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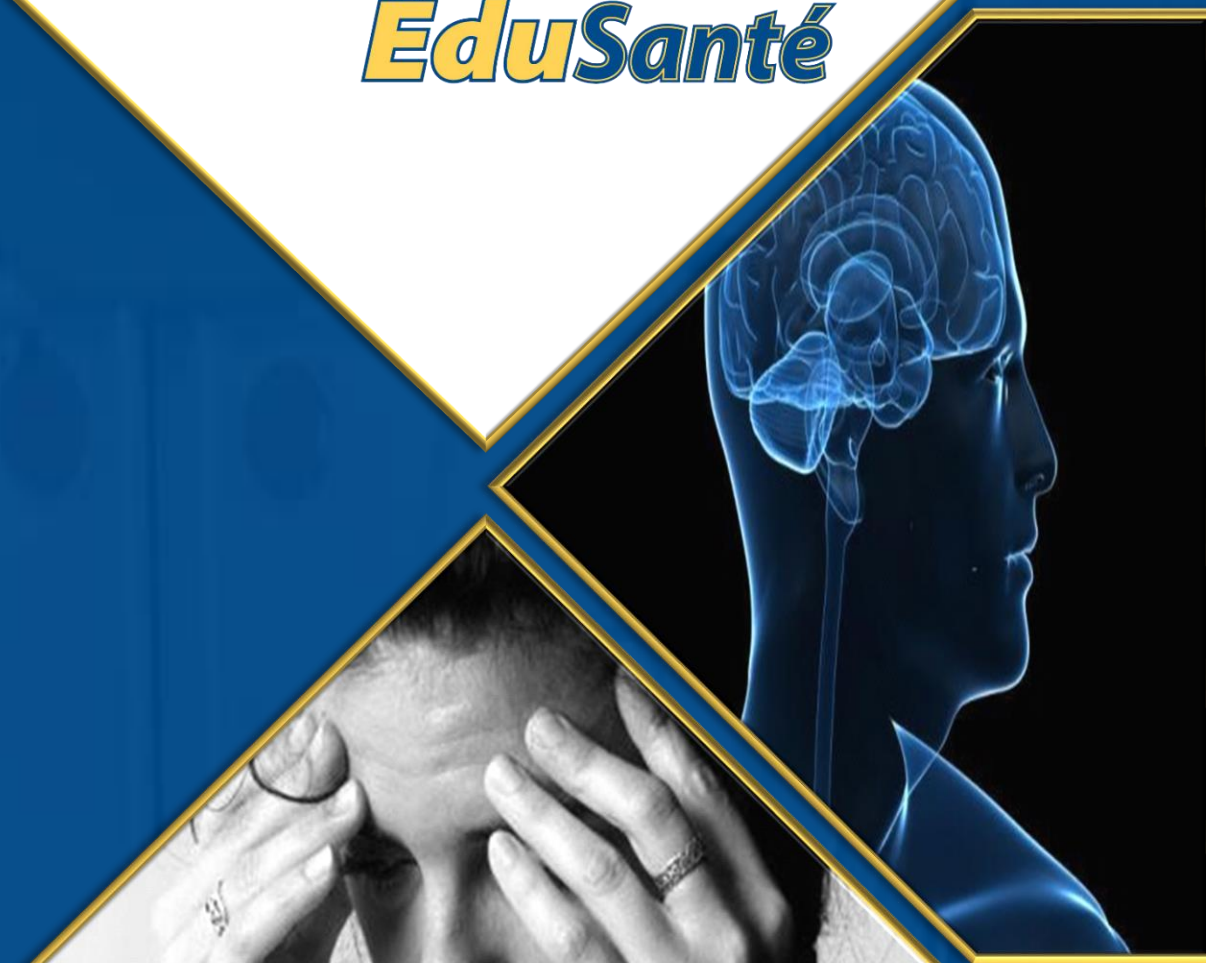
Neurology

Primary Care Paramedicine



Module: 13

Section: 04

Lecture Outline

- Introduction
- Pathophysiology
- General assessment findings
- General management of nervous system emergencies

Lecture Outline

- Review of nervous system emergencies:
  - Altered mental status
  - Stroke
  - Seizures
  - Infection
  - Syncope
  - Headache and vertigo
  - Neoplasms
  - Degenerative disorders

Introduction

- Nervous system disorders affect 3.6 M Canadians in community and 170 K in long term care facilities.
- Neuro conditions account for more than half of the Canadians requiring continuing care.
- Over the next 20 years, Canada will see a significant increase in the number of people diagnosed with a neuro condition.

Source: Public Health Agency Canada, 2014.

Pathophysiology

- Consciousness is a state of awareness of the environment (intact cerebral cortex) and is fully responsive to stimuli (intact RAS)
- Alterations of the cognitive systems result from dysfunction or interruption of the CNS

Pathophysiology

- Alterations in cognitive systems
  - RAS
  - Cerebral cortex
- Peripheral nervous systems disorders
  - Peripheral neuropathy

Central Nervous System Disorders

Structural lesions

- Tumour
- Degenerative disease
- Intracranial hemorrhage
- Parasites
- Trauma

Toxic-metabolic states

- Anoxia
- Diabetic ketoacidosis
- Hepatic failure
- Hypoglycemia
- Renal failure
- Thiamine deficiency
- Toxic exposure

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Neurology

ALTERED MENTAL STATUS

Case 01

- You respond to a long term care (LTC) facility for a report of an 91 y/o F who has not acting normal and who has just fallen. Upon arrival you find the patient lying in a recovery position on the floor. Staff tell you she is early stage Alzheimer's and borderline diabetic controlled by diet. The patient is conscious, not orientated to time or place. She says she feels tired. You note a pool of urine by her feet and a small abrasion to her knees and 1 cm LAC above her right eye.

Altered Mental Status

A Acidosis, Alcohol, Ammonia, Arrhythmias

E Epilepsy, Electrolytes

I Infection

O Overdose, Oxygen, Opiates

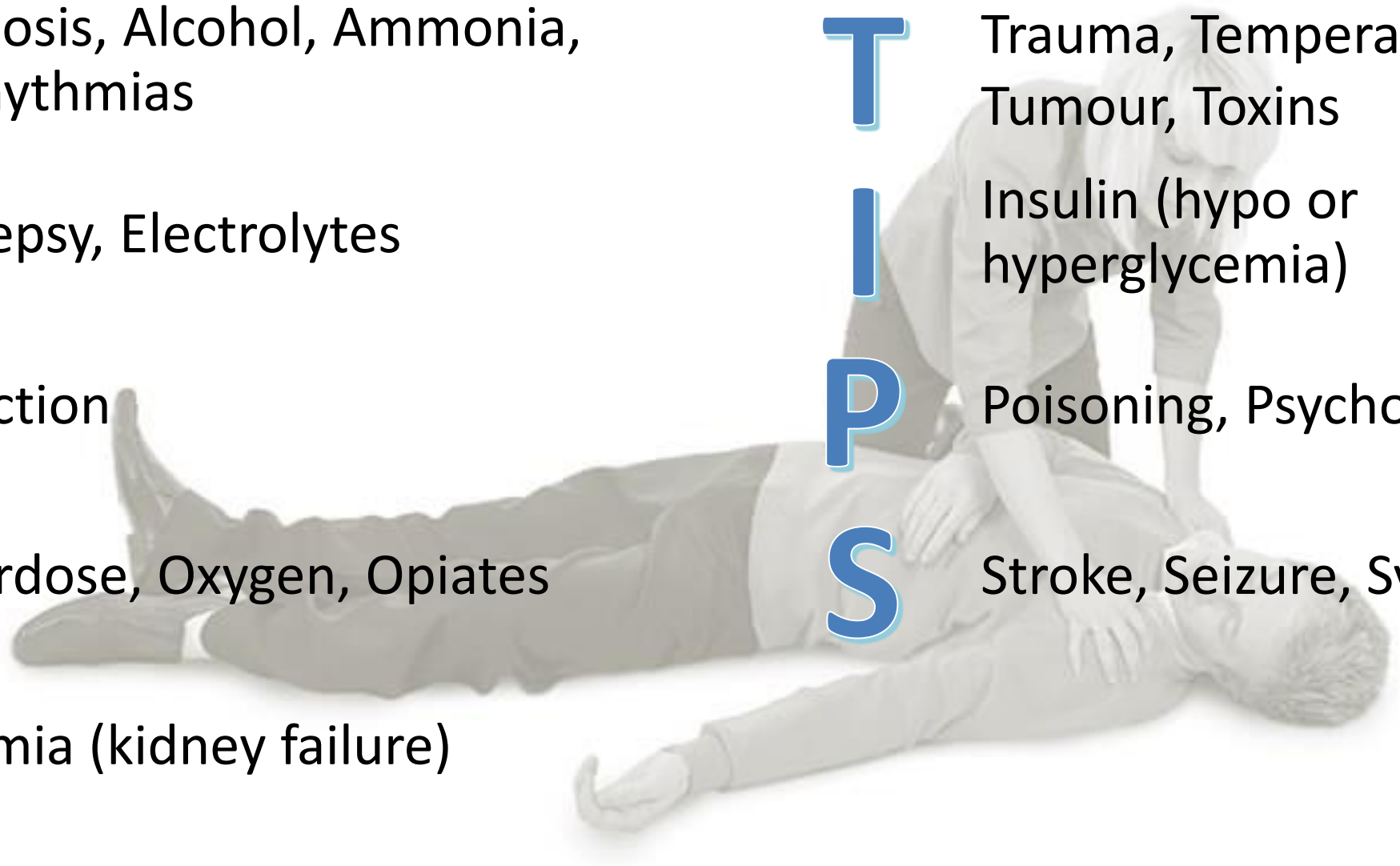
U Uremia (kidney failure)

T Trauma, Temperature, Tumour, Toxins

I Insulin (hypo or hyperglycemia)

P Poisoning, Psychosis

S Stroke, Seizure, Syncope



AEIOU TIPS

- Easily identifiable and retrievable mnemonic used to rule out potential causes of ALOR
- Does not always lead the practitioner to the proper cause.
- Does not evaluate/differentiate between two positive factors

Delirium vs. Dementia

Delirium

- Occurs abruptly
- Symptoms can fluctuate during the day
- **Affects mainly attention**
  - Typically caused by acute illness (i.e dehydration, infection)
  - Dementia is the greatest risk factor for delirium
- Considered a true emergency

Dementia

- Develops over time
- Slow progression of cognitive decline
- **Affects mainly memory**
  - Typically caused by anatomic changes in the brain; has a slower onset and is irreversible

Its possible to have dementia and be suffering from delirium

The hallmark separating delirium from underlying dementia is inattention. The individual simply cannot focus on one idea or task.

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Delirium vs. Dementia

	Delirium	Dementia
Onset	Abrupt	Usually insidious; abrupt in some strokes or trauma
Course	Fluctuates	Slow decline
Duration	Hours to weeks	Months to years
Attention	Impaired	Intact early; often impaired late
Sleep-wake	Disrupted	Usually normal
Alertness	Impaired	Normal
Orientation	Impaired	Intact early; impaired late
Behavior	Agitated, withdrawn or depressed; or combination	Intact early
Speech	Incoherent, rapid/slowed	Word-finding problems
Thoughts	Disorganized, delusions	Impoverished
Perceptions	Hallucinations/illusions	Usually intact early

Source: Adapted from: Gower LE, et al. *Western J Emerg Med.* 2012;13:194-201.

Mini Mental State Examination (MMSE)

- A cognitive test used to screen for the presence of cognitive impairment

Total	Functionality
20 – 30	Functions well
10 – 20	Moderately frail
< 10	Severely frail

STANDARDIZED MINI-MENTAL STATE EXAMINATION (SMMSE)

	QUESTION	TIME ALLOWED	SCORE
1	a. ***What year is this?***	10 seconds	/1
	b. ***Which season is this?***	10 seconds	/1
	c. ***What month is this?***	10 seconds	/1
	d. ***What is today's date?***	10 seconds	/1
	e. ***What day of the week is this?***	10 seconds	/1
2	a. ***What country are we in?***	10 seconds	/1
	b. ***What province are we in?***	10 seconds	/1
	c. ***What city/town are we in?***	10 seconds	/1
	d. ***IN HOME – What is the street address of this house?*** ***IN FACILITY – What is the name of this building?***	10 seconds	/1
	e. ***IN HOME – What room are we in? IN FACILITY – What floor are we on?***	10 seconds	/1
3	**SAY:** ***I am going to name three objects. When I am finished, I want you to repeat them. Remember what they are because I am going to ask you to name them again in a few minutes.*** Say the following words slowly at 1-second intervals - **ball/ car/ man**	20 seconds	/3
4	***Spell the word WORLD. Now spell it backwards.***	30 seconds	/5
5	***Now what were the three objects I asked you to remember?***	10 seconds	/3
6	**SHOW** wristwatch. **ASK:** ***What is this called?***	10 seconds	/1
7	**SHOW** pencil. **ASK**: ***What is this called?***	10 seconds	/1
8	**SAY:** ***I would like you to repeat this phrase after me: No ifs, ands or buts.***	10 seconds	/1
9	**SAY:** ***Read the words on the page and then do what it says.*** Then hand the person the sheet with CLOSE YOUR EYES on it. If the subject reads and does not close their eyes, repeat up to three times. Score only if subject closes eyes	10 seconds	/1
10	**HAND** the person a pencil and paper. **SAY:** ***Write any complete sentence on that piece of paper.*** (Note: The sentence must make sense. Ignore spelling errors)	30 seconds	/1
11	**PLACE** design, eraser and pencil in front of the person. **SAY**: ***Copy this design please.***  Allow multiple tries. Wait until person is finished and hands it back. Score only for correctly copied diagram with a 4-sided figure between two 5-sided figures.	1 minute	/1
12	**ASK** the person if he is right or left-handed. Take a piece of paper and hold it up in front of the person. **SAY**: ***Take this paper in your right/left hand*** (whichever is non-dominant), ***fold the paper in half once with both hands and put the paper down on the floor*** . Score 1 point for each instruction executed correctly.	30 seconds	
	Takes paper correctly in hand		/1
	Folds it in half		/1
	Puts it on the floor		/1
	TOTAL TEST SCORE		**/30**

Note: This tool is provided for use in British Columbia with permission by Dr. William Molloy. This questionnaire should not be further modified or reproduced without the written consent of Dr. D. William Molloy.

Provided by the Alzheimer's Drug Therapy Initiative for physician use.

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Neurology

CVA/TIA

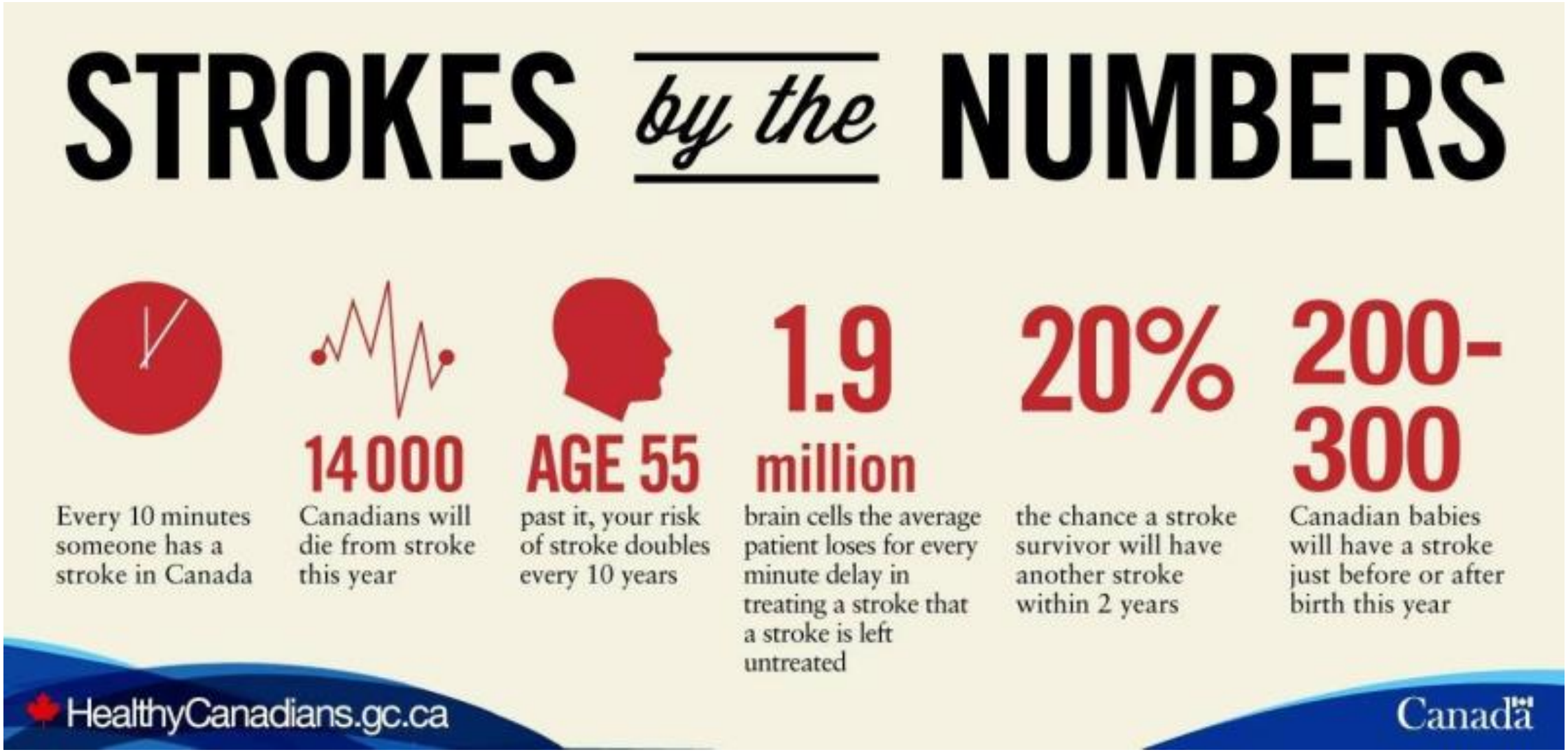
Case 02

- You respond to a call for a 41 y/o M who appears not to be acting normal. Upon arrival at the address you find the patient sitting in his lazy boy slumped to his right side. The patients wife said they were watching TV and he all of a sudden began to speak gibberish. No past history although his wife says he was recently diagnosed with mild hypertension. The patient is conscious, orientated to person only, speaking in slurred speech and is unable to move his right arm.

Stroke

- Injury or death to brain tissue
  - Usually due to an interruption in cerebral blood flow
- Physiology compares to an MI
- Categories
  - Occlusive
  - Hemorrhagic

Statistics


STROKES by the NUMBERS
Every 10 minutes someone has a stroke in Canada
14 000
Canadians will die from stroke this year
AGE 55
past it, your risk of stroke doubles every 10 years
1.9 million
brain cells the average patient loses for every minute delay in treating a stroke that a stroke is left untreated
20%
the chance a stroke survivor will have another stroke within 2 years
200-300
Canadian babies will have a stroke just before or after birth this year
HealthyCanadians.gc.ca
Canada

Effects

For every minute delay in treating a stroke, the average patient loses 1.9 million brain cells, 13.8 billion synapses, and 12 km of axonal fibres (Saver, 2006)

Each hour in which treatment does not occur, the brain loses as many neurons as it does in almost 3.6 years of normal aging (Saver, 2006)

Risk Factors

Unpreventable Risk Factors

- Age
- Gender
- Family history of heart disease or stroke
- Prior CVA or TIA
- Race

Preventable Risk Factors

- Diabetes
- Excessive alcohol consumption
- High blood pressure
- A diet high in saturated fat, trans fat, and cholesterol
- Obesity
- Lack of physical activity
- Cigarette smoking
- Stress

Risk Factors

- Risk factors unique to women

CVA

- Sudden interruption of blood flow to the brain
- It is caused by the:
  - Interruption of the flow of blood to the brain (an ischemic stroke)
  - Rupture of blood vessels in the brain (a hemorrhagic stroke)

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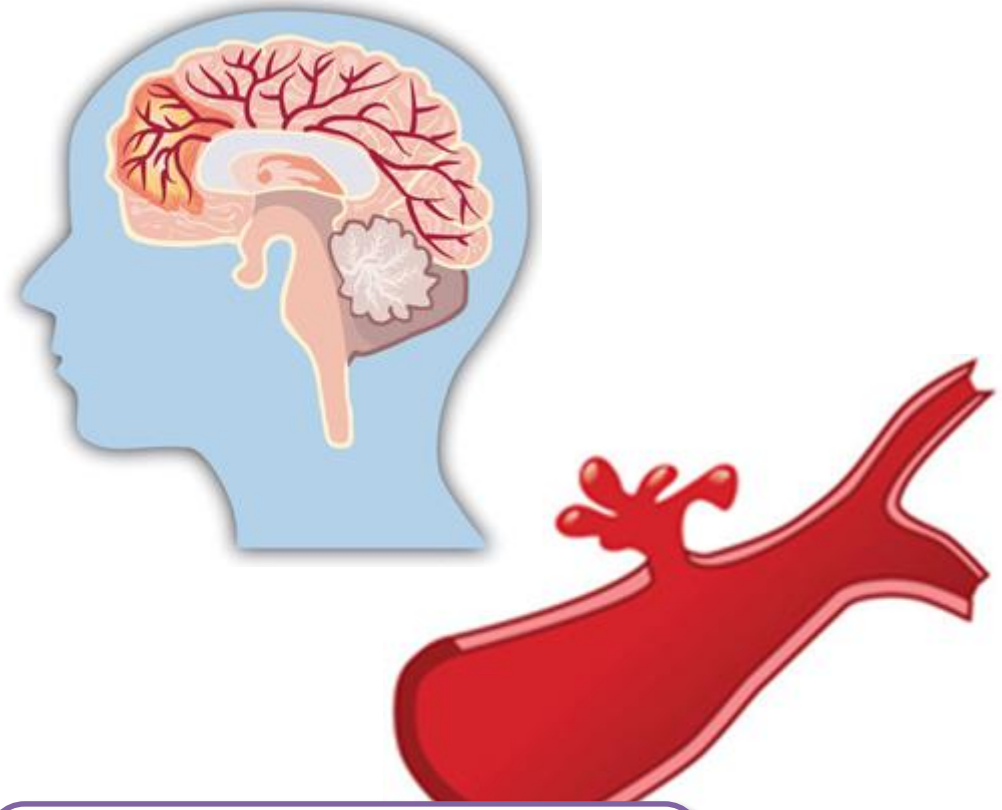
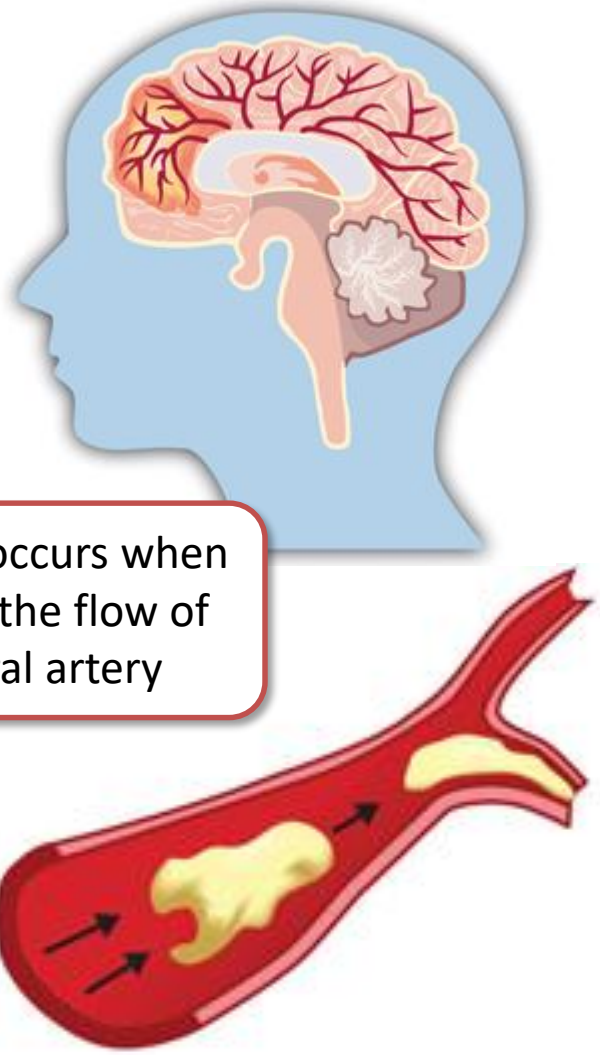
Types of Strokes



An **hemorrhagic stroke** occurs when a blood vessel bursts within the brain



An **ischemic stroke** occurs when a blood clot blocks the flow of blood in a cerebral artery

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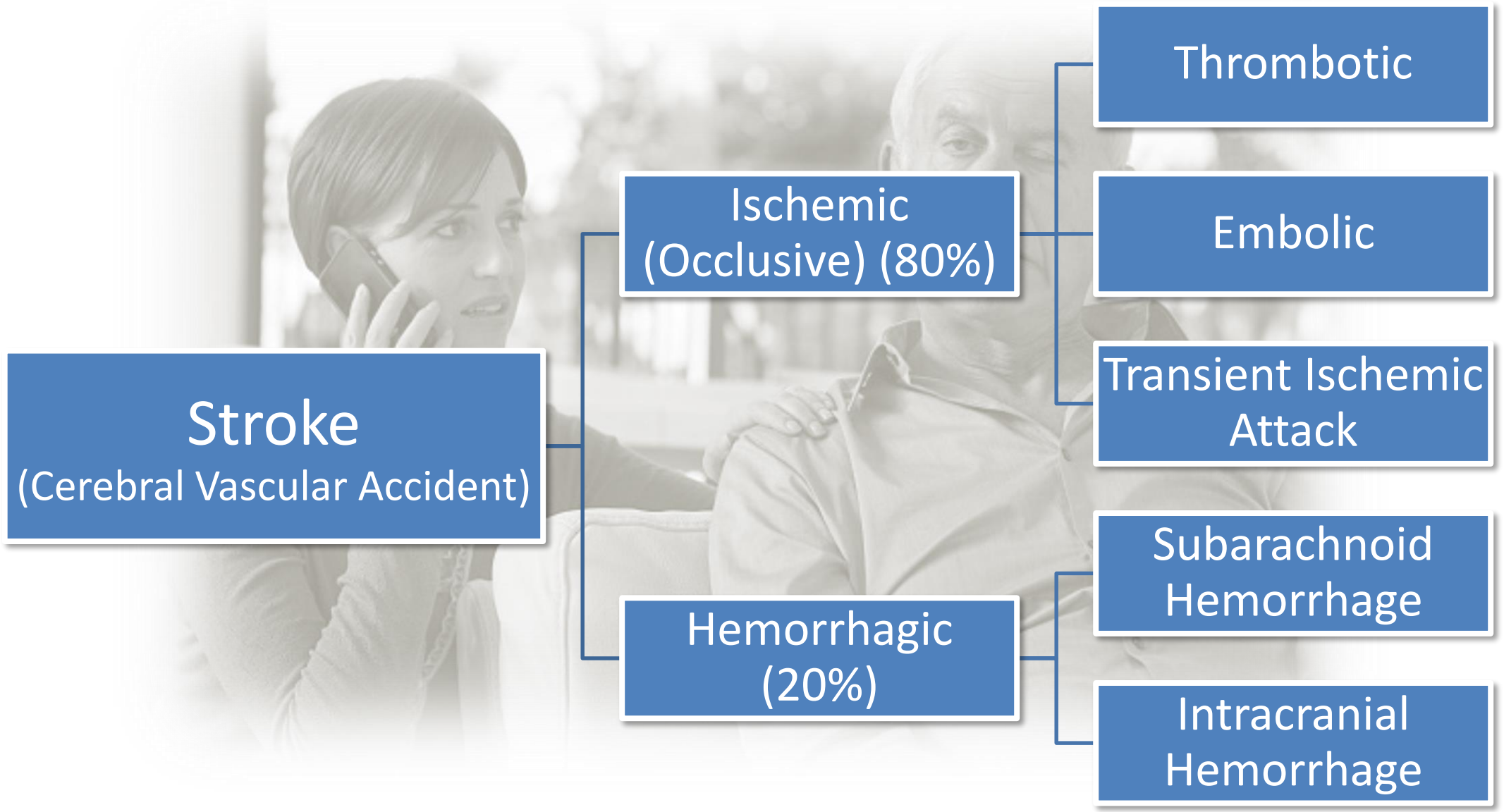
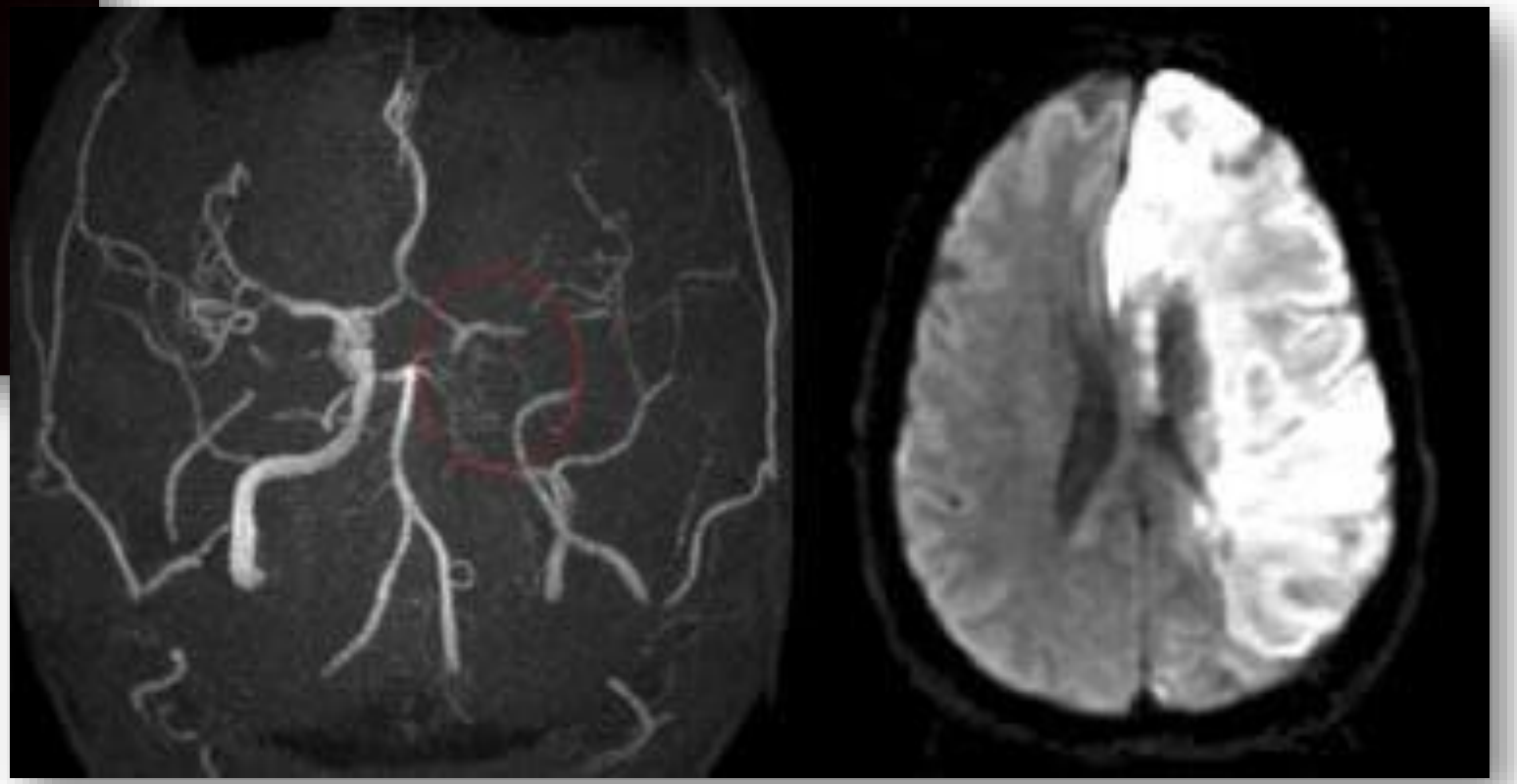
Stroke Types



Occlusive Stroke

- AKA Ischemic Stoke
- 80% of strokes are occlusive
- Often referred to as being either:
  - Thrombotic
  - Embolic

Occlusive Stroke



Occlusive Stroke

Signs and Symptoms

- Hemiparesis or Hemiplegia (opposite side of lesion)
- Numbness
- Aphasia
- Confusion or coma
- Convulsions
- Incontinence
- Diplopia (double vision)
- Monocular blindness (loss of vision in one eye)
- Numbness of the face
- Dysarthria (slurred speech)
- Headache
- Dizziness or vertigo
- Ataxia

Hemorrhagic Stroke

- About 20% of strokes are hemorrhagic (high mortality)
- Usually occur during stress or exertion (and possible drug use)
- There are two main types of hemorrhagic stroke:
  - Subarachnoid hemorrhage
  - Intracerebral hemorrhage

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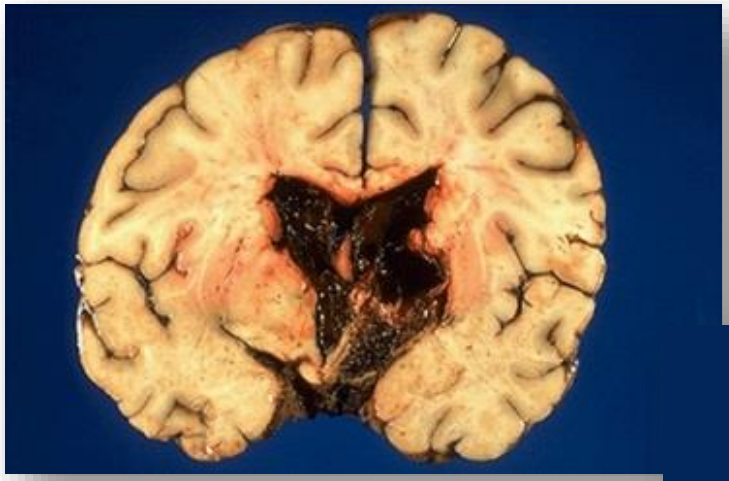
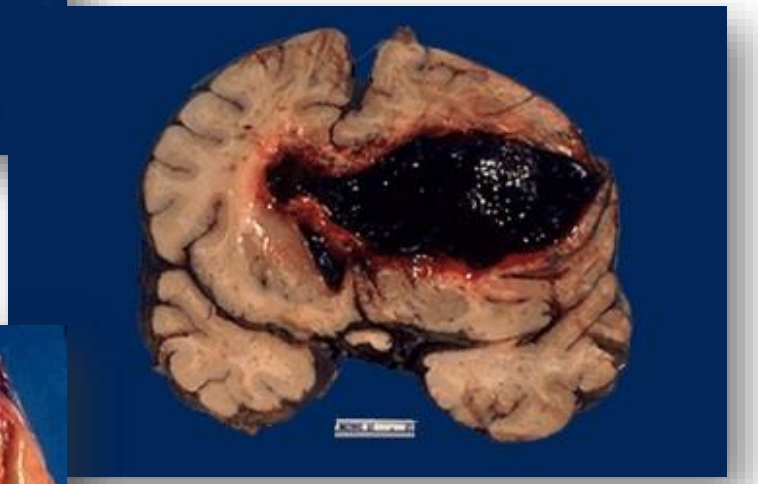
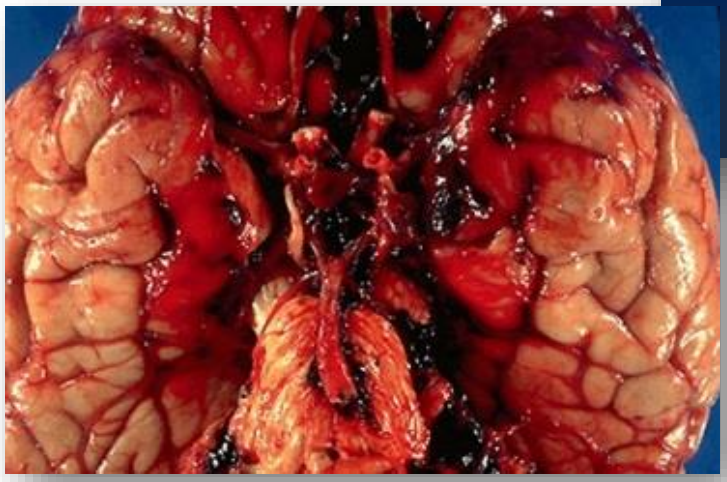
Hemorrhagic Stroke







Hemorrhagic Stroke

- Sudden onset characterized by headache and decreased LOC
- Intracranial
  - Within the brain
  - Small blood vessels
  - Effects depend on location of blood vessels
- Subarachnoid
  - Develops from congenital blood vessel abnormalities

Hemorrhagic Stroke

- Hemorrhage inside the brain tears and separates blood vessels
- Impaired drainage of CSF
- Herniation of brain tissue occurs rapidly

Hemorrhagic Stroke

Signs and Symptoms

- Abrupt presentation
- Usually begins with a headache
- N/V
- Progressive deterioration in LOC
- Often have syncope or seizure at time of hemorrhage
- Cushing's Reflex

Hemorrhagic Stroke

Signs	Symptoms
• Facial drooping • Headache • Aphasia/dysphasia • Hemiparesis • Hemiplegia • Paresthesia • Gait disturbances • Incontinence	• Confusion • Agitation • Dizziness • Vision problems

Posterior Circulation Stroke

- Defined by infarction occurring within the vascular territory supplied by the vertebrobasilar arterial system
- 20% of ischemic events involve PC
- Difficult to diagnose because they present in such diverse ways
- Etiologies
  - Atherosclerosis
  - Cardioembolism
  - Dissection

Posterior Circulation Stroke

Signs	Symptoms
• Unilateral limb weakness (38%) • Gait ataxia (31%) • Unilateral limb ataxia (30%) • Dysarthria (28%) • Nystagmus (24%) • Babinski's sign (24%)	• Dizziness (47%) • Unilateral limb weakness (41%) • Dysarthria (31%) • Headache (28%) • Nausea or vomiting (27%) • Blurry vision (20%)

Transient Ischemic Attack (TIA)

- Caused by a temporary interruption of blood flow to the brain
- S/S are similar to an ischemic stroke except they go away in a few minutes or hours (no more than 24 hours)
- Important warning sign that you may be at risk of having an ischemic stroke in the future
- Carotid artery disease is most common cause

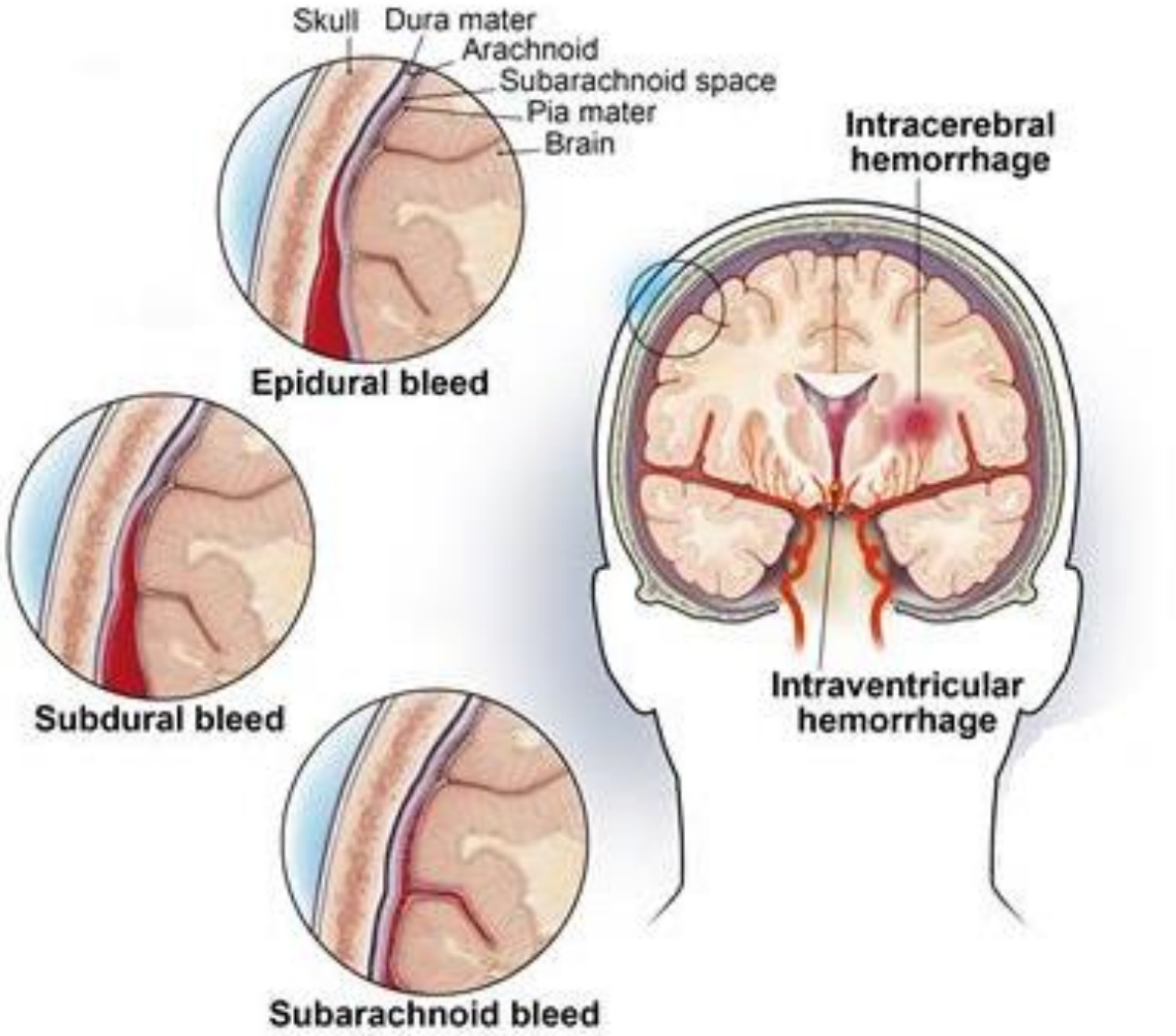
Signs and Symptoms of TIA

- May include:
  - Unilateral motor weakness affecting the face, arm or leg
  - Speech (dysarthria) or language (aphasia) difficulties
  - Visual disturbance (transient monocular blindness, hemianopia or diplopia)
  - Unilateral sensory disturbance (paresthesias) affecting the face, arm or leg
  - Ataxia

Sudden onset of symptoms

Note: Speech and motor deficits are the key symptoms of TIA

Intracerebral Hemorrhage



Rupture blood vessel within the brain

- Bleeding directly into brain
- Direct cerebral irritation

Intracerebral Hemorrhage

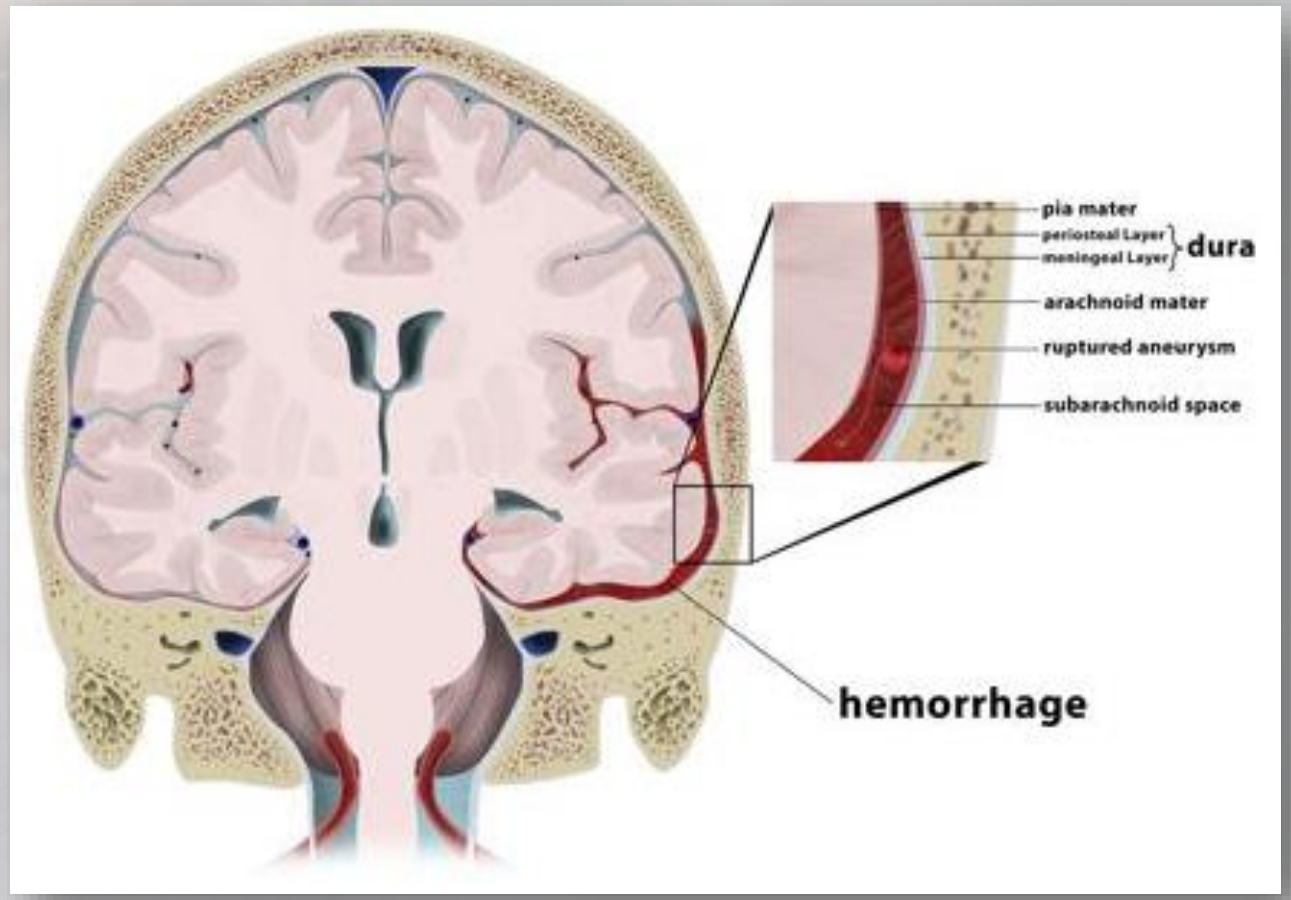
Signs and Symptoms

- tends to happen in person who is awake
- symptoms worsen over a period of 30 to 90 min
- sudden weakness
- paralysis / numbness
- inability to speak
- inability to control eye movements
- N/V
- difficulty walking
- irregular breathing, stupor, coma

Subarachnoid Hemorrhage

Signs and Symptoms

- sudden severe headache; sometimes described as a thunderclap
- N/V
- sensitivity to light; photophobia
- blurred or double vision
- dizziness, LOC, seizures

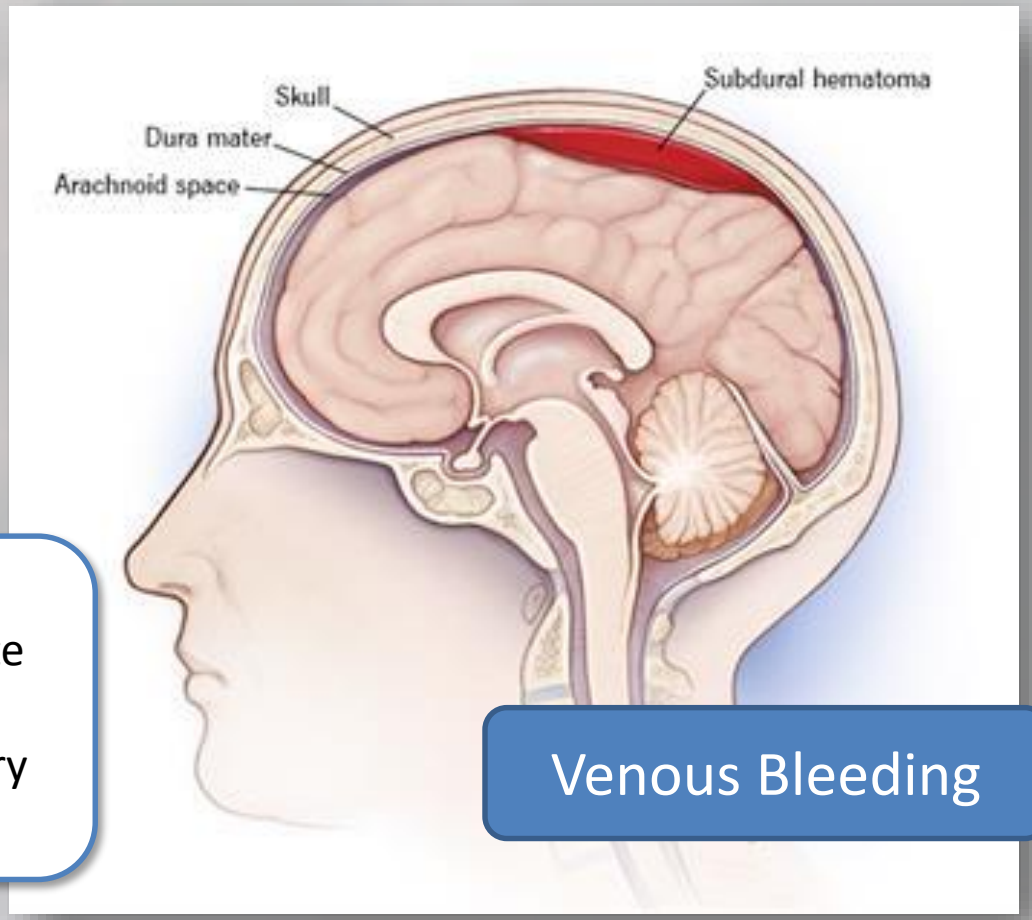


Subdural Hemorrhage

Signs and Symptoms

- headache
- confusion
- change in behaviour
- N/V
- lethargy or excessive drowsiness
- weakness
- seizures

Symptoms depend on rate of bleeding - potentially immediate alter in conscious or be normal for several days after head injury then slowly become confused

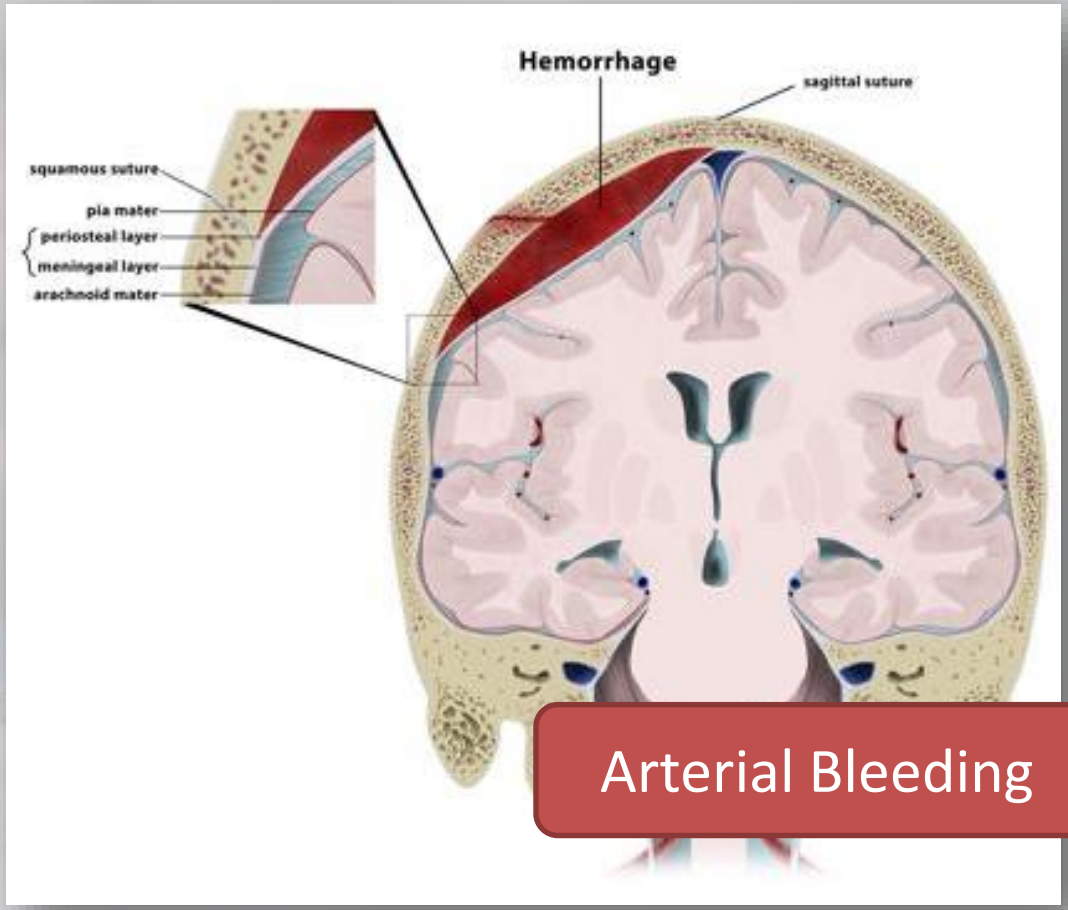


Venous Bleeding

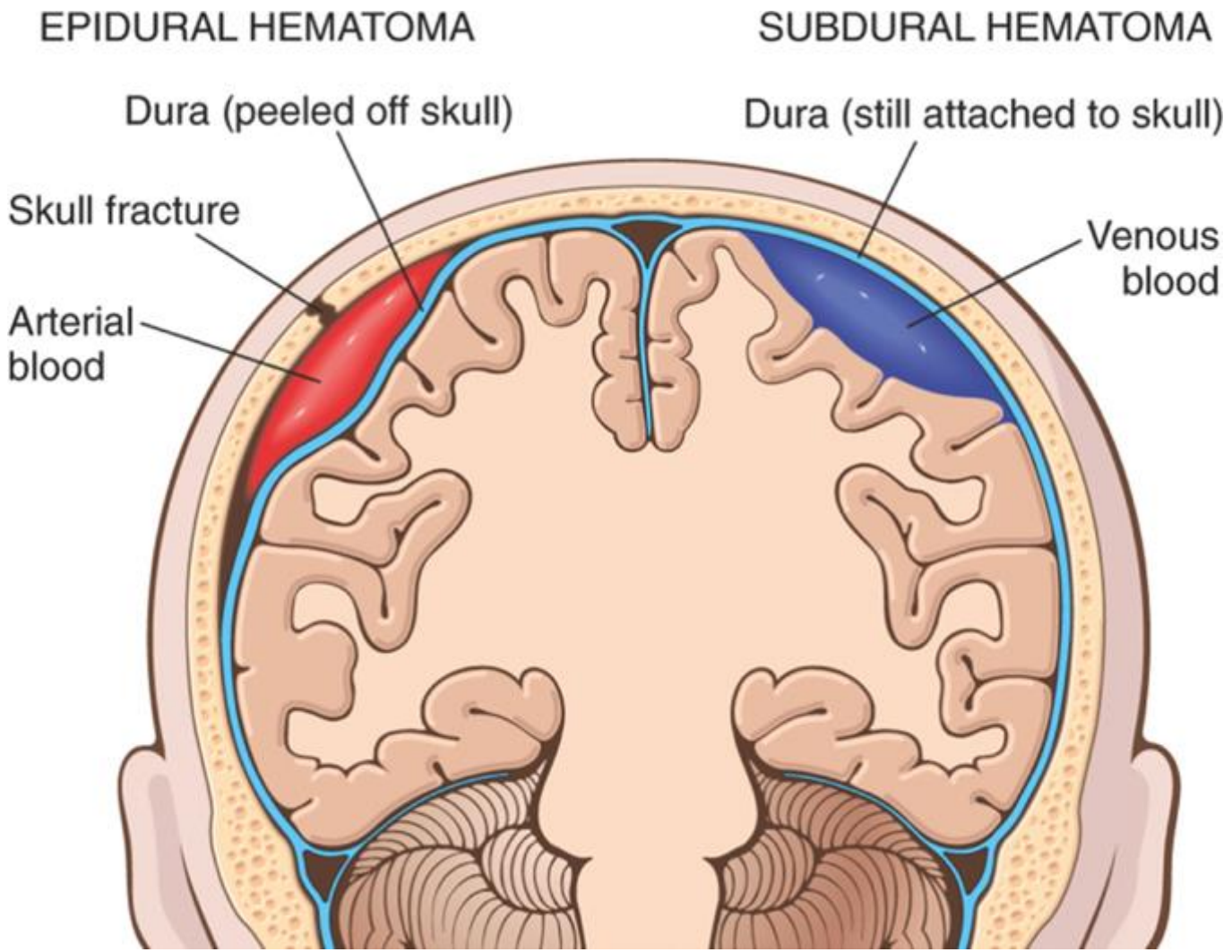
Epidural Hemorrhage

Signs and Symptoms

- Headache
- confusion
- change in behaviour
- N/V
- lethargy or excessive drowsiness
- weakness
- Seizures



Epidural vs. Subdural



Stroke Assessment

- EMS goals
  - Obtain a focused history and patient assessment
  - Provide necessary stabilization and treatment
  - Transport to closest, most appropriate facility
  - Advance notice to receiving ED

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Cincinnati Prehospital Stroke Scale

Facial Droop		Both sides of face move normally
		One side of face is weak or flaccid
Arm Drift		Both arms have equal normal strength
		One arm is weak or doesn't move at all
Speech		Patient uses correct words with no slurring
		Slurred or inappropriate words or mute

1/3 symptoms present

72%

3/3 symptoms present

85%

Stroke Assessment

- Universal precautions
- Scene assessment
- Primary assessment
- Thorough history
- Transport
- Secondary assessment
- Patch

History

- Onset of symptoms (and progression)
- Recent events
  - Stroke, MI
  - Trauma
  - Surgery
  - Bleeding
- Comorbid diseases
  - Hypertension
  - Diabetes mellitus
- Use of medications
  - Anticoagulants
  - Insulin
  - Antihypertensives

Management

- Scene safety and BSI
- Maintain the airway.
- Support breathing.
- Obtain a detailed history.
- Position the patient.
- Determine the blood glucose level.
- Establish IV access.
- Monitor the cardiac rhythm.
- Protect paralyzed extremities.

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Neurology

SEIZURES

Case 03

- You get called to the homeless shelter (around back) for an unconscious male. Upon arrival you find an approx. 50 y/o M supine with empty beer cans and liquor bottles all around him. You note frothiness around his mouth and his tongue is bleeding he also has urinated in his pants. He appears sleepy, responding to pain only by making groaning sounds. While you were looking for a medic alert tag he lets out a screech, tenses up then his extremities begins to shake violently.

Seizure

- Temporary alteration in behaviour die to massive electrical discharge from one or more groups of neurons in the brain
- A symptom of a brain problem

Possible causes	
• CVA/TIA • Brain tumour • Head injury • Medications/drugs • Epilepsy • Electrolyte imbalance	• Hypoglycaemia • Repetitive sounds/lights • Withdrawal from alcohol • Brain infections • Hypoxia • Idiopathic seizures

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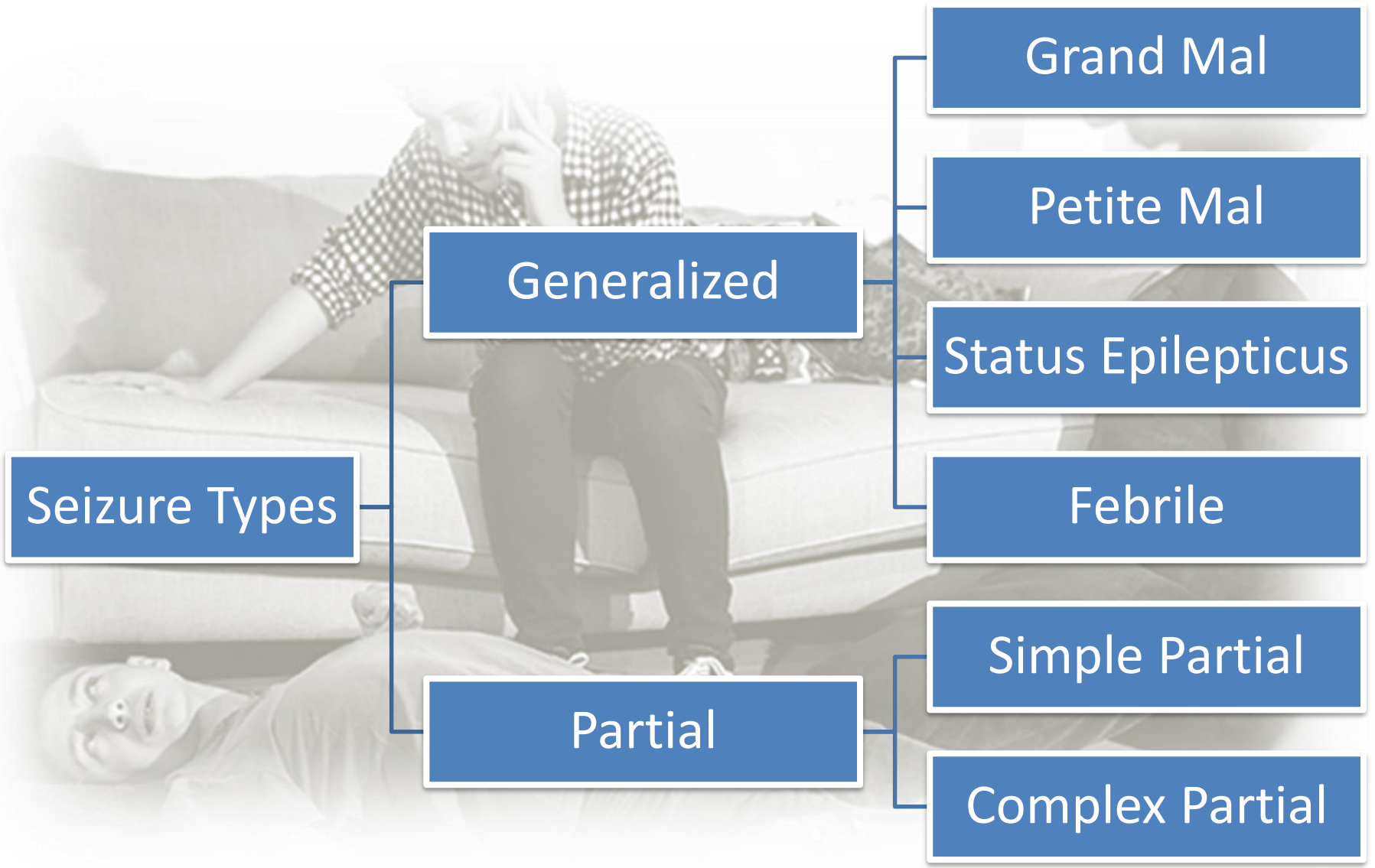
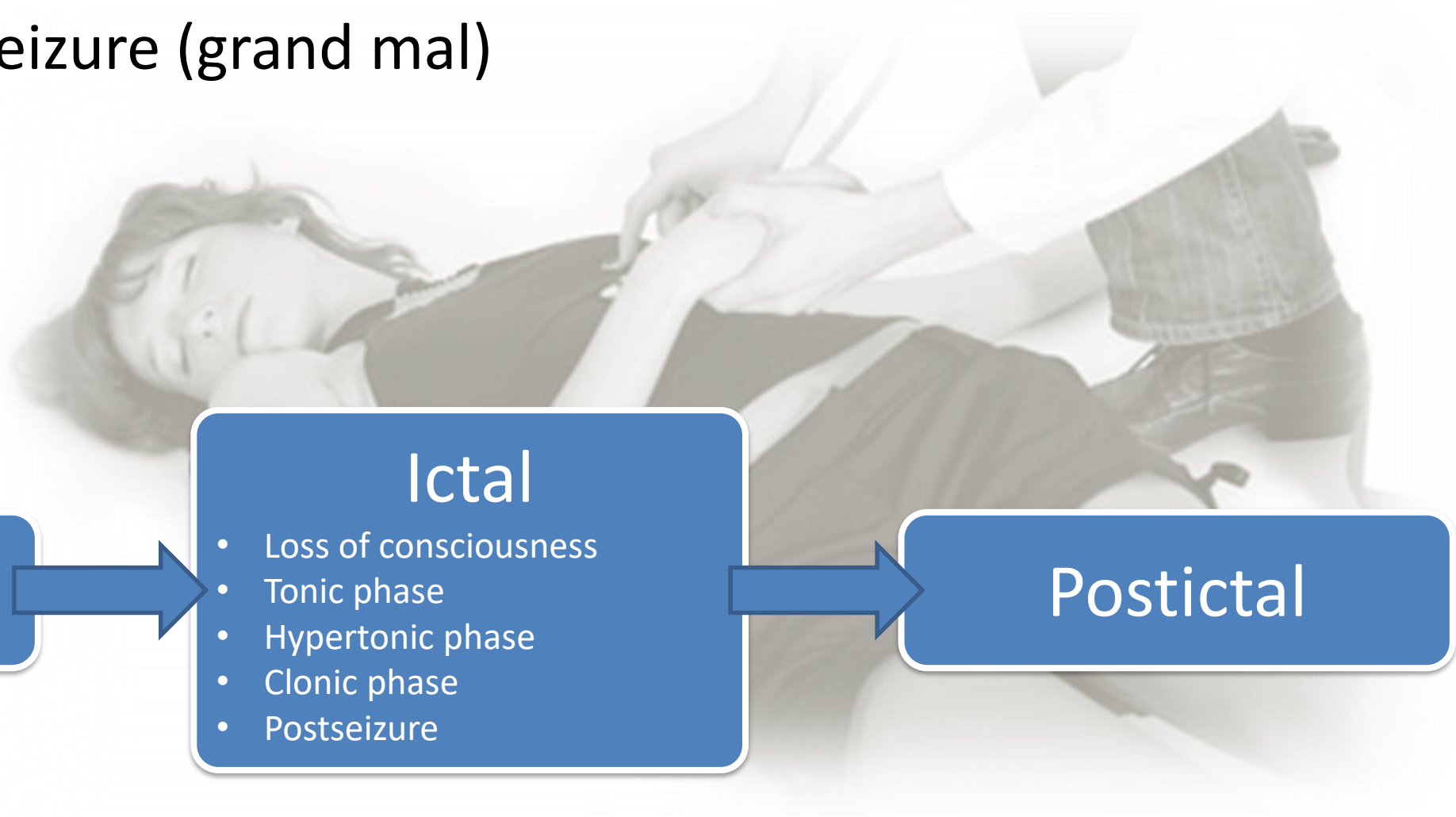
Seizure Types



Generalized Seizures

- Tonic-clonic seizure (grand mal)



Aura → Ictal → Postictal

Ictal

- Loss of consciousness
- Tonic phase
- Hypertonic phase
- Clonic phase
- Postseizure

Aura Phase

Possible Aura Symptoms

- Bitter, acidic taste
- Déja Vu
- Dizziness
- Flickering vision
- Hallucinations
- Head, arm, or leg pain
- Jamais vu (feeling of unfamiliarity with a person, place, or thing despite having already experienced it)
- Nausea/stomachache
- Numbness
- Out-of-body sensation
- Ringing or buzzing sounds
- Strange, offensive smells
- Strong feelings of joy, sadness, fear, or anger
- Subtle arm or leg twitching
- Tingling
- Vision loss or blurring

Ictal Phase

Signs and Symptoms

- Arm or leg stiffening
- Chewing or lip-smacking
- Confusion
- Difficulty breathing
- Distractedness
- Drooling
- Eye or head twitching movement in one direction
- Hearing loss
- Inability to move or speak
- Loss of bladder and/or bowel control
- Memory lapses
- Numbness
- Pale/flushed skin
- Pupil dilation
- Racing heart
- Sense of detachment
- Strange sounds
- Sweating
- Tremors
- Twitching
- Unusual physical activity such as dressing/undressing
- Vision loss, blurring, flashing vision
- Walking/running

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Generalized Seizures

Postictal Phase

Signs and Symptoms

- Arm or leg weakness
- Body soreness
- Confusion
- Difficulty finding names or words
- Drowsiness
- Feelings of fear, embarrassment, or sadness
- General malaise
- Headaches/migraines
- Hypertension
- Memory loss
- Nausea
- Thirst

Generalized Seizures

- Absence (petit mal)
  - Presents with brief loss of consciousness
  - May not respond to normal treatment
- Pseudoseizure
  - Usually stem from a psychological disorder
  - No postictal phase

Partial Seizures

- Simple partial seizures
  - Involve one body area
  - Can progress to generalized seizure

Partial Seizures

- Complex partial seizure
  - Characterized by an aura
  - Typically 2-3 minutes in length
  - Loss of contact with surroundings

Patient History

- History of seizures
- History of head trauma
- Any alcohol or drug abuse
- Recent history of fever, headache or stiff neck
- History of heart disease, diabetes or stroke
- Compliant with current medications
- Physical exam
  - Signs of head trauma or injury to tongue, alcohol or drug abuse
- Type of seizure
- Length of seizure
- Patient presentation after stopped
- Events preceding seizure

Management

- Scene safety and BSI.
- Maintain the airway.
- Administer high-flow oxygen.
- Establish IV access.
- Treat hypoglycemia if present.
- Protect the patient from the environment.
- Do not restrain the patient.
- Maintain body temperature.

Management

- Position the patient.
- Suction if required.
- Monitor cardiac rhythm.
- Avoid bright lights
- Provide a quiet atmosphere.
- Transport.

Seizure

- Place a seizing patient with no spinal injury on their side

Status Epilepticus

- Defined as:
  - Tonic-clonic phase lasts 5 minutes or longer
  - Two or more generalized seizures that occur without a return of consciousness.
  - A continuous seizure lasting more that 30 mins

Management

- Management of airway and breathing is critical.
- Establish IV access and cardiac monitoring.
- Administer 25g 50% dextrose if hypoglycemia is present.
- Monitor the airway closely.

Febrile Seizure

- Seizure triggered by fever (>38°C)
- Typically seen in children aged 3 months to 6 years
- Simple
  - Generalized full body convulsions
  - Last less than 15 minutes
  - No more than one in a 24-hour period
- Complex
  - Start focally with one body part moving independently of others
  - Last more than 15 minutes
  - Occur more than once in a 24-hour period

Patient History

- When was their last dose of antipyretics?
- History of febrile seizures?
- Family history?
- What are the associated symptoms over the past few days?
- How long have they had the fever?
- Back to normal temperature post seizure?

Febrile Seizure

Management

- Monitor the airway and circulation
- Passive cooling
  - Remove excess clothing and blankets

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SYNCOPE

Case 04

- You respond to a 55 y/o M who has reported to have passed out. Currently conscious and breathing. Upon arrival, you find the patient sitting at a desk looking anxious. He tells you that he has been off work the previous couple of days due to a “GI issue” and has not been able to keep anything down. This morning he ate nothing only a had a cup of coffee. The patient attended a meeting for three hours this morning, when the went to get up he passed out. Witnesses state for 30-60 seconds.

Syncope

- A sudden, temporary loss of consciousness
- Assessment
  - Cardiovascular
  - Noncardiovascular
  - Idiopathic

Differentiating

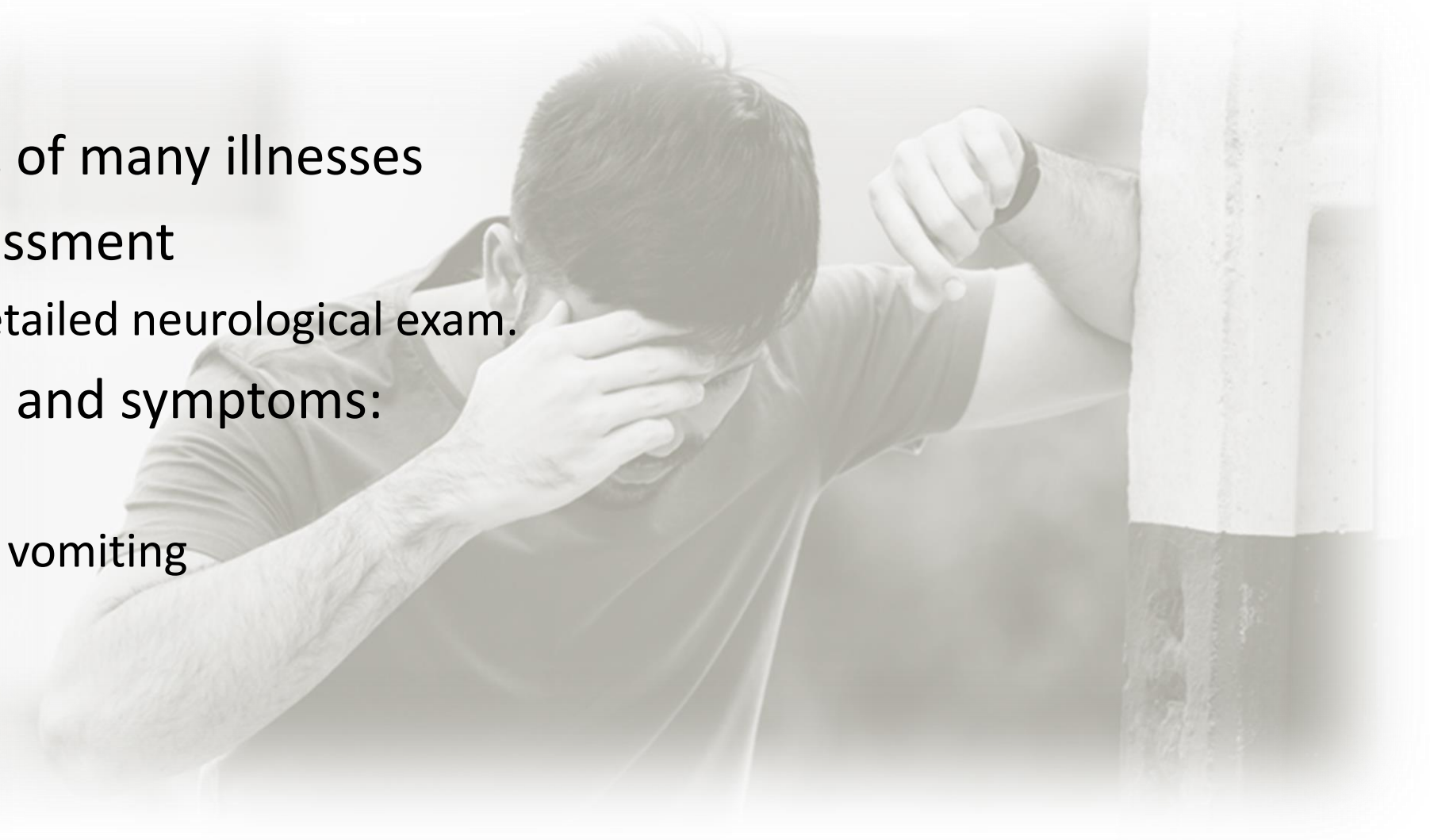
Syncope	Seizure
Usually begins in a standing position	May begin in any position
Patient will usually remember a warning of fainting (weakness/dizziness)	May begin without warning or may be preceded by an aura
Jerking motions usually are not present	Jerking motions present during unconsciousness
Patient regains consciousness almost immediately on becoming supine	Patient remains unconscious during seizure, remains drowsy during postictal period

Management

- Scene safety and BSI.
- Maintain the airway.
- Support breathing.
- Check circulatory status.
- Monitor mental status.
- Establish IV access.
- Determine blood glucose level.
- Monitor the cardiac rhythm.
- Reassure the patient and transport.

“Weak and Dizzy”

- Assessment
  - Symptomatic of many illnesses
  - Focused assessment
    - Include a detailed neurological exam.
  - Specific signs and symptoms:
    - Nystagmus
    - Nausea and vomiting
    - Dizziness



"Weak and Dizzy"

Management

- Scene safety and BSI.
- Maintain airway and administer high-flow oxygen.
- Position of comfort.
- Establish IV access and monitor cardiac rhythm.
- Determine blood glucose level.
- Consider medication.
- Antiemetic
- Transport and reassure patient.

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Neurology

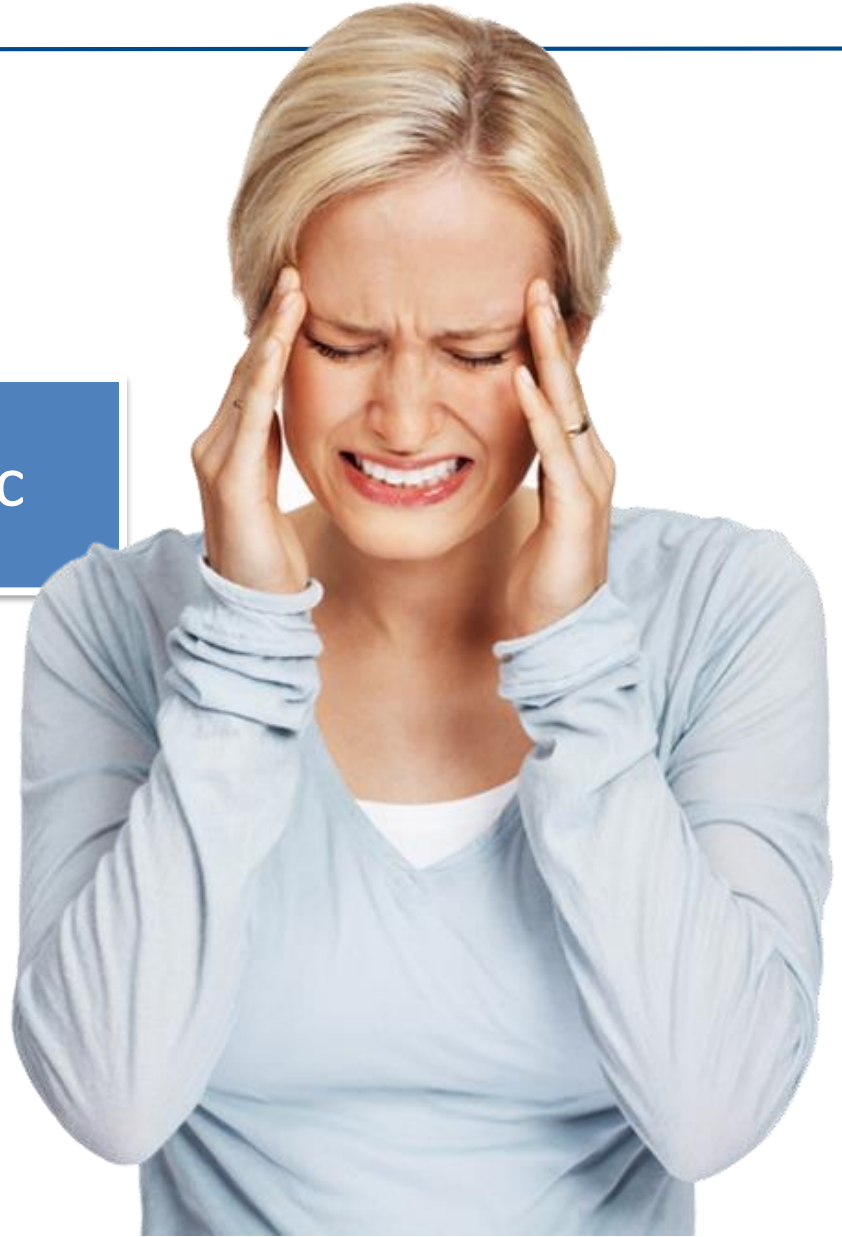
HEADACHES

Case 05

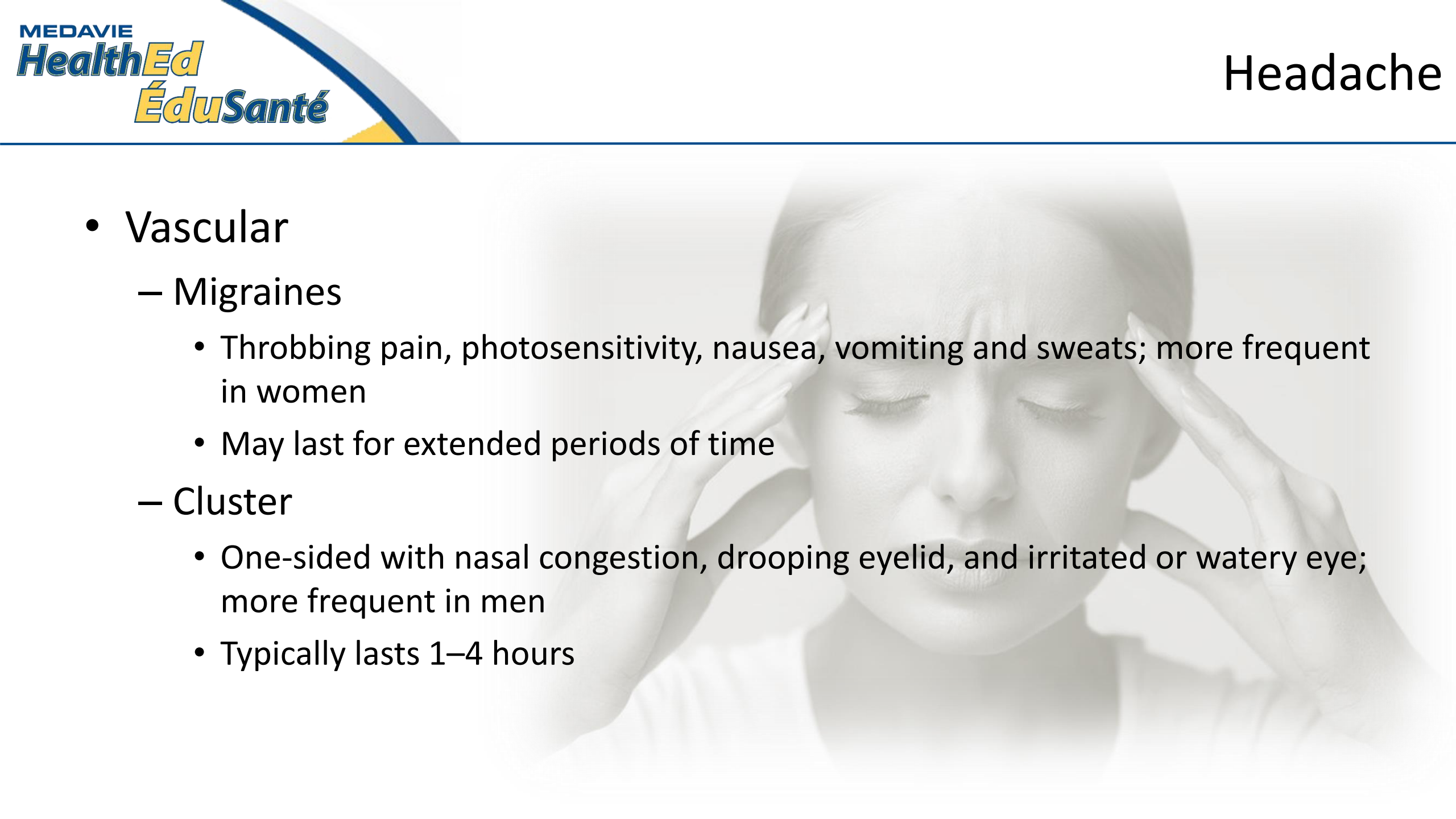
- You are dispatched to a 33 y/o F who awoke from a nap with severe headache and vision problems. Upon arrival you find the patient lying in a fetal position with the blanket pulled over her head. She states the pain is on right side of head and she has lost her peripheral vision. Vital signs were WNL and Cincinnati Stroke Scale was normal. No past significant history. While enroute, she became nauseated and vomited several times.

Headache Types

- Headache Types
  - Vascular
    - Cluster
    - Migraine
  - Tension
  - Organic



Headache



- Vascular
  - Migraines
    - Throbbing pain, photosensitivity, nausea, vomiting and sweats; more frequent in women
    - May last for extended periods of time
  - Cluster
    - One-sided with nasal congestion, drooping eyelid, and irritated or watery eye; more frequent in men
    - Typically lasts 1–4 hours

Headache

- Tension
  - Most headaches due to tension
  - Often pain starts off mild and gets worse
  - Described as dull achy pain
  - Muscle contractions of face, neck, scalp
    - Caused by stress, persistent noise, eye strain, poor posture
- Organic
  - Occurs due to tumors, infection, or other diseases of the brain, eye, or other body system.
  - Headaches associated with fever, confusion, nausea, vomiting, or rash can be indicative of an infectious disease.

Assessment

- What was the patient doing at the onset of pain?
- Does anything provoke or relieve the pain?
- What is the quality of the pain?
- Does the pain radiate to the neck, arm, back, or jaw?
- What is the severity of the pain?
- How long has the headache been present?

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Neurology

NEOPLASMS

Case 06

- You are called for a 40 y/o M who is not acting normal. Upon arrival, you are met by the patients wife who tells you that her husband appears drunk although he is a non drinker and there is no smell of ETOH. When he came home from work he was confused, had slurred speech and difficulty walking. The patient tells you he feels tired. No significant PMHx or meds. BGL and Cincinnati Stroke Scale were WHL. While transporting Pt experienced 45 sec generalized seizure.

Neoplasms

- Refers to the growth of a new tumour
  - CNS neoplasms have a high mortality
- Benign
  - Abnormal growth
  - Pressure in confined spaces (cranial vault)
- Malignant
  - Infiltrates healthy tissue
  - Likely to metastasize

Signs and Symptoms

- Recurring or severe headaches
- Nausea and vomiting
- Weakness or paralysis
- Lack of coordination or unsteady gait
- Dizziness, double vision
- Seizures without a prior history of seizures

Patient History

- Pertinent History
  - Surgery, chemotherapy, radiation therapy or holistic therapy
  - Experimental treatments

Management

- Scene safety and BSI.
- Maintain airway and administer high-flow oxygen.
- Position of comfort.
- Establish IV access and monitor cardiac rhythm.
- Consider medication administration.
- Analgesics, antiseizure meds, anti-inflammatory meds
- Transport and reassure patient.

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Neurology

CNS INFECTIONS

Case 07

- You are dispatched to a 38 y/o F with flu like symptoms. Upon arrival the patient tells you that she has had a sore throat, coughing, headache and feeling “achy” for 48 hrs. Reports today of “almost” passing out a couple of times along with blurred vision. Her headache is getting worse especially around bright lights and is feeling short of breath. A rash is noted on her legs.

CNS Infections

Causes

- Bacteria
- Viruses
- Fungus
- Protozoans

Types

- Meningitis
  - Inflammation of meninges surrounding the brain and spinal cord
- Encephalitis
  - Inflammation of brain
- Abscess
  - Inflammation/collection of pus

Meningitis

Signs and Symptoms	Management
• Headache • Irritable • Neck stiffness • Photophobia • Fever • Vomiting • Varying levels of consciousness • Rash	• Symptom relief

Encephalitis

Signs and Symptoms	Management
• Affects children and adults mostly • Drowsiness, confusion, coma • Nerve palsies • Paresis • May have sequelae (e.g. memory loss, motor impairment, death)	• Symptom relief

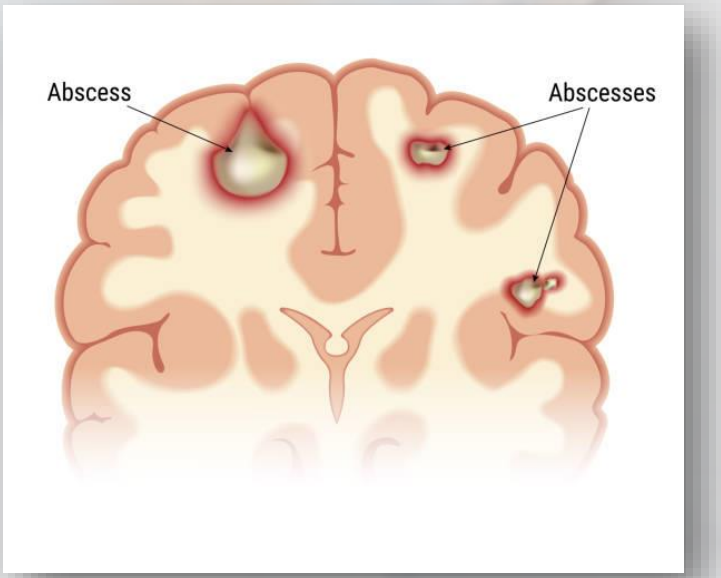
Brain Abscess

Signs and Symptoms

- Non specific signs
- Lethargy, hemiparesis, nuchal rigidity
- Headache, nausea, vomiting, seizures

Management

- Symptom relief



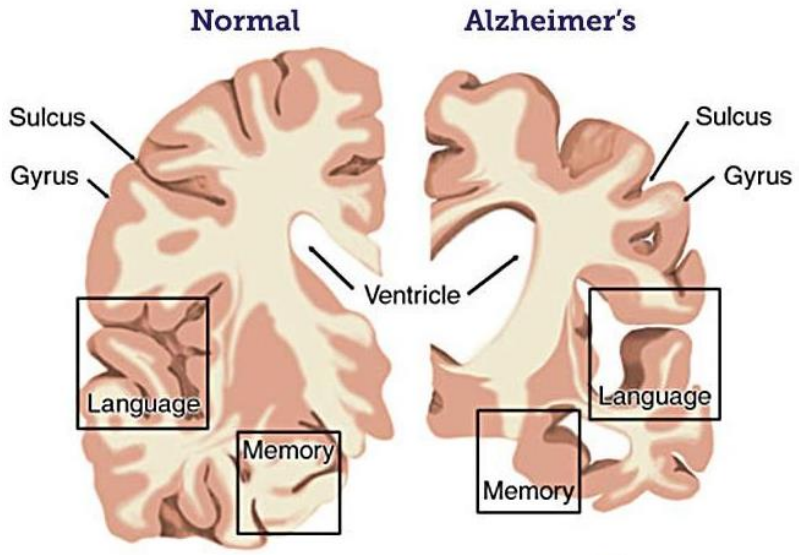
Neurology

DEGENERATIVE DISORDERS

Degenerative Disorders

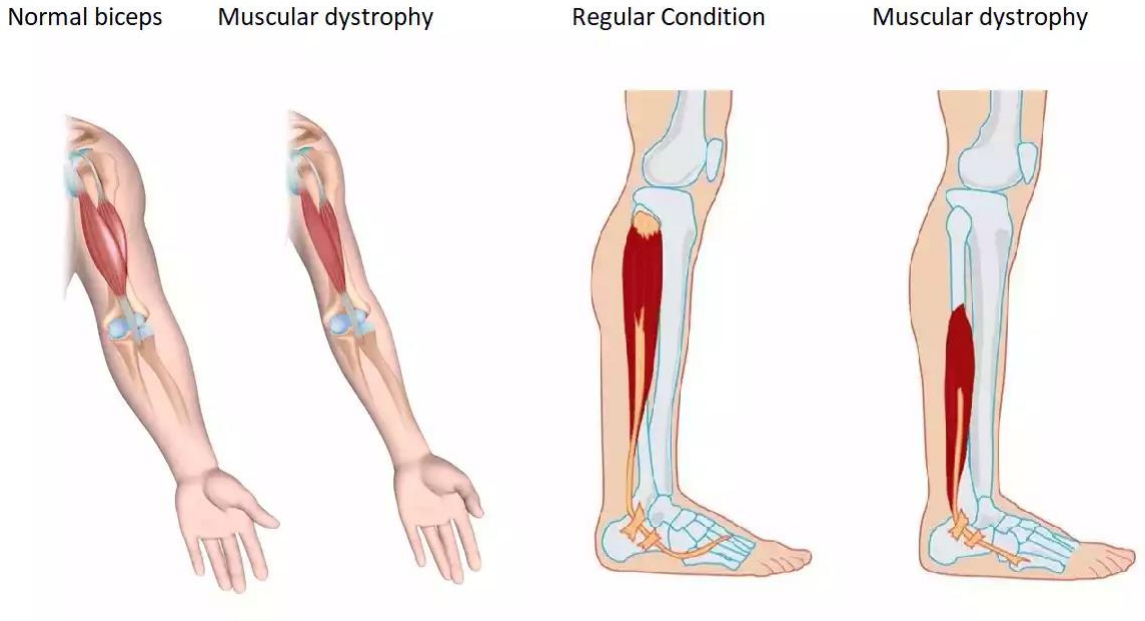
Alzheimer's disease

- Most frequent cause of dementia in the elderly
- Results in atrophy of the brain due to nerve cell death in the cerebral cortex



Muscular dystrophy

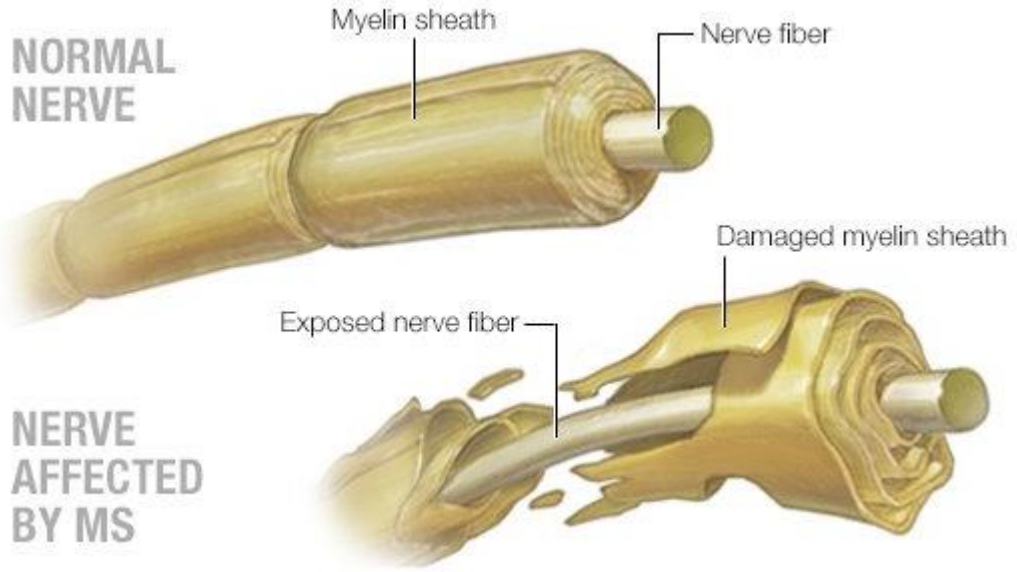
- Progressive muscle weakness and degeneration of muscle fibres



Degenerative Disorders

Multiple sclerosis

- Unpredictable disease resulting from deterioration of the myelin sheath
- Weakness and sensory loss



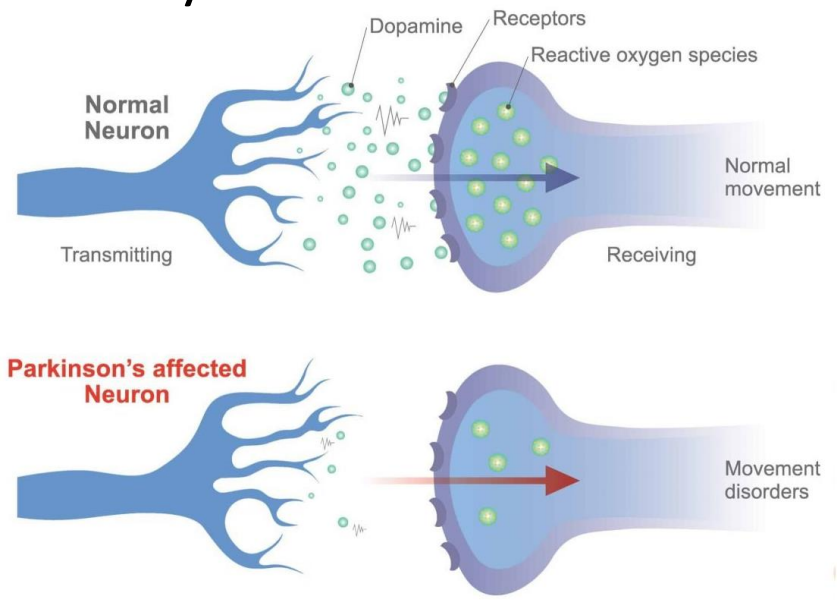
Dystonia

- Group of disorders
- Muscle contractions that cause twisting repetitive movements

Degenerative Disorders

Parkinson's disease

- Chronic progressive motor system disorder
- Tremor, rigidity, bradykinesia, postural instability



Central pain syndrome

- Result of CNS injury
- Intense, steady burning pain

Degenerative Disorders

Bell's palsy

- One-sided facial paralysis
- Unknown cause

Amyotrophic lateral sclerosis (ALS)

- Degeneration of motor tracts
- Weakness, loss of motor control

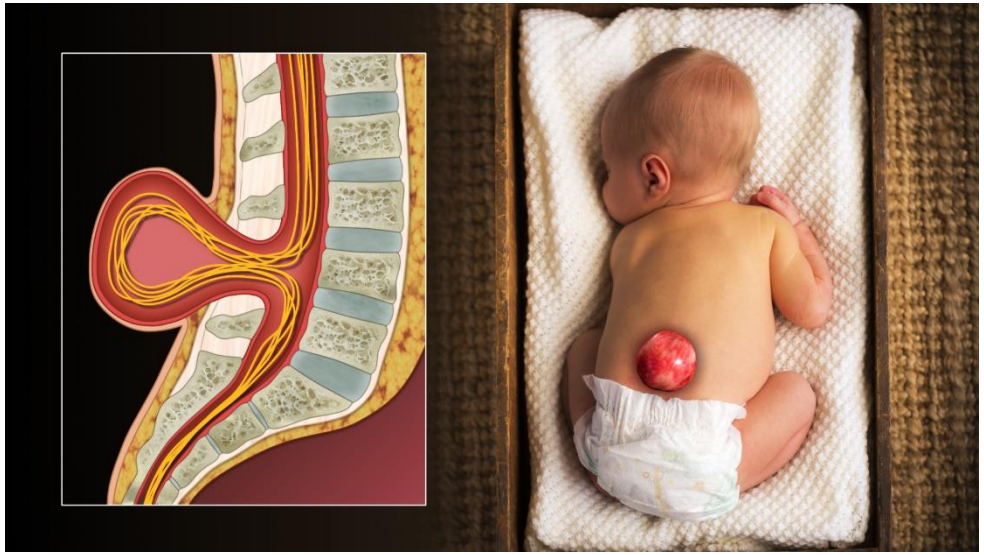
Degenerative Disorders

Myoclonus

- Temporary, involuntary twitching of muscles

Spina bifida

- One or more fetal vertebra fail to close
- Portion of the spine left unprotected



Degenerative Disorders

Poliomyelitis

- Inflammatory, viral disease of CNS tissue
- Sometimes results in permanent paralysis

Degenerative Disorders

- Obtain history
  - Exacerbation of chronic illness or new problem?
- Management
  - Special considerations
    - Mobility, communication, respiratory compromise, and anxiety

Neurology

GENERAL ASSESSMENT

Assessment

- Scene and primary assessment
  - AVPU
  - General appearance
  - Speech
  - Skin and facial drooping
  - Mood, thought, perception, judgment, memory and attention

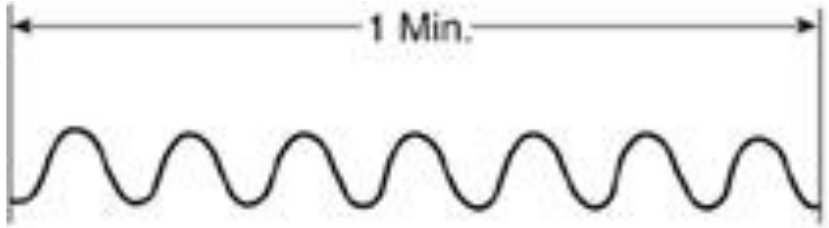
History

- When did the incident occur?
- Loss of consciousness?
- Incontinence?
- Chief complaint?
- Changes?
- Complicating factors?

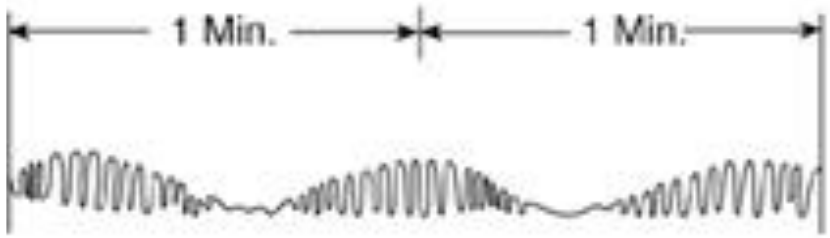
Secondary Assessment

- Face
  - Smile, frown, facial drooping
- Eyes
  - Pupils
- Nose/mouth
  - Potential compromise of the airway

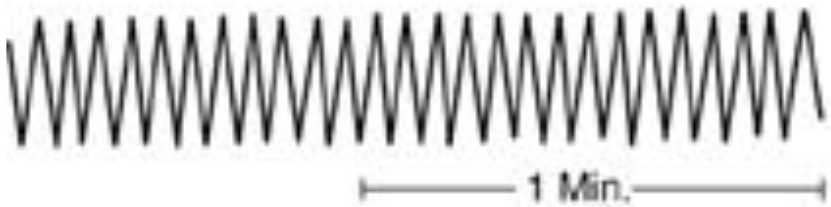
Respiratory Status



Normal



Cheyne-Stokes breathing



Kussmaul's

Central neurogenic hyperventilation

Ataxic (Biot's) pattern

Apneustic pattern

Cardiovascular System Status

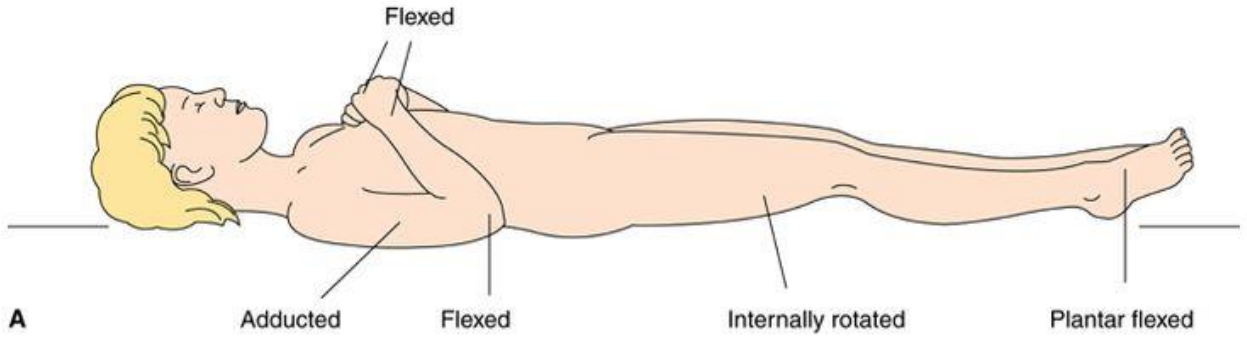
- Heart rate
- ECG
- Bruits
- JVD

Nervous System Status

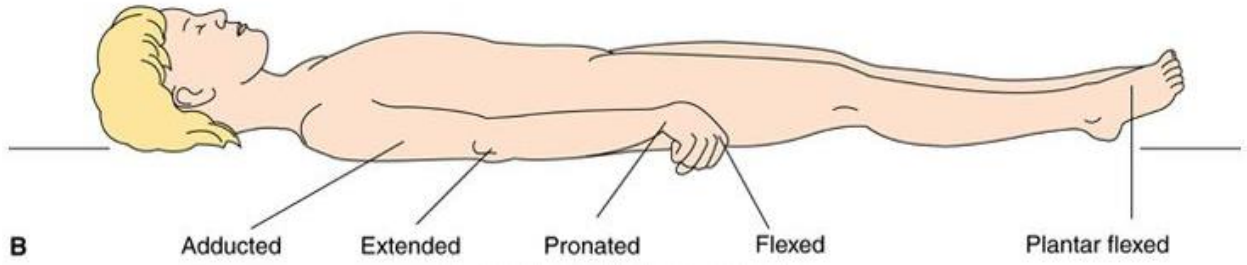
- Sensorimotor evaluation
  - AVPU
  - Incontinence
  - Distal properties
- Motor system status
  - Muscle tone
  - Strength
  - Flexion/extension
  - Coordination
  - Balance

Posturing

- Decorticate
  - Arms flexed, legs extended
  - Lesion at or above the upper brainstem



- Decerebrate
  - Sustained extension
  - Lesion in the brainstem



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Glasgow Coma Scale (GCS)

Eye Opening		Verbal Response		Motor Response	
Spontaneous	4	Orientated	5	Obeys Commands	6
To Voice	3	Confused	4	Localizes Pain	5
To Pain	2	Inappropriate Words	3	Withdraw (Pain)	4
None	1	Incomprehensible Words	2	Flexion (Pain)	3
		None	1	Extension (Pain)	2
				None	1

Table 29-1 Comparison of Vital Signs in Shock and Increased Intracranial Pressure

Vital Signs	Shock	Increased ICP
Blood pressure	Decreased	Increased
Pulse	Increased	Decreased
Respirations	Increased	Decreased
Level of Consciousness	Decreased	Decreased

Additional Assessment Tools

- End tidal CO_2
- Pulse oximetry
- Blood glucose determination

Geriatric Considerations

- More susceptible to systemic illness
- Certain changes occur naturally with aging
  - Pupil sluggishness
  - Loss of overall body strength
  - Muscle atrophy
  - Altered sensation

General Management

- Airway and breathing
- Circulatory support
- Pharmacological intervention
- Psychological support
- Transport considerations
- Primary treatment is supportive

Summary

- Pathophysiology
- General assessment findings
- Management of nervous system emergencies