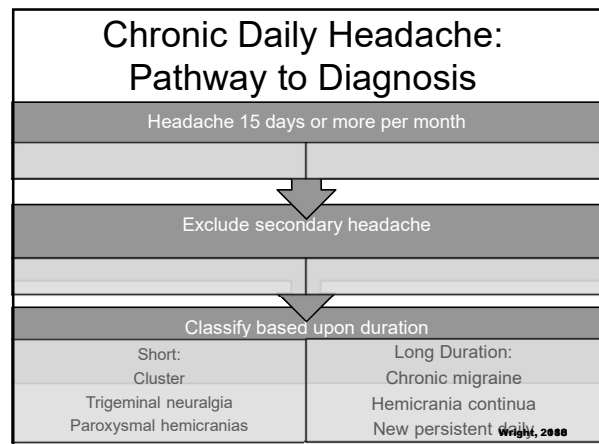
Drug	Dosage
Mefanamic acid	500 mg three times daily
Coenzyme Q10	100 mg three times daily
Cyproheptadine	4 mg daily

<http://www.headachejournal.org/SpringboardWebApp/userfiles/headache/file/AHS-AAN%20Guidelines.pdf> accessed 12-30-2012 Wright, 2018

- ### AHS/AAN Migraine Prevention: Migraines Associated With Menstruation
- Frovatriptan: Level A
    - 2.5 mg two times daily perimenstrually
  - Naratriptan: Level B
    - 1 mg two times daily x 5 days perimenstrually
  - Zolmitriptan: Level B
    - 2.5 mg two times daily perimenstrually
  - Estrogen; Level C
    - 1.5 mg estradiol in gel daily x 7 days perimenstrually
- <http://www.headachejournal.org/SpringboardWebApp/userfiles/headache/file/AHS-AAN%20Guidelines.pdf> accessed 12-30-2012 Wright, 2018

- ### Summary Slide
- Level A
    - Antiepileptic drugs (AEDs): divalproex sodium, sodium valproate, topiramate
    - Beta-Blockers: metoprolol, propranolol, timolol
    - Triptans: frovatriptan for short-term MAMs prevention
  - Level B
    - Antidepressants: amitriptyline, venlafaxine
    - Beta Blockers: atenolol, nadolol
    - Triptans: naratriptan, zolmitriptan for short term MAMs prevention
- <http://www.headachejournal.org/SpringboardWebApp/userfiles/headache/file/AHS-AAN%20Guidelines.pdf> accessed 12-30-2012 Wright, 2018

- ### What About Cluster Headaches?
- Oxygen – 7L via mask (high flow oxygen)
  - Abortive therapies
    - Avoid medications such as stadol, opioids
  - Prophylaxis:
    - Lithium: best studied prophylactic medication
- Wright, 2018 179



### Prevalence of CDH

**4.1% of 13,000 General Public (~50% chronic migraine)**

**30%–80% Headache Clinic Population**

Sanin LC et al. *Cephalalgia*. 1994; Scher AI et al. *Headache*. 1998; Silberstein SD et al. *Neurology*. 1996.

Wright, 2018 181

### Proposed Pathophysiology

**Migraine cycles**

**Medication overuse**

**Stress**

**Infections/Trauma**

**Hyperexcitability of pain systems**

**Neurotransmitters**

**Genetic factors**

**Sinus, oral, dental pathology**

**Cervical spine**

Saper J. *Headache*. 2002

### Common Pitfalls in Migraine Diagnosis:

#### Importance of Medication Overuse

- MOH is common, but widely unrecognized
- MOH is almost always transformed migraine
- Ask patients about all pain medication use!

1. Diener HC and Katsarava Z. *Curr Med Res Opin* 2001;17(suppl 1):S17-S21.  
2. Bigal ME et al. *Neurology* 2004;63(5):843-847.

Wright, 2018 183

### MOH Diagnosis

- Patients typically overuse multiple medications simultaneously
  - Mean tablets/day = 5.2
  - Most commonly overused drugs are
    - Butalbital combinations (48%)
    - Acetaminophen (46%)
    - Opioids (33%)
    - ASA (32%)
    - Triptans (18%)

Wright, 2018 Bigal ME, et al. *Cephalalgia* 2004;24:483-490.

### When Do We See Medication Overuse?

- Ergotamine, triptans, opioids, butalbital (any formulation)
  - ≥10 days per month or more
- Analgesic overuse
  - ≥15 days per month
- Total exposure ≥15 days per month
- Triptan overuse more likely to increase migraine frequency

Headache Classification Subcommittee of the International Headache Society. *Cephalalgia* 2004.

Wright, 2018 185

### Chronic Daily Headache

- Requires multimodal approach to the treatment of their pain
  - Treat underlying comorbidities
  - Set limits on abortive medications (≤ 2 days per week)
  - Use adjunctive therapies – acupuncture, pressure, other nonpharmacologic options

Wright, 2008

### Long Term Headache: Oral Options

- Long term: Prednisone
  - 0.5 – 1.0 mg/kg/day
  - 21 day taper
  - Slowly withdraw other abortive medications
  - Ramp up prophylactic medication at same time
  - Protect stomach

Wright, 2008

### Other Principles

- Ramp up preventative medication while pulling away abortive
- Reduce amount used by 10-25% weekly
  - I.e. 60 butalbital per month means 15 weekly approximately
  - Each week – go down by 10% or 1 - 2 tablets
  - Will take 3 months to remove overused drug
  - If rapid withdrawal needed - phenobarbital
- In meantime, ramp up preventative medications

Wright, 2008

### Abortive Medications

- Avoid medications that patient is overusing
  - Opioids, barbiturates, ergotamines
- Use ones that patient has not been using
  - Hydroxyzine
  - Metoclopramide
  - NSAIDs

Wright, 2008

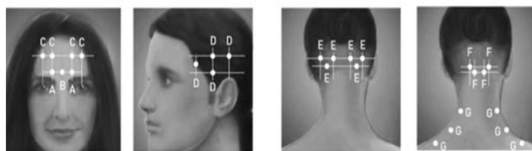
### Additional Therapy For Chronic Migraine

- onabotulinumtoxinA (Botox, Dysport)
  - Chronic Migraine: Recommended total dose 155 Units, as 0.1 mL (5 Units) injections per each site divided across 7 head/neck muscles

[http://www.botoxchronicmigraine.com/aboutchronicmigraine/?cid=sem\\_CMB\\_goo\\_s\\_7899](http://www.botoxchronicmigraine.com/aboutchronicmigraine/?cid=sem_CMB_goo_s_7899) accessed 12-30-2012

Wright, 2008

### Additional Therapy For Chronic Migraine



[http://www.botoxchronicmigraine.com/aboutchronicmigraine/?cid=sem\\_CMB\\_goo\\_s\\_7899](http://www.botoxchronicmigraine.com/aboutchronicmigraine/?cid=sem_CMB_goo_s_7899) accessed 12-30-2012

Wright, 2008

### My Medication Doesn't Work...

- Prednisone
  - 60, 40, 20 mg/day
- Or....Ketorolac
  - 30 – 60 mg IM
- Antiemetic
  - ondansetron or similar
- IV fluids

Wright, 2018

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## Office Based Abortive Treatment

- Treatment with injectable anti-nausea medication
  - Dopamine antagonist if sedation is not an issue (e.g. prochlorperazine 5-10mg IM)
  - Ondansetron if sedation is to be avoided (e.g. 8 mg ODT)
- Treatment with a migraine specific therapy
  - Subcutaneous sumatriptan (usually 4-6 mg SQ)
  - DHE-45® (usual dose 1 mg SQ or IM)
- Treatment with injectable NSAID especially if allodynia is present (e.g. ketorolac 60 mg IM)

Jakubowski M, Levy D, Goor-Areh I. et al. Headache 2005;45:850-861.

Wright, 2018

## Syncope

Wright, 2018

194

## 15 year old female

- Passed out today in the classroom
  - Occurred after standing
  - Awoke on floor, classmate witnessed the event
  - Does not believe she was "out long"
- Mild headache since fall
  - Struck head on corner of desk w/ visible ecchymotic area at occiput w/ ~1 cm abrasion

Wright, 2018

195

## 15 year old female

- No prior similar episodes
  - Occasional episodes of feeling "lightheaded" with quick position change or if she has blood drawn or gets shots
- Concurrent hx
  - NO medications

Wright, 2018

196

## 15 year old female

- Current status
  - BP=118/82, P=88, RR= 20
  - You enter classroom and she is awake and speaking
  - Alert, oriented X 3
  - PERRLA
  - Cardiac: S1S2; RRR
  - No urinary or fecal incontinence

Wright, 2018

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## Syncope

- A transient loss of consciousness characterized by a loss of postural tone, typically sudden in onset with spontaneous recovery
  - Desai, 2001

Wright, 2018

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### Syncope vs. seizure

<ul style="list-style-type: none"><li>■ Syncope<ul style="list-style-type: none"><li>□ &lt;5 mins</li><li>□ Injury from fall</li><li>□ No incontinence</li><li>□ Normal CK</li><li>□ No warning</li><li>□ No disorientation post episode</li></ul></li></ul>	<ul style="list-style-type: none"><li>■ Seizure<ul style="list-style-type: none"><li>□ Often &gt; 5 mins</li><li>□ Usually no injury</li><li>□ Incontinence</li><li>□ Elevated CK</li><li>□ Aura or prodrome</li><li>□ Post ictal state<ul style="list-style-type: none"><li>■ Desai, 2001</li></ul></li></ul></li></ul>
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Wright, 2018 199

### Syncope etiology

- Orthostatic hypotension
  - Common cause of syncope
  - HCTZ/diuretics often implicated

Wright, 2018 200

### Syncope etiology

- Neurally mediated syncope
  - Vasovagal syncope
    - Most common in young women
    - Prodromal nausea, sweating and malaise
    - Associated with pallor
    - Often occurs in hot, enclosed environments while standing or after witnessing or being involved in an unpleasant event
    - Gradual loss of consciousness rather than seizures where it is associated with a rapid loss
    - Rapid recovery if patient is recumbent

Wright, 2018 201

### Syncope etiology

- Situational syncope
  - Cough, defecation, micturition, swallow
  - Cough syncope:
    - Rare
    - Cough causes the patient to Valsalva
  - Micturition syncope:
    - More common in men
    - Typically occurs at night; often associated with alcohol ingestion
    - Most likely the result of a vasodepressor reflex triggered by a sudden decrease in bladder pressure
    - Treatment: urinate in the sitting position; alcohol avoidance

Wright, 2018 202


### Cardiac Etiology

- Cardiac outflow obstruction
  - Common cause of syncope in an older individual
  - Variety of causes
    - Complete heart block
    - Valvular
      - Aortic stenosis
    - Aortic dissection

Wright, 2018 203

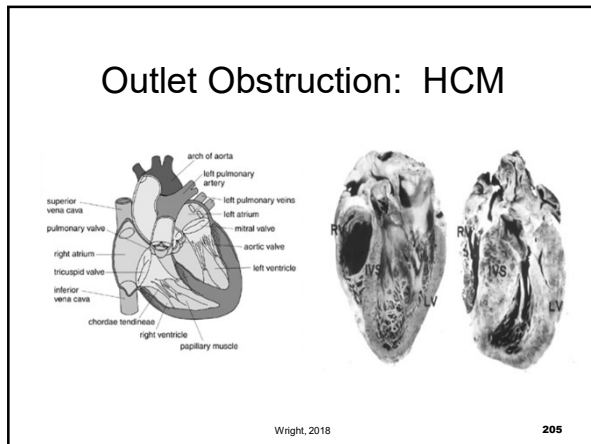
### Syncope etiology

- Dysrhythmia
  - TDP, VT, SVT
  - AV block
    - HR < 30 BPM



Torsades.org

Wright, 2018 204



### Orthostatic Syncope: Medications to Consider

- TCA: prolong QT
- Alpha blockers
- CCB
- ACEI
- Clonidine
- Diuretics
- Alcohol
- ARBs

Wright, 2018 206

### Vasovagal syncope Assessment clues

- Syncopal episode preceded by
  - Fear, pain, anxiety
  - Prolonged standing in one place
  - Warmth, nausea, sweating, light-headedness
  - Rapid return to consciousness
  - Younger individual
  - More likely female

Wright, 2018 207

### Syncope Associated with Palpitations

- Most common causes
  - PAC, PVC, SVT
- Evaluation
  - History, exam, Holter or King of Hearts event monitor depending on frequency,
  - ETT
  - EPS

Wright, 2018 208

### Syncope Hx- Before

- Prodromal symptoms
  - Lightheaded, dizziness, tinnitus from cerebral hypoperfusion
  - Rapid LOC with seizure, arrhythmia (>8 seconds)

Wright, 2018 209

### Syncope hx- During Witnesses?

- Tongue biting
  - Seizure
- Incontinence
  - Seizure or faint
- Lowers self to recumbent position
  - Dysrhythmia
  - Vasovagal episode

Wright, 2018 210

### Points to aortic stenosis

- Age
  - <30= congenital
  - >70= acquired
- Cosymptoms
  - Chest pain, dyspnea
  - Symptoms w/ exertion
  - Multiple episodes presyncope
  - DOE

Wright, 2018 211

### Points to Moderate to Severe Aortic Stenosis

- Narrow pulse pressure
- LVH
- Displaced PMI

Wright, 2018 212

### Aortic Stenosis Murmur

- Best heard in aortic region
  - Harsh with early systolic peak

Wright, 2018 213

### Aortic stenosis

- Murmur radiation
  - To neck
    - Well preserved carotid upstrokes in milder disease
    - Delayed w/ more severe obstruction

Wright, 2018 214

### Syncope

- Evaluation
  - History
  - Exam
  - Diagnostics
    - Event monitor depending on frequency, tilt test, EPS, GTT, further neurologic or psychiatric evaluation as indicated

Wright, 2018 215

### With This Patient...

- Neurally mediated syncope
- What do we do now?

Wright, 2018 216

Thank You!

I Would Be Happy to Entertain  
Any Questions

Wright, 2018 **217**

Wendy L. Wright, ARNP

WendyARNP@aol.com

Wright, 2018 **218**