Intimate Partner Violence-Related Brain Injuries (IPV-BI): What Health Care Providers Need to Know

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Learning Objectives

- Discuss the immediate and long-term consequences of intimate partner violence (IPV)-related brain injuries from blunt trauma and/or strangulation.
- Identify neurological and psychological signs and symptoms of brain trauma in survivors of IPV.
- Consider care interventions and resources for patients with IPV-related brain injuries.

A Survivor's Story…

Photo credit: https://headspineaz.org/tbi/

Intimate Partner Violence (IPV)

- Intimate partner:
  - Close personal relationship
    - E.g., emotional connectedness, regular contact, familiar with each other's lives, identify as a couple, ongoing physical/sexual contact
    - Does not require sexual intimacy
    - May or may not live together
    - May be opposite- or same-sex
  - Includes:
    - Current or former spouse (married, common-law, civil union, domestic partners)
    - Current or former dating partner, boyfriends/girlfriends

https://www.cdc.gov/violenceprevention/intimatepartnerviolence/fastfact.html

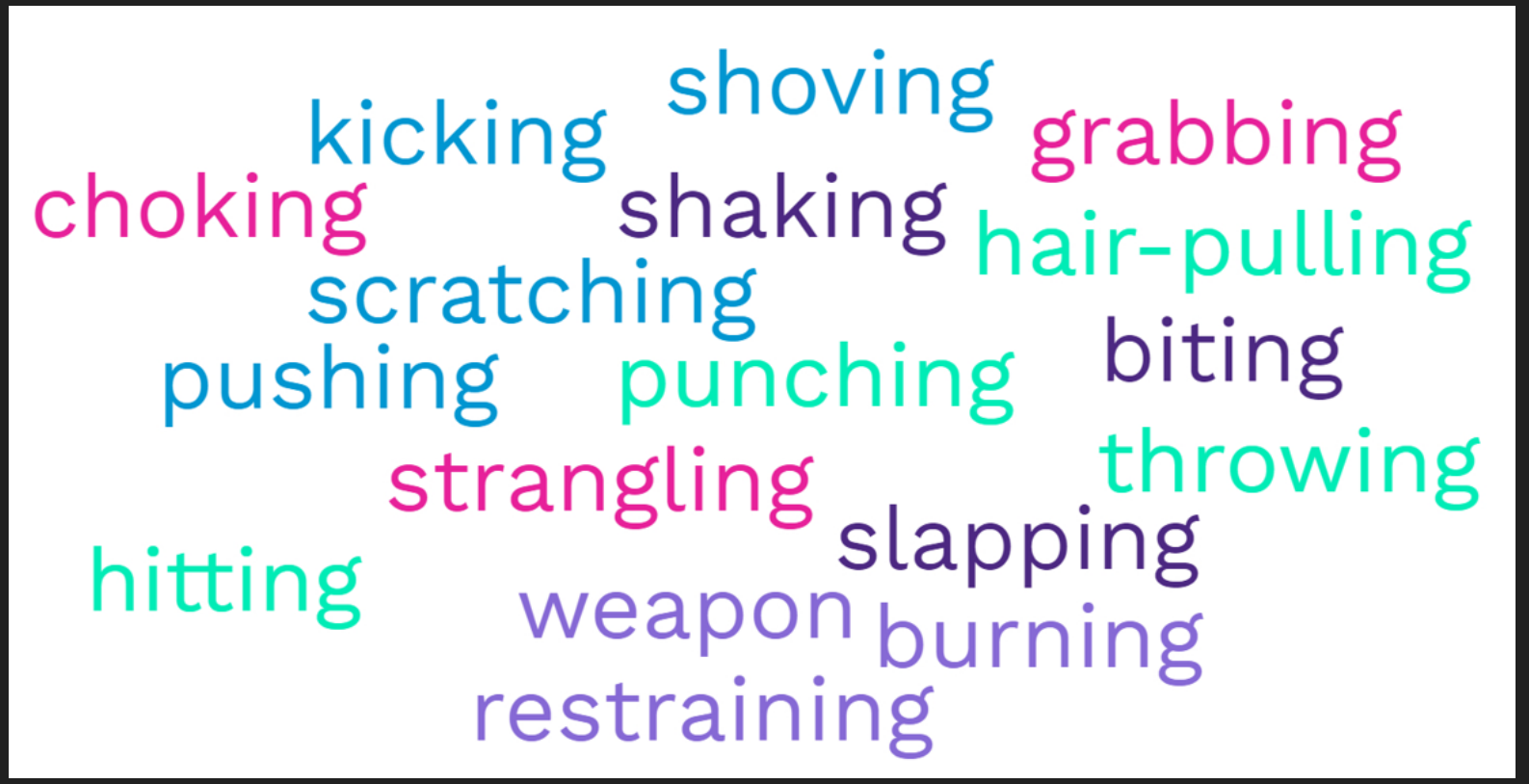
Intimate Partner Violence (IPV)

- Violence or aggression:
  - Varies in frequency, severity, type
  - Occurs on a continuum
  - Includes four types of behavior:
    - Physical violence
      - Hurting or attempting to hurt a partner by hitting, kicking, or using another type of physical force
    - Sexual violence
    - Psychological aggression
    - Stalking

CDC, 2022

https://www.cdc.gov/violenceprevention/intimatepartnerviolence/fastfact.html

Examples of Physical IPV



Breiding et al., 2014

U.S. Estimates of Severe Physical IPV

Lifetime and 12-Month Prevalence of Physical Violence by an Intimate Partner — U.S. Women, National Intimate Partner and Sexual Violence Survey, 2016/2017 Annualized Estimates

Characteristic	Lifetime			12-Month		
	Weighted %	95% CI	Estimated Number of Victims*	Weighted %	95% CI	Estimated Number of Victims*
Any physical violence	42.0	(40.6, 43.4)	52,437,000	4.5	(3.9, 5.2)	5,649,000
Slapped, pushed, or shoved	38.9	(37.5, 40.2)	48,508,000	4.0	(3.4, 4.7)	5,018,000
Slapped	25.7	(24.5, 26.9)	32,022,000			
Pushed or shoved	36.0	(34.7, 37.4)	44,954,000			
Any severe physical violence	32.5	(31.1, 33.8)	40,497,000	3.1	(2.6, 3.8)	3,929,000
Hit with a fist or something hard	18.9	(17.9, 20.0)	23,630,000			
Kicked	12.2	(11.3, 13.1)	15,200,000			
Hurt by pulling hair	17.7	(16.7, 18.9)	22,145,000			
Slammed against something	24.4	(23.2, 25.6)	30,483,000			
Tried to hurt by choking or suffocating	16.2	(15.1, 17.2)	20,168,000			
Beaten	15.2	(14.2, 16.2)	18,967,000			
Burned on purpose	2.8	(2.4, 3.3)	3,510,000			
Used a knife	3.9	(3.4, 4.6)	4,913,000			
Used a gun	4.7	(4.2, 5.3)	5,906,000			

Lifetime and 12-Month Prevalence of Physical Violence by an Intimate Partner — U.S. Men, National Intimate Partner and Sexual Violence Survey, 2016/2017 Annualized Estimates

Characteristic	Lifetime			12-Month		
	Weighted %	95% CI	Estimated Number of Victims*	Weighted %	95% CI	Estimated Number of Victims*
Any physical violence	42.3	(40.8, 43.8)	49,932,000	5.5	(4.8, 6.2)	6,462,000
Slapped, pushed, or shoved	39.0	(37.6, 40.5)	46,094,000	5.0	(4.4, 5.7)	5,911,000
Slapped	29.8	(28.4, 31.2)	35,133,000			
Pushed or shoved	33.0	(31.5, 34.4)	38,914,000			
Any severe physical violence	24.6	(23.3, 25.9)	28,996,000	3.0	(2.5, 3.5)	3,541,000
Hit with a fist or something hard	16.9	(15.8, 18.1)	19,985,000			
Kicked	12.2	(11.2, 13.2)	14,382,000			
Hurt by pulling hair	6.8	(6.1, 7.6)	8,067,000			
Slammed against something	7.0	(6.3, 7.9)	8,302,000			
Tried to hurt by choking or suffocating	4.1	(3.6, 4.8)	4,898,000			
Beaten	5.0	(4.3, 5.7)	5,883,000			
Burned on purpose	1.9	(1.5, 2.3)	2,215,000			
Used a knife on you	4.4	(3.7, 5.1)	5,170,000			
Used a gun on you	1.4	(1.1, 1.8)	1,700,000			

Leemis et al., 2022

U.S. Estimates of IPV-Related Impact

Table 11

Lifetime and 12-Month Prevalence of Contact Sexual Violence,[1] Physical Violence, and/or Stalking by an Intimate Partner with IPV-Related Impact[2] — U.S. Women, National Intimate Partner and Sexual Violence Survey, 2016/2017 Annualized Estimates

Victimization Type	Lifetime			12-Month		
	Weighted %	95% CI	Estimated Number of Victims*	Weighted %	95% CI	Estimated Number of Victims*
Any reported IPV-related impact[2]	41.0	(39.7, 42.4)	51,205,000	4.5	(3.9, 5.2)	5,658,000
Fearful	28.5	(27.2, 29.7)	35,521,000	2.8	(2.4, 3.4)	3,545,000
Concern for safety	29.9	(28.7, 31.2)	37,332,000	2.7	(2.2, 3.2)	3,315,000
Any PTSD symptoms[3]	33.7	(32.4, 35.0)	42,047,000	3.7	(3.1, 4.3)	4,581,000
Injury	35.3	(33.9, 36.6)	44,008,000	1.3	(1.0, 1.6)	1,605,000
Minor bruises or scratches	25.9	(24.7, 27.2)	32,380,000			
Cuts, major bruises, or black eyes	15.8	(14.8, 16.8)	19,674,000			
Other physical injuries	8.1	(7.4, 8.9)	10,121,000			
Injury to any ligaments, muscles, or tendons	4.5	(3.9, 5.1)	5,592,000			
Broken bones or teeth	3.7	(3.2, 4.2)	4,603,000			
Back or neck injury	3.3	(2.8, 3.9)	4,143,000			
Being knocked out after getting hit, slammed against something, or choked	3.4	(3.0, 3.9)	4,268,000			
Head injury	3.6	(3.1, 4.1)	4,452,000			
Mental or emotional harm	28.4	(27.2, 29.7)	35,446,000			
Needed medical care	13.9	(12.9, 14.9)	17,314,000	0.6	(0.4, 0.9)	739,000

Table 12

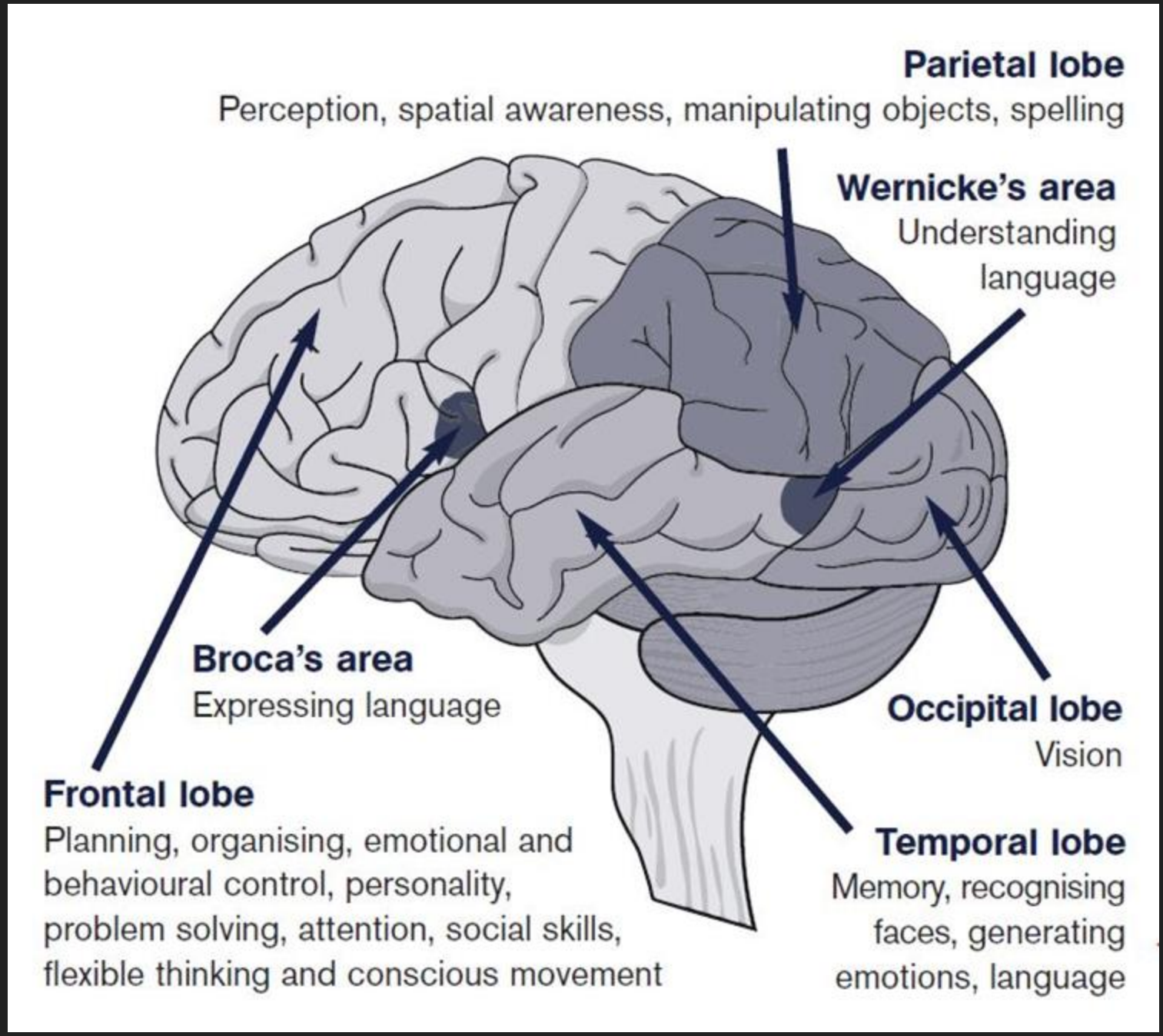
Lifetime and 12-Month Prevalence of Contact Sexual Violence,[1] Physical Violence, and/or Stalking by an Intimate Partner with IPV-Related Impact[2] — U.S. Men, National Intimate Partner and Sexual Violence Survey, 2016/2017 Annualized Estimates

Victimization Type	Lifetime			12-Month		
	Weighted %	95% CI	Estimated Number of Victims*	Weighted %	95% CI	Estimated Number of Victims*
Any reported IPV-related impact[2]	26.3	(25.0, 27.6)	31,056,000	2.8	(2.3, 3.3)	3,253,000
Fearful	8.1	(7.4, 9.0)	9,593,000	1.2	(0.9, 1.6)	1,415,000
Concern for safety	7.1	(6.4, 7.9)	8,378,000	1.0	(0.8, 1.3)	1,207,000
Any PTSD symptoms[3]	14.5	(13.5, 15.6)	17,157,000	1.9	(1.6, 2.4)	2,275,000
Injury	21.1	(19.9, 22.3)	24,875,000	0.8	(0.6, 1.0)	927,000
Minor bruises or scratches	15.4	(14.4, 16.5)	18,203,000			
Cuts, major bruises, or black eyes	6.4	(5.7, 7.2)	7,539,000			
Other physical injuries	2.4	(1.9, 2.9)	2,789,000			
Injury to any ligaments, muscles, or tendons	0.9	(0.6, 1.2)	1,020,000			
Broken bones or teeth	0.7	(0.5, 1.0)	799,000			
Back or neck injury	0.7	(0.5, 1.0)	799,000			
Being knocked out after getting hit, slammed against something, or choked	0.6	(0.4, 1.0)	691,000			
Head injury	0.8	(0.6, 1.1)	928,000			
Mental or emotional harm	11.3	(10.3, 12.3)	13,316,000			
Needed medical care	4.3	(3.7, 5.0)	5,036,000	0.3	(0.2, 0.5)	336,000

Leemis et al., 2022

The Brain and Neck

A Brief Review



https://www.headway.org.uk/about-brain-injury/individuals/effects-of-brain-injury/executive-dysfunction/

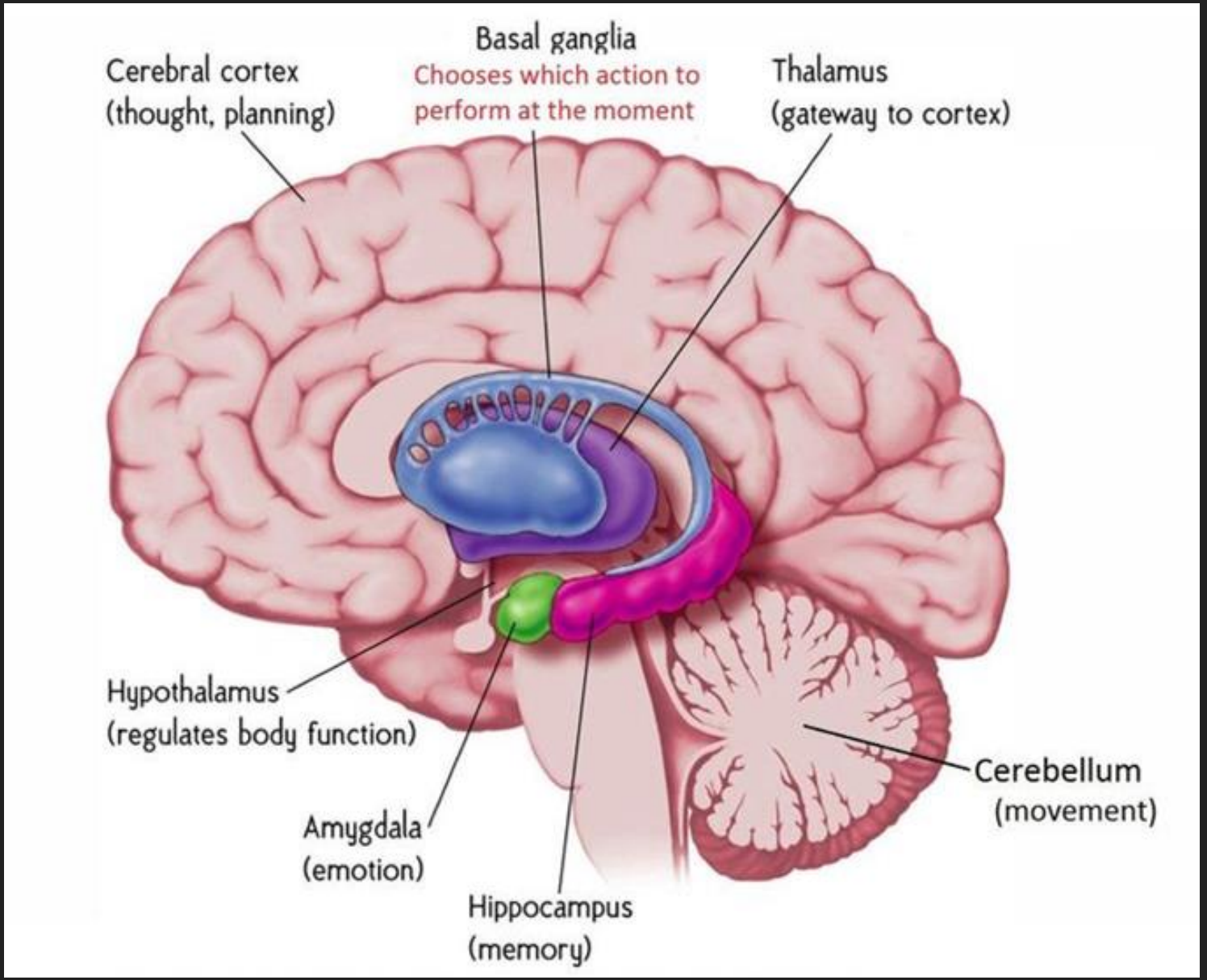


Photo: Peer Teaching Society, 2018

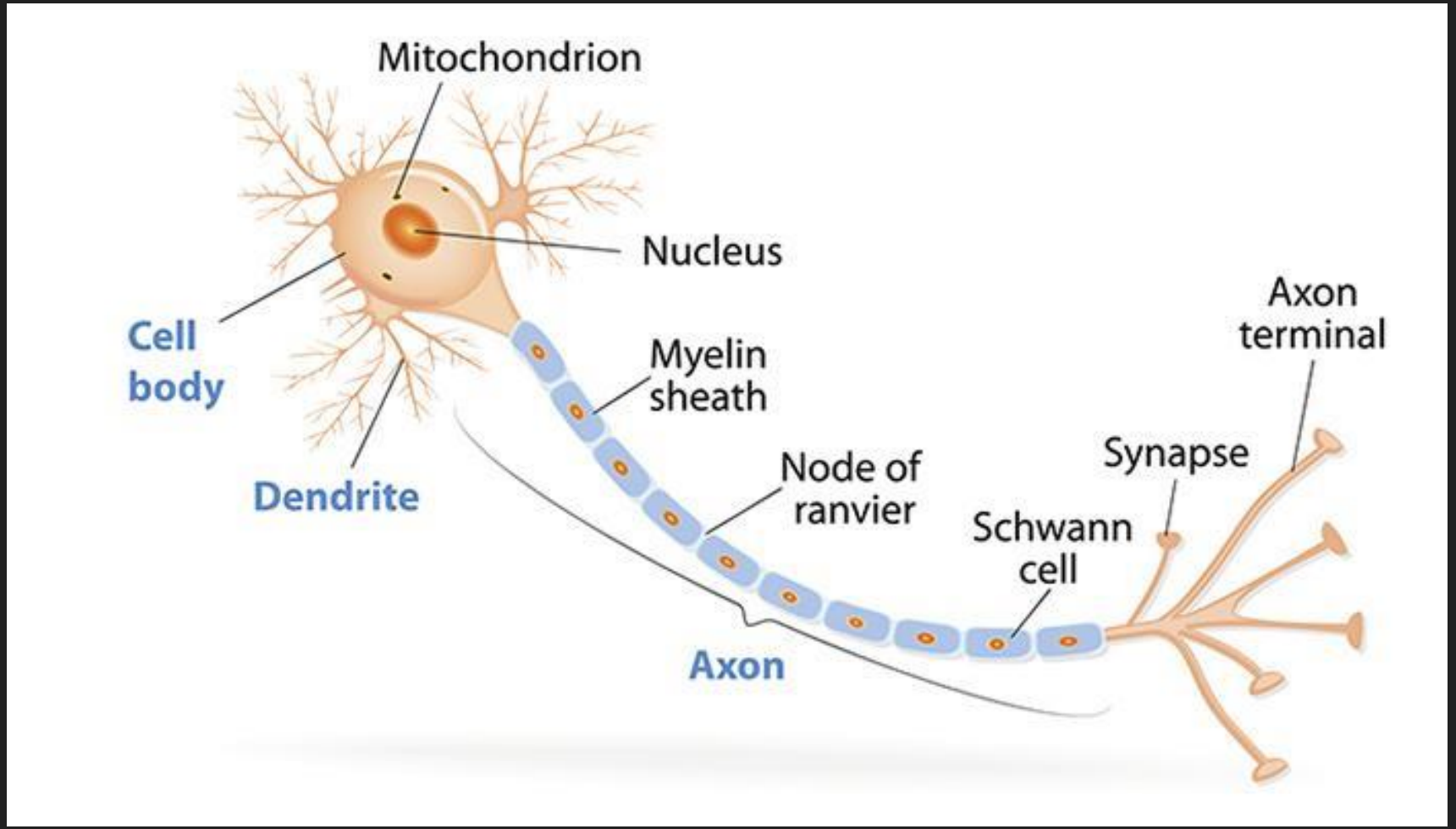


Photo: https://qbi.uq.edu.au/brain/brain-anatomy/axons-cable-transmission-neurons

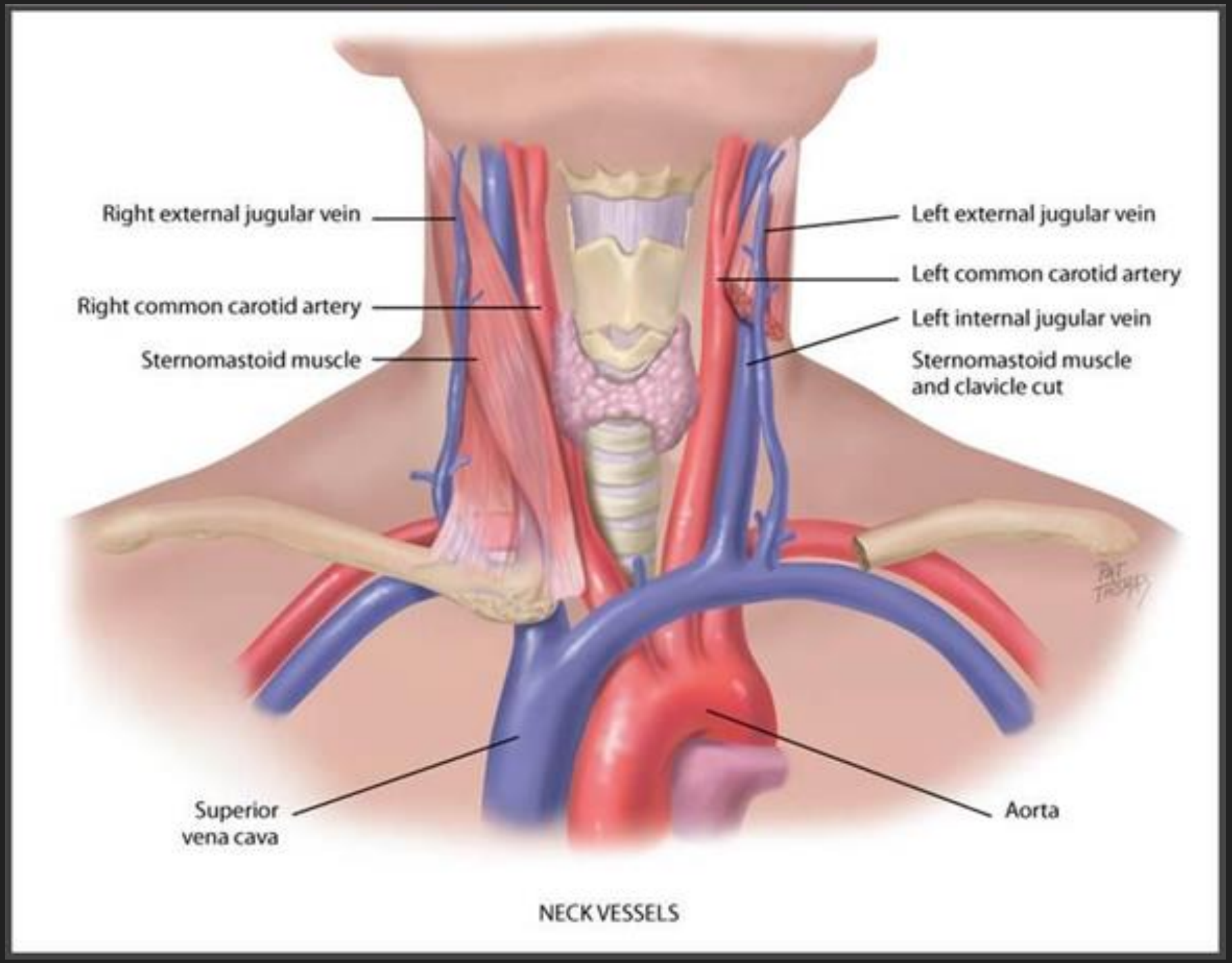


Photo: Quizlet.com

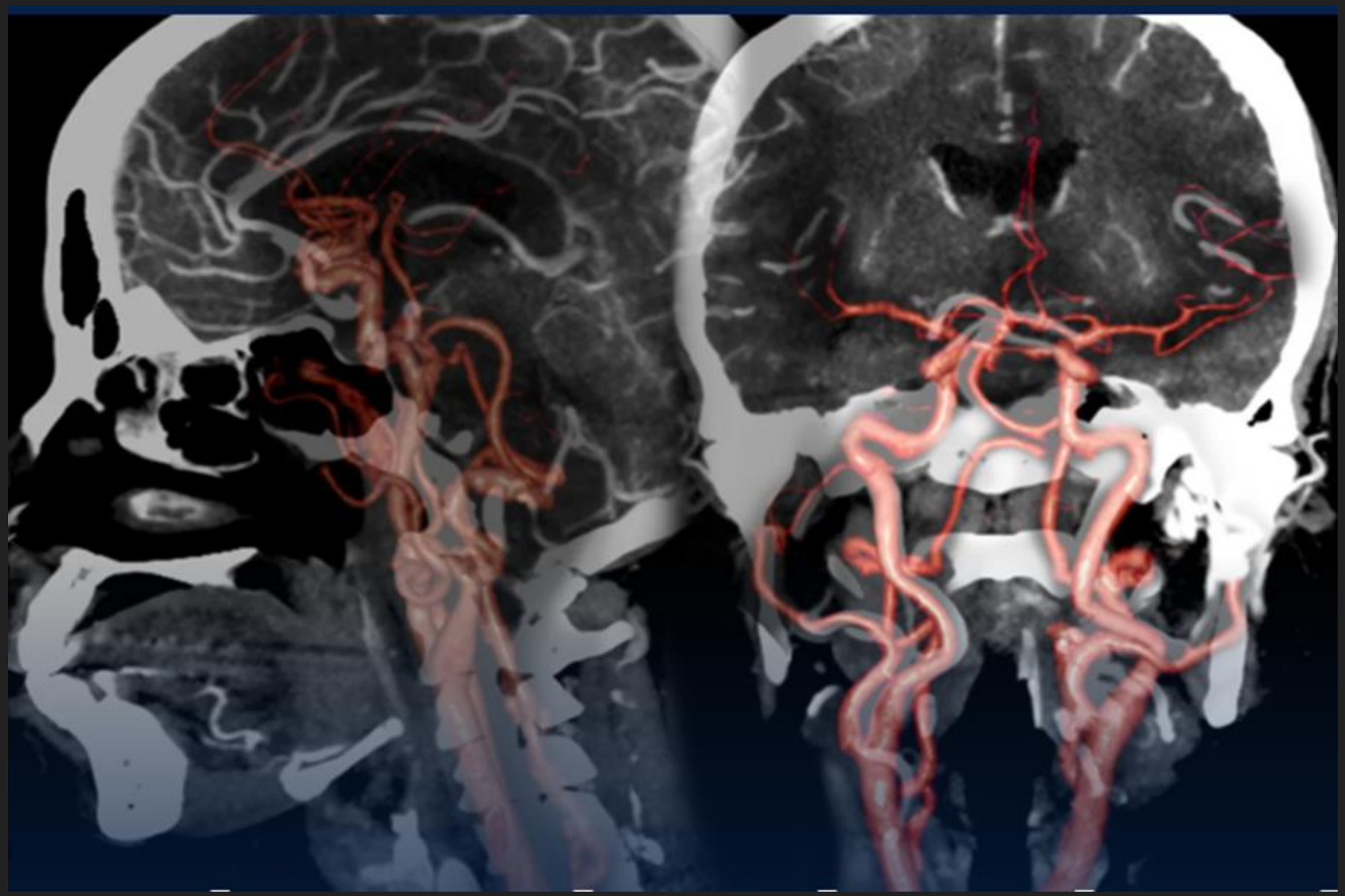


Photo: https://www.ucsfhealth.org/medical-tests/ct-angiography---head-and-neck

Food for Thought

- Oxygen and glucose via the bloodstream

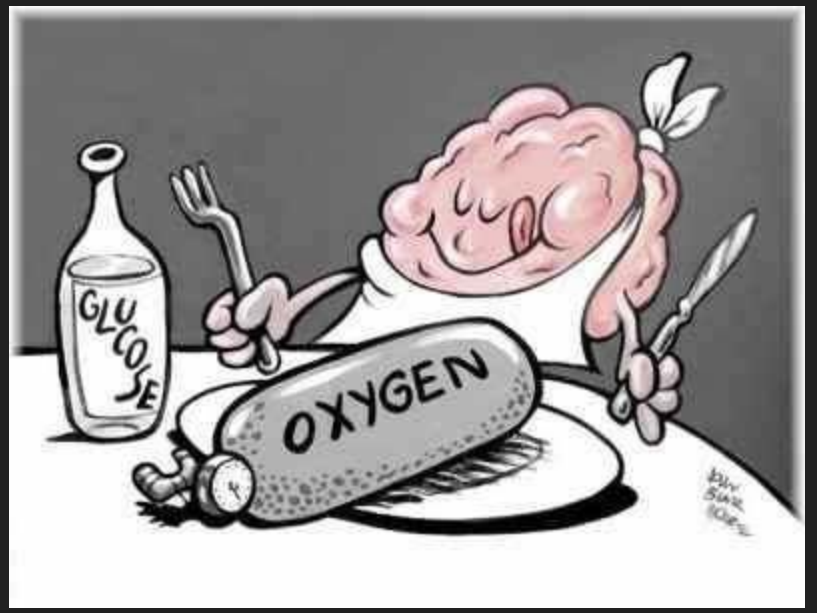


Photo: https://www.quora.com/Why-does-the-brain-consume-so-much-oxygen-relative-to-its-size#!n=12

Types of Brain Injuries

- Acquired versus Congenital
- Traumatic versus Non-Traumatic
- Traumatic: Impact versus Traumatic: Inertial
- Primary versus Secondary

Brain Injury Association of America, 2020; Photo credit: military.com

Traumatic: Impact

- External contact injury
- Head struck by or against something
- Closed vs. open/ penetrating
- Ex: gunshot, stab wound, falls, MVC, sports, assaults

Traumatic: Inertial

- Brain moves in skull
- Ex: falls, MVC, sports, assaults

Non-Traumatic

- Internal injury
- Ex: ischemia (lack of blood flow), hypoxia/anoxia (low/no oxygen), tumor, infection, stroke, assaults

Brain Injury Association of America, 2020

Traumatic Brain Injury (TBI)

Photo credits: health.mil; theatlantic.com; sciencenews.org

Traumatic Brain Injury (TBI)

- External force
- Disrupts brain function
- Evidenced by at least one of the following:
  - Any loss of consciousness;
  - Loss of memory immediately pre- or post-incident;
  - Altered mental state at time of incident;
  - Focal neurologic deficit(s)

Mild TBI (mTBI, "concussion"):

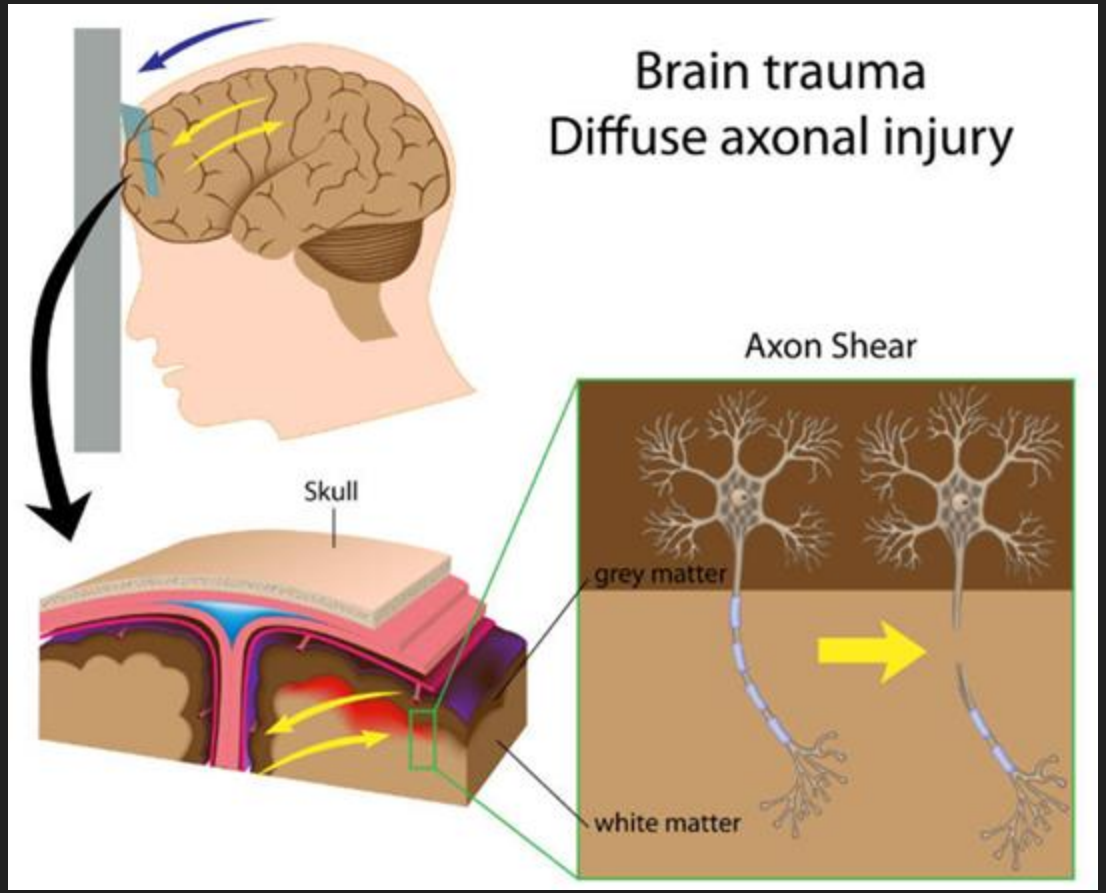
- Severity of injury does not exceed:
  - Loss of consciousness of approximately 30 min or less;
  - After 30 min an initial Glasgow Coma Scale of 13–15;
  - Post-traumatic amnesia not greater than 24 hr

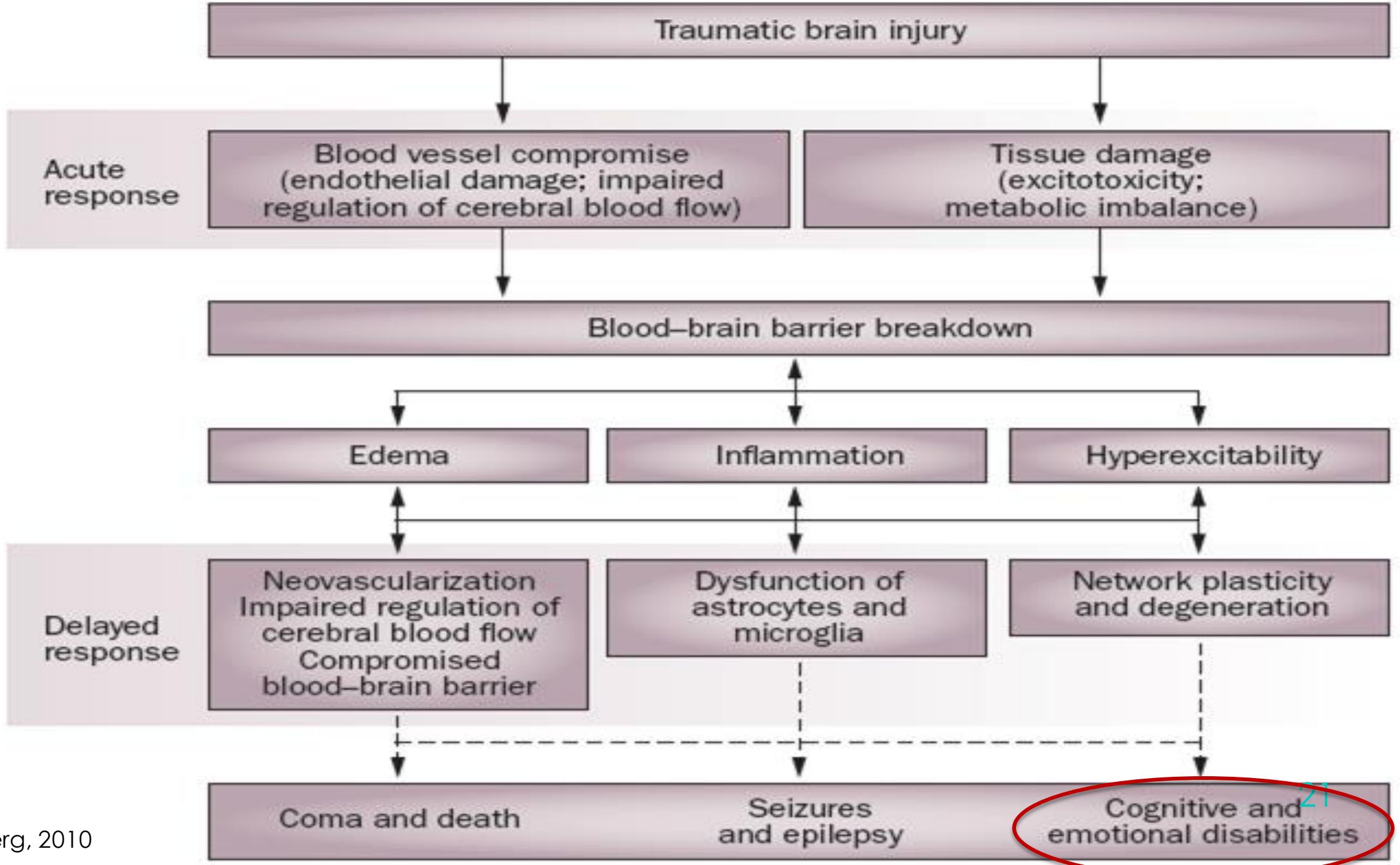
Brain Injury Association of America, 2022; Committee on Mild Traumatic Brain Injury and American Congress of Rehabilitation Medicine, 1993

Traumatic Brain Injury (TBI)

- Contusion
  - Coup-Contrecoup
- Hematoma
- Diffuse Axonal Injury

- Mild, moderate, severe
- May not be evident on CT or MRI





Shlosberg, 2010

Strangulation

External pressure to the neck that closes blood vessels and/or air passages and deprives person of oxygen[1]

Less pressure than needed to open a can of soda[2]

Loss of consciousness in 5-10 seconds, death in minutes[3]

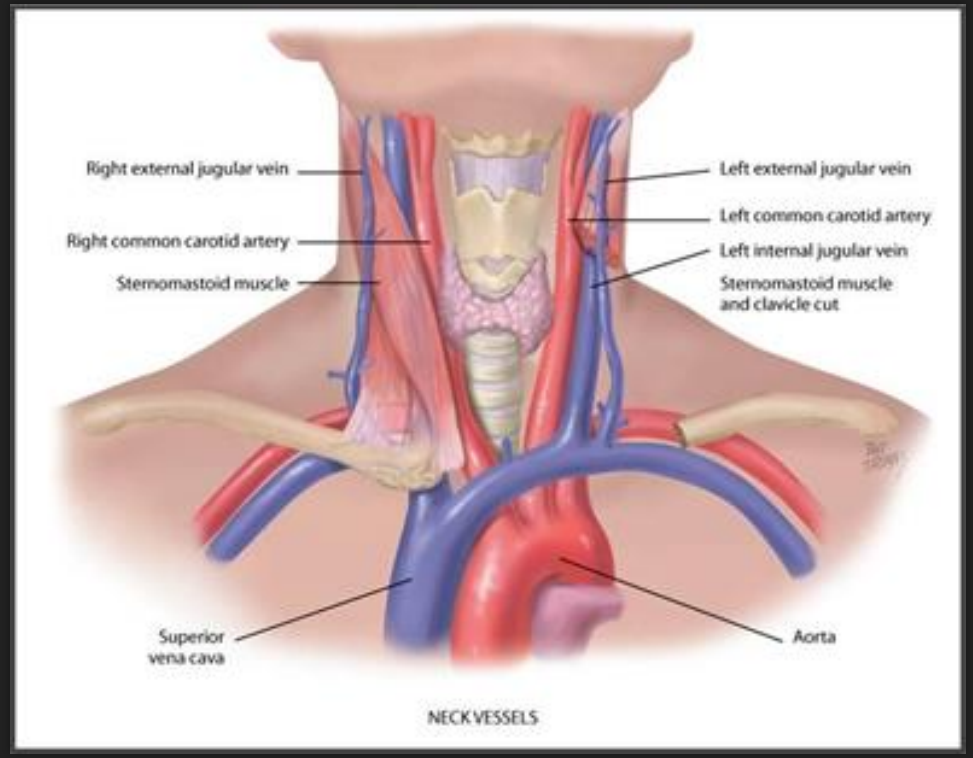
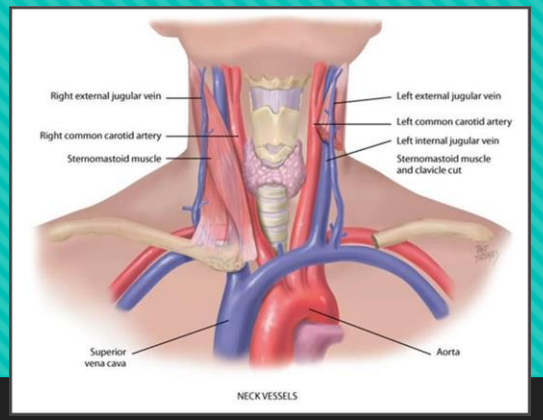


Photo obtained at: https:/humananatomylibrary.co/photos/380334/head-neck-arteries-veins-3065-kubiet-flashcards-ch-19-head-neck-arteries-veins-3065-kubiet-flashcards-ch.asp/

[1]Sauvageau, 2010; [2]Training Institute on Strangulation Prevention, 2015; [3]Huether & McCance, 2000

Strangulation: A Type of Asphyxia



Supply

- Oxygen in environment displaced by other gases or consumed without replacement
- Examples: entrapment in airtight spaces, sewers

Transfer

- Oxygen transfer to body from environment is impeded
- Example: airway obstruction (smothering, choking, strangulation, hanging)

Transport

- Reduced oxygen transport within the body
- Example: cervical vascular compression reducing cerebral blood flow (hanging, strangulation)

Uptake/Use

- Cells unable to use oxygen, enzyme systems blocked or damaged
- Example: cyanide poisoning

Adapted from: Byard, 2010

The Mechanics of Strangulation

External pressure to neck

↓

Occlusion of venous flow from brain

↓

Loss of consciousness with resulting muscle relaxation

↓

Further pressure occludes arterial flow and/or airway

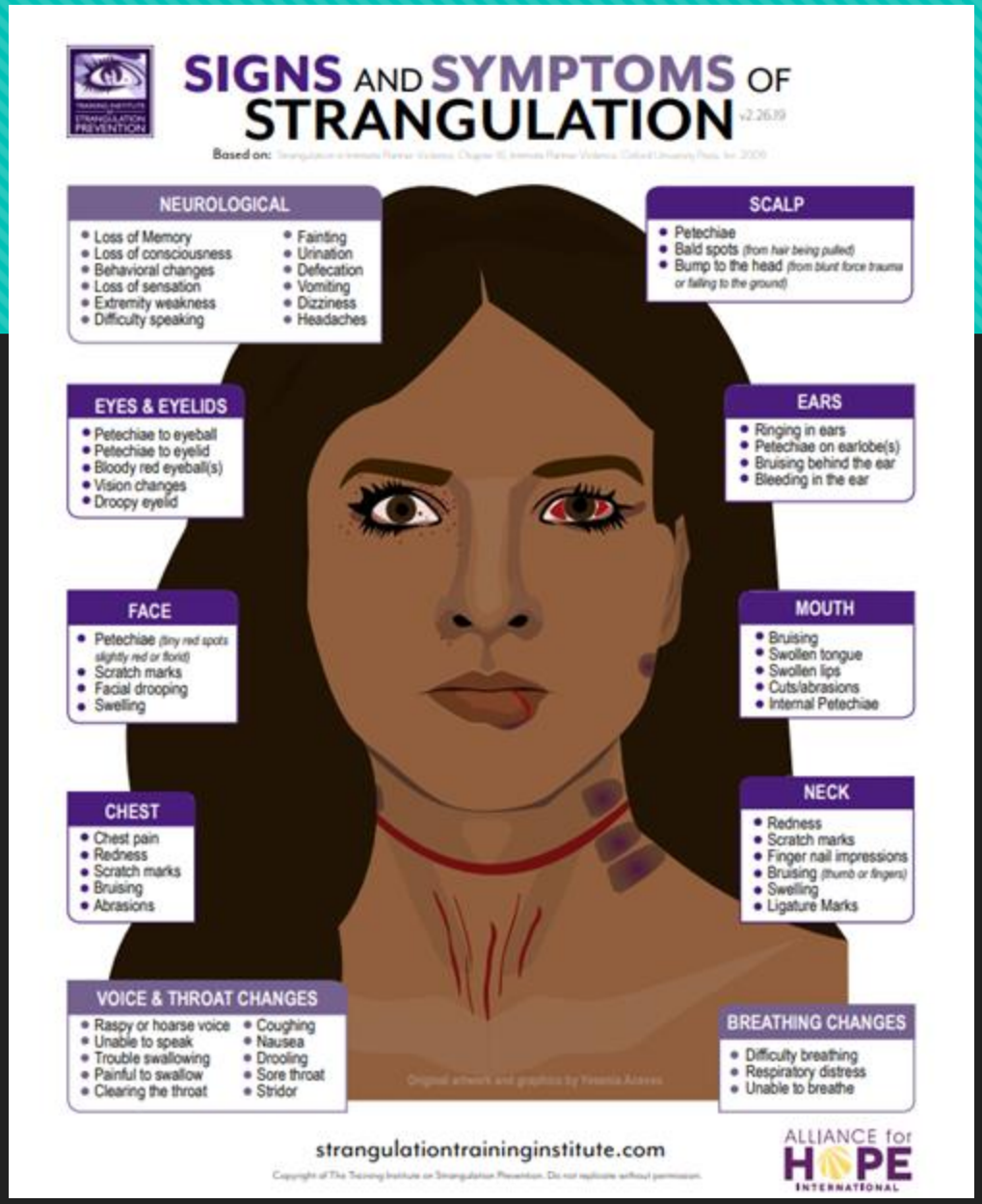
↓

Death

[Possible cardiac dysrhythmia from carotid body reflex, thought to be uncommon]

Hawley et al. (2001)

Strangulation: Morbidity/Mortality



TISP, 2019

Potentially devastating acute and long-term health outcomes[1-6]

- E.g., cervical artery injuries, carotid dissections, traumatic brain injuries, PTSD, miscarriage
- Multiple strangulation associated with increased injury

Can be more challenging to identify in those with darker skin tones[7]

43% of women murdered and 45% of women almost murdered by a partner were previously strangled[1]

Can be fatal without external injuries[8]

[1]Glass et al. (2008); [2]Wilbur et al. (2001); [3]Nash & Sheridan (2007); [4]Valera & Kucyi (2016); [5]Kwako et al. (2011); [6]Messing et al., 2018; [7]Scafide et al., 2022; [8]Hawley et al (2001)

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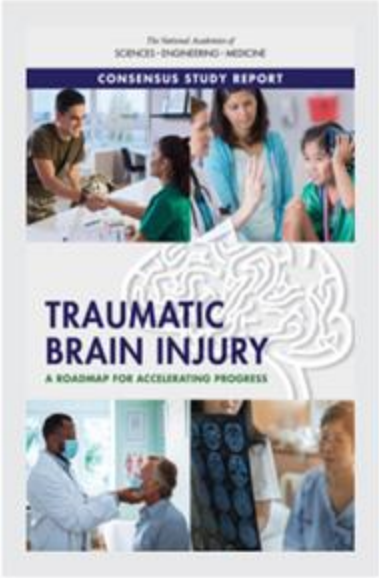


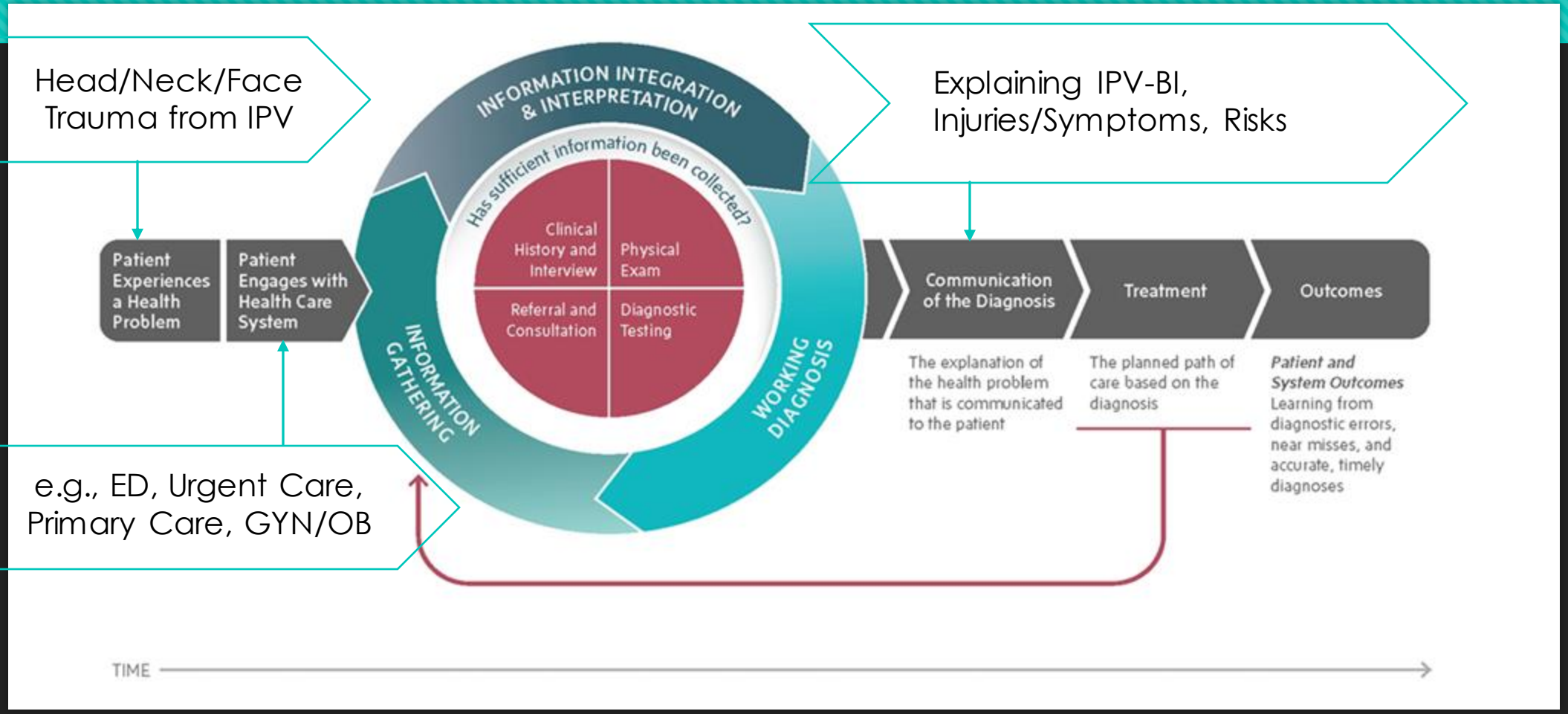
Traumatic Brain Injury: A Roadmap for Accelerating Progress (2022)

DETAILS

244 pages | 6 x 9 | PAPERBACK

ISBN 978-0-309-49043-6 | DOI 10.17226/25394

Diagnosis and IPV-Related TBI



Adapted from: Balogh, Miller & Ball (Eds.) (2015). *Improving diagnosis in health care*. The National Academies of Sciences, Engineering and Medicine. Washington (DC): National Academies Press.

Examples of Post-BI Symptoms and Challenges

Physical	Cognitive	Behavioral
Headache	Difficulty concentrating	Depression
Movement problems	Memory problems	Anxiety
Impaired or blurred vision	Reduced attention span	Agitation
Difficulties with speech or swallowing	Difficulty with problem solving	Reduced impulse control
Dizziness and balance problems	Confusion	Increased anger or irritability
Seizures	Increased risk of Alzheimer's disease, Parkinson's disease, and other neurodegenerative disorders	
Fatigue		
Pain		
Sleep problems		

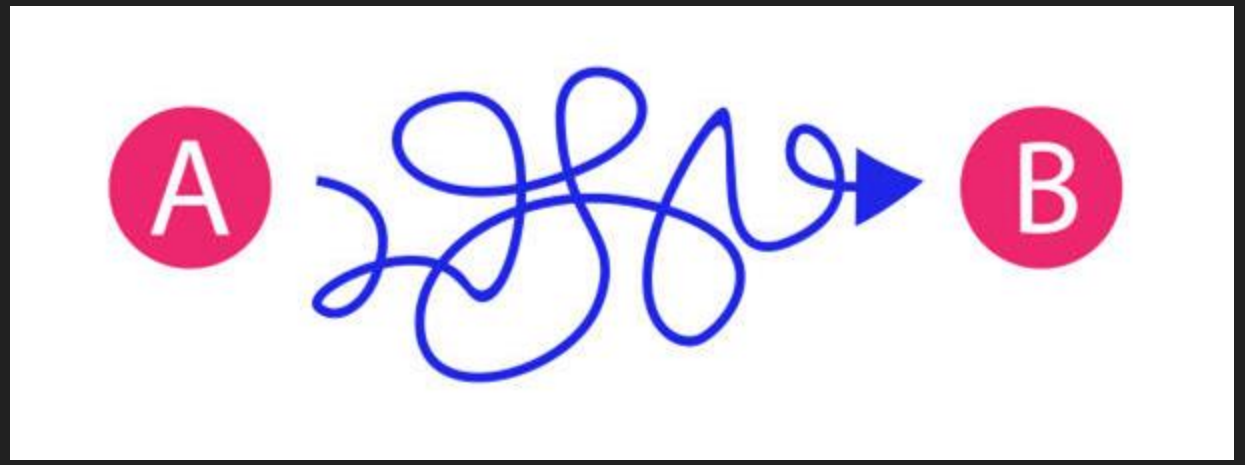
NOTE: This list is intended to illustrate symptoms that can develop after TBI and is not intended to be exhaustive or to represent the experiences of all people who experience such an injury.

NASEM, 2022

Pinkconcussions.com; Woods, 2005; Gill, 2008; Kwako, 2011; Valera, 2003, 2017, 2018

Potential Cognitive Difficulties

- Reduced attention span
- Short-term and/or long-term memory loss; memory distortions
- Disorganization



Potential Cognitive Difficulties

Decreased ability to:

- Concentrate
- Solve problems
- Think straight
- Think abstractly
- Learn new information
- Follow complicated directions
- Identify objects and their functions.
- Spell, write, read and work with numbers.
- Communicate.

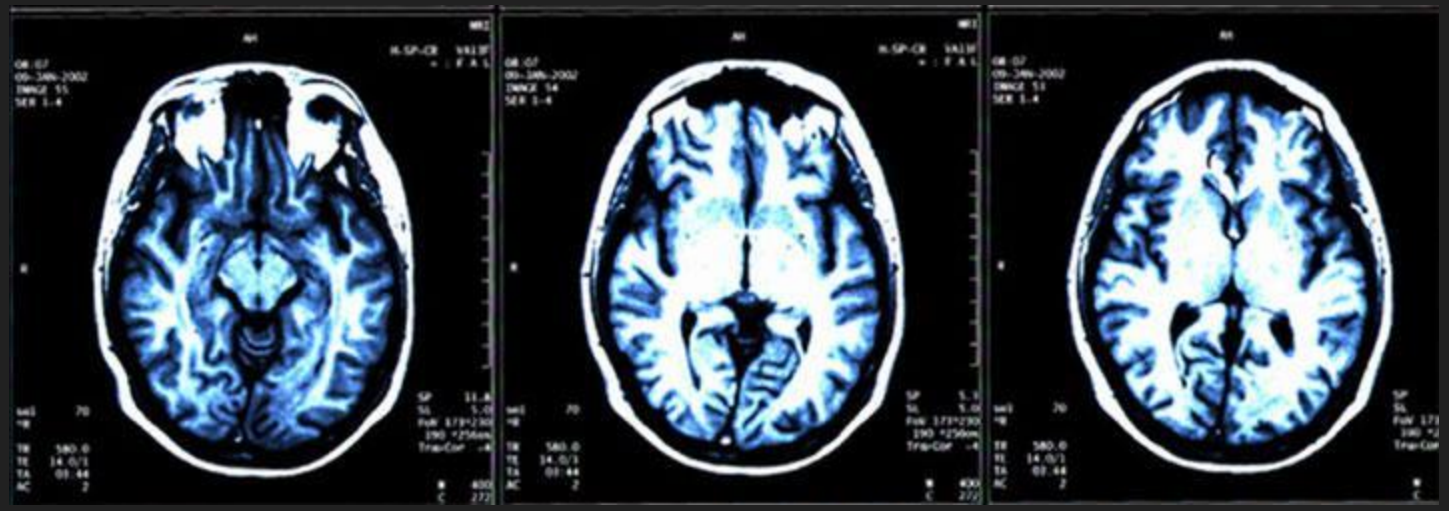
TBIs in Abused Women Linked to Central Nervous System/ Neurocognitive Symptoms

- Significantly more central nervous system symptoms than non-abused
  - Trouble concentrating, memory problems, fainting/dizzy spells
- More frequent strangulation (5+ vs 2 or fewer) = more symptoms
  - Memory, depression, insomnia, headaches, dizziness, and loss of sensation
- Blunt force: TBI often have symptoms like headaches , dizziness, memory loss, insomnia, depression, apathy, and fatigue

Campbell et al., 2018; Smith et al., 2001; Wilbur et al., 2001

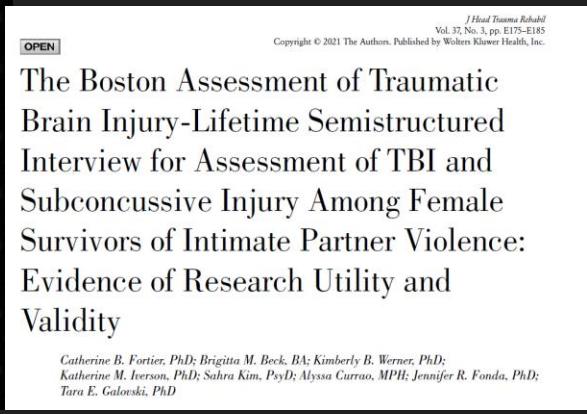
Functional Recovery from TBI

- Can be difficult to predict
- May depend on severity of injury, age, genetics, repetitive injury
- Team approach



Examples of Emerging Research

Imaging
Fluid Biomarkers
Neuropsychological assessment tools


J Head Trauma Rehabil
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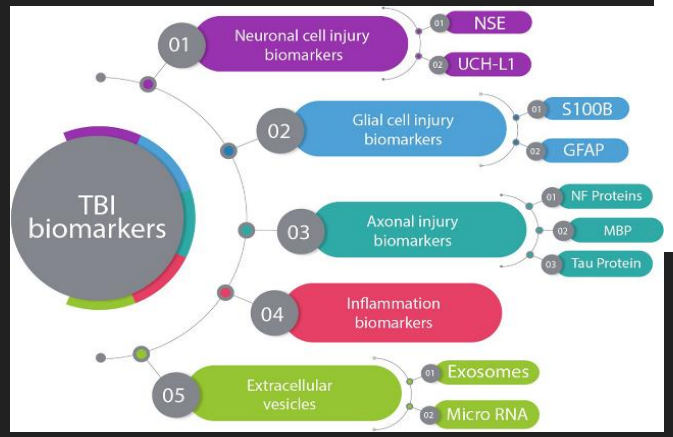
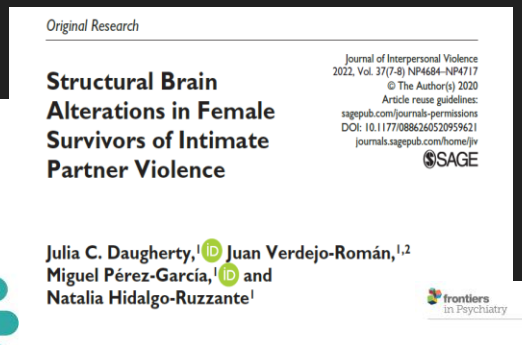
OPEN

The Boston Assessment of Traumatic Brain Injury-Lifetime Semistructured Interview for Assessment of TBI and Subconcussive Injury Among Female Survivors of Intimate Partner Violence: Evidence of Research Utility and Validity

Catherine B. Fortier, PhD; Brigitta M. Beck, BA; Kimberly B. Werner, PhD; Katherine M. Iverson, PhD; Sahra Kim, PsyD; Alyssa Currao, MPH; Jennifer R. Fonda, PhD; Tara E. Galovski, PhD



Ghaith et al., 2002


Original Research

Structural Brain Alterations in Female Survivors of Intimate Partner Violence

Journal of Interpersonal Violence
2022, Vol. 37(7-8) NP4684–NP4717
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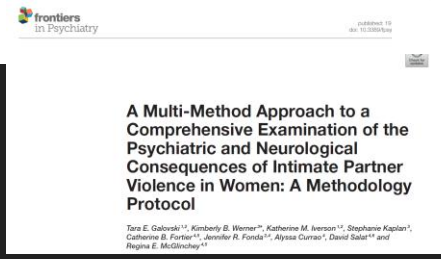
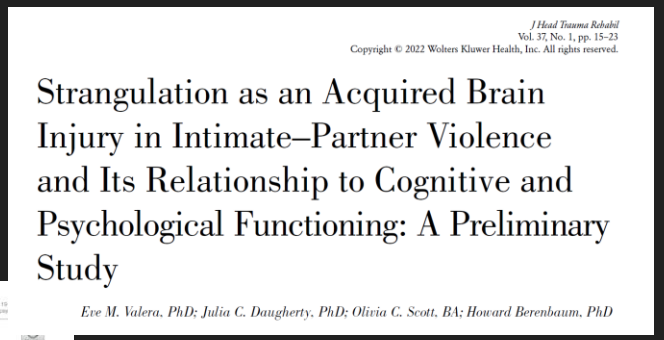
Julia C. Daugherty, Juan Verdejo-Román, Miguel Pérez-García, and Natalia Hidalgo-Ruzzante


frontiers in Psychiatry

A Multi-Method Approach to a Comprehensive Examination of the Psychiatric and Neurological Consequences of Intimate Partner Violence in Women: A Methodology Protocol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Strangulation as an Acquired Brain Injury in Intimate–Partner Violence and Its Relationship to Cognitive and Psychological Functioning: A Preliminary Study

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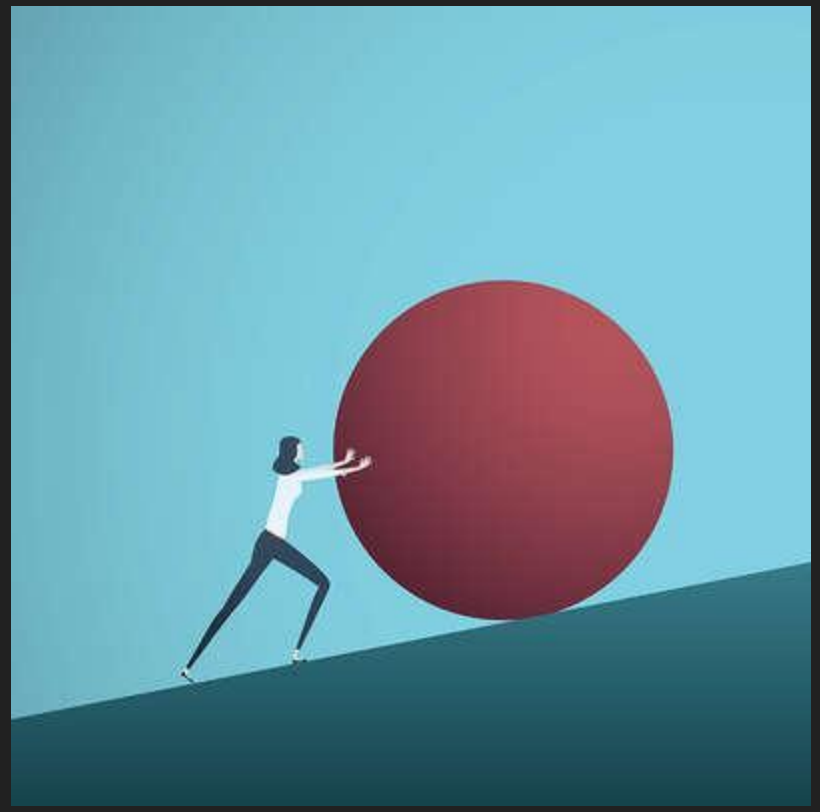
IPV-BI: Care Interventions and Resources

Why Hesitate to Seek Help for Brain Injury?

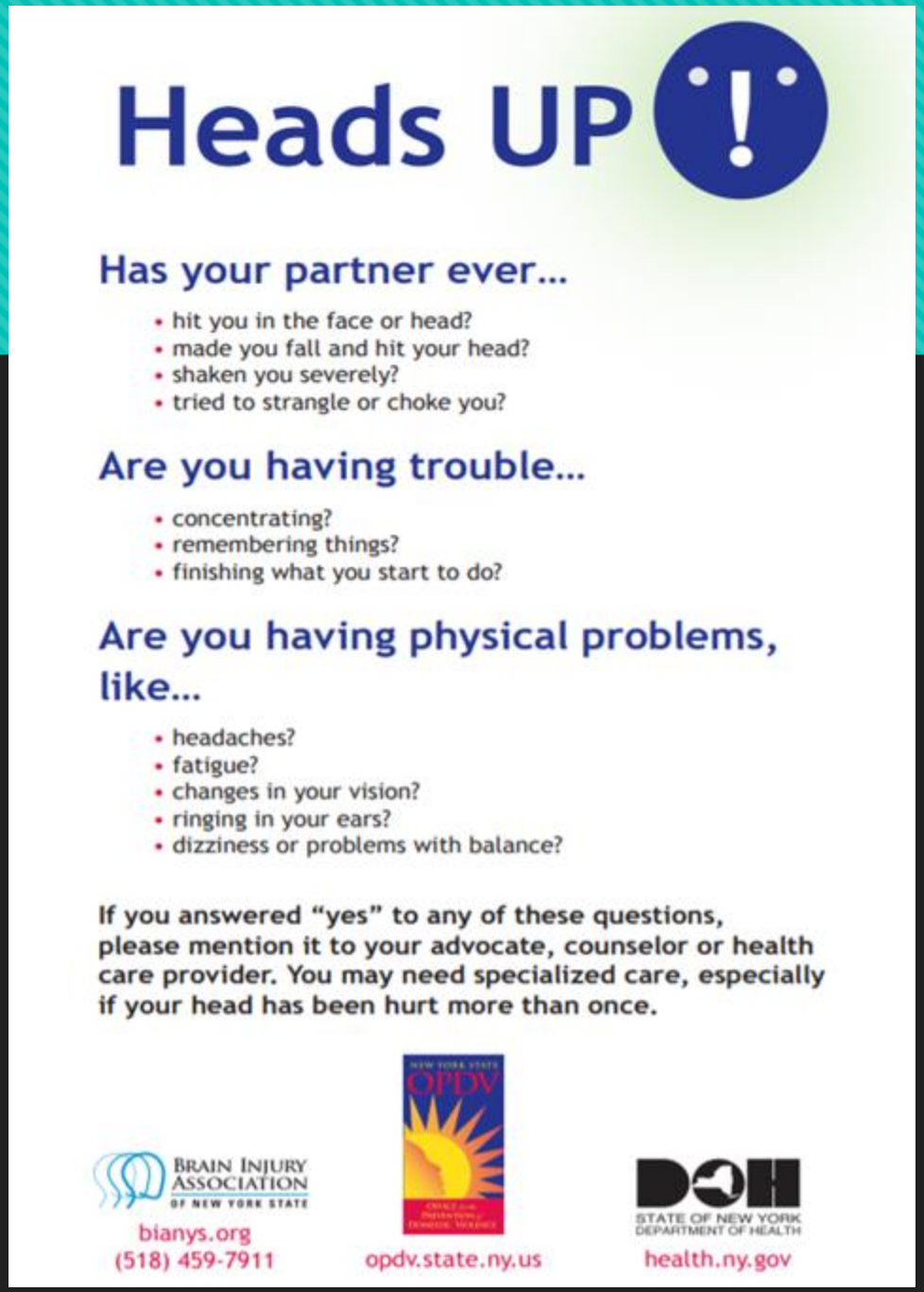
- Cognitive symptoms
- Safety concerns/partner manipulation
- Shame, stigma, or worry about abuse and/or being "brain injured"
- Fear of losing custody of their children
- Fear of getting partner in trouble
  - Especially, if economically dependent
- Lack of transportation, health insurance

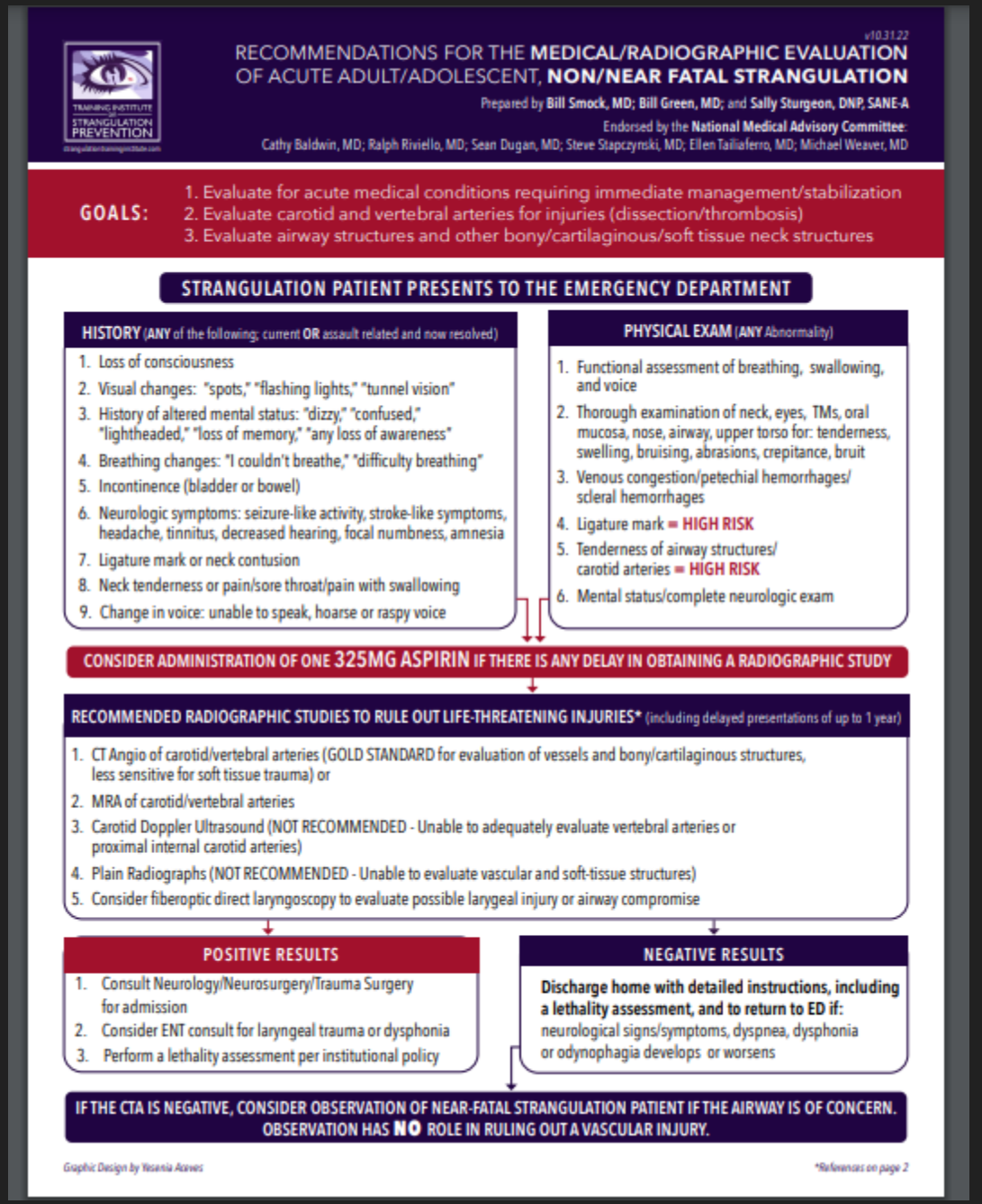


Murray, 2016; https://abitoolkit.ca/service-provision/screening-for-brain-injury

Screening Questions

https://abitoolkit.ca/assets/images/HEADS-UP.pdf

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RECOMMENDATIONS FOR THE MEDICAL/RADIOGRAPHIC EVALUATION OF ACUTE ADULT/ADOLESCENT, NON/NEAR FATAL STRANGULATION
Prepared by Bill Smock, MD; Bill Green, MD; and Sally Sturgeon, DNP, SANE-A
Endorsed by the National Medical Advisory Committee:
Cathy Baldwin, MD; Ralph Riviello, MD; Sean Dugan, MD; Steve Stapczynski, MD; Ellen Taliaferro, MD; Michael Weaver, MD
GOALS:
1. Evaluate for acute medical conditions requiring immediate management/stabilization
2. Evaluate carotid and vertebral arteries for injuries (dissection/thrombosis)
3. Evaluate airway structures and other bony/cartilaginous/soft tissue neck structures
STRANGULATION PATIENT PRESENTS TO THE EMERGENCY DEPARTMENT
HISTORY (ANY of the following; current OR assault related and now resolved)
1. Loss of consciousness
2. Visual changes: "spots," "flashing lights," "tunnel vision"
3. History of altered mental status: "dizzy," "confused," "lightheaded," "loss of memory," "any loss of awareness"
4. Breathing changes: "I couldn't breathe," "difficulty breathing"
5. Incontinence (bladder or bowel)
6. Neurologic symptoms: seizure-like activity, stroke-like symptoms, headache, tinnitus, decreased hearing, focal numbness, amnesia
7. Ligature mark or neck contusion
8. Neck tenderness or pain/sore throat/pain with swallowing
9. Change in voice: unable to speak, hoarse or raspy voice
PHYSICAL EXAM (ANY Abnormality)
1. Functional assessment of breathing, swallowing, and voice
2. Thorough examination of neck, eyes, TMs, oral mucosa, nose, airway, upper torso for: tenderness, swelling, bruising, abrasions, crepitance, bruit
3. Venous congestion/petechial hemorrhages/ scleral hemorrhages
4. Ligature mark = HIGH RISK
5. Tenderness of airway structures/ carotid arteries = HIGH RISK
6. Mental status/complete neurologic exam
CONSIDER ADMINISTRATION OF ONE 325MG ASPIRIN IF THERE IS ANY DELAY IN OBTAINING A RADIOGRAPHIC STUDY
RECOMMENDED RADIOGRAPHIC STUDIES TO RULE OUT LIFE-THREATENING INJURIES* (including delayed presentations of up to 1 year)
1. CT Angio of carotid/vertebral arteries (GOLD STANDARD for evaluation of vessels and bony/cartilaginous structures, less sensitive for soft tissue trauma) or
2. MRA of carotid/vertebral arteries
3. Carotid Doppler Ultrasound (NOT RECOMMENDED - Unable to adequately evaluate vertebral arteries or proximal internal carotid arteries)
4. Plain Radiographs (NOT RECOMMENDED - Unable to evaluate vascular and soft-tissue structures)
5. Consider fiberoptic direct laryngoscopy to evaluate possible larygeal injury or airway compromise
POSITIVE RESULTS
1. Consult Neurology/Neurosurgery/Trauma Surgery for admission
2. Consider ENT consult for laryngeal trauma or dysphonia
3. Perform a lethality assessment per institutional policy
NEGATIVE RESULTS
Discharge home with detailed instructions, including a lethality assessment, and to return to ED if:
neurological signs/symptoms, dyspnea, dysphonia or odynophagia develops or worsens
IF THE CTA IS NEGATIVE, CONSIDER OBSERVATION OF NEAR-FATAL STRANGULATION PATIENT IF THE AIRWAY IS OF CONCERN. OBSERVATION HAS NO ROLE IN RULING OUT A VASCULAR INJURY.
Graphic Design by Yesenia Aceves
*References on page 2

TISP, 2019

Attention and Concentration

- Decrease distractions, interruptions.
- Minimize bright lights, extraneous noise.
- Limit length of meetings and build in short breaks.
- Work on one task at a time (also helps with fatigue).
- Speak clearly and concisely.

http://www.ncdsv.org/images/NYSOPDV_TBIandDV.pdf

Information Processing and Memory

- Talk slowly, stay on point.
- Focus on one task at a time.
- Break information into small pieces.
- Double-check for understanding.
- Be factual, not abstract.

http://www.ncdsv.org/images/NYSOPDV_TBIandDV.pdf

Information Processing and Memory

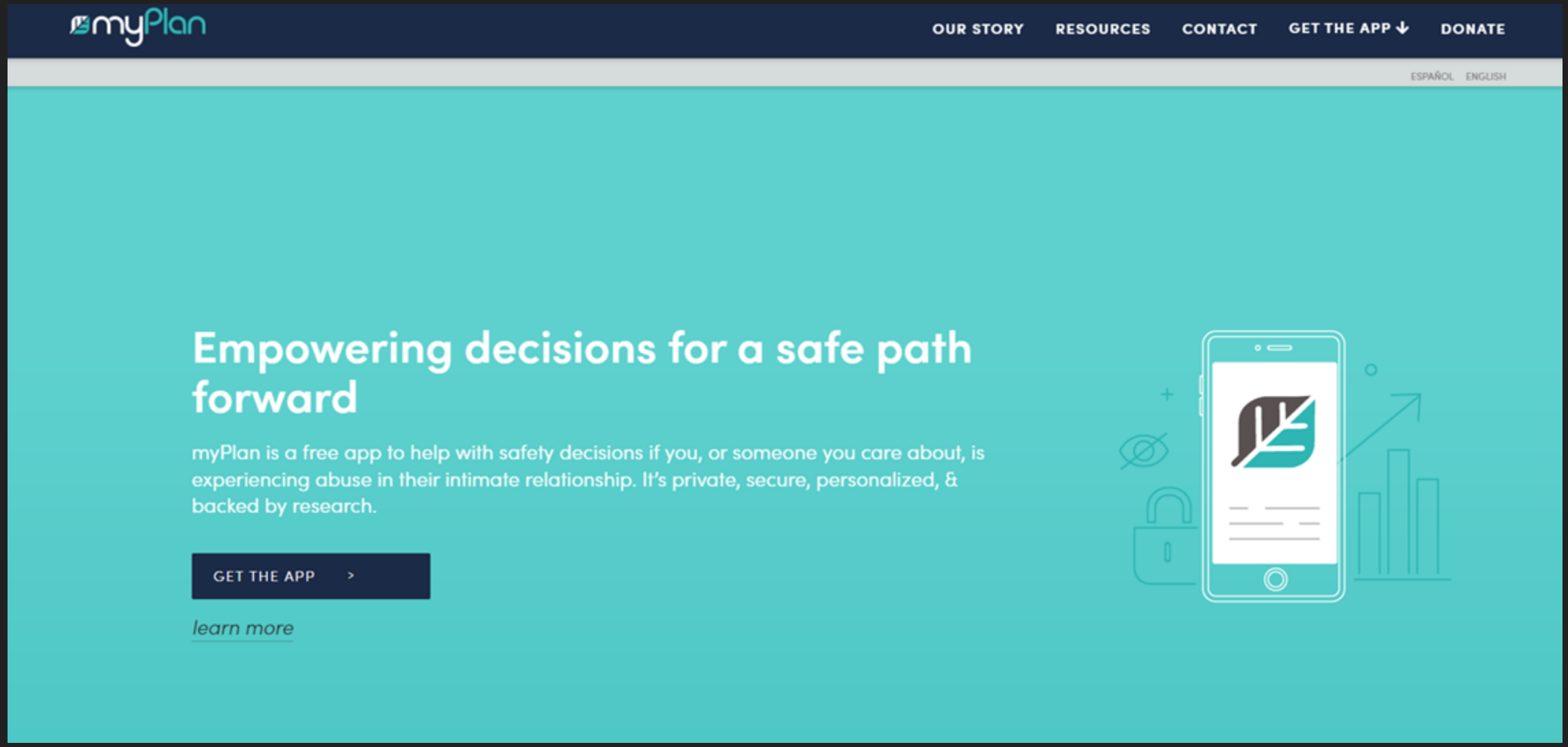
- Ask yes-or-no questions.
- Repeat, repeat, repeat.
- Give tasks in sequential steps.
- Provide checklists, “to-do” lists.

http://www.ncdsv.org/images/NYSOPDV_TBIandDV.pdf

Executive Functioning

- Help prioritize goals and break them into small, tangible, sequential steps.
- Provide clear, detailed orders.
- Warm hand-off to advocates and other staff for assistance with forms and navigating court process.
- Allow extra time for task completion.
- Point out possible short- and long-term consequences of specific choices.
- Provide clear and specific feedback.

http://www.ncdsv.org/images/NYSOPDV_TBIandDV.pdf



https://myplanapp.org/

BALTIMORE
Forensic Nurse Examiners Program

bMOREsafe
Mercy Medical Center

http://www.bmoresafemercy.org/

Links to Resources

- Maryland Network Against Domestic Violence:
  - https://www.mnadv.org/
- The Center on Partner-Inflicted Brain Injury (Ohio Domestic Violence Network)
  - https://www.odvn.org/brain-injury/
- Maryland Health Care Coalition Against Domestic Violence
  - https://healthanddv.org/

Links to Resources

- Futures Without Violence
  - www.futureswithoutviolence.org
- Training Institute on Strangulation Prevention
  - https://www.strangulationtraininginstitute.com/
- Pink Concussions
  - https://www.pinkconcussions.com/

Links to Resources

- Further Reading
  - https://www.nytimes.com/2022/03/01/magazine/brain-trauma-domestic-violence.html
  - https://www.newyorker.com/news/news-desk/the-unseen-victims-of-traumatic-brain-injury-from-domestic-violence

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