Recognizing Medical Emergencies

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Objectives

• The participant will define assessment of 3 areas - neurological, cardiac and pulmonary emergencies
• The participant will be able to describe delirium and DTs
• The participant will be able to describe 3 cardinal symptoms of NMS
• The participant will identify assessment tools and strategies for intervention
• The participant will recognize appropriate responses to observed changes in medical status

Medical Emergencies

Recognizing Signs and Symptoms:
Neurological
Cardiac
Pulmonary
Delirium
DTs
NMS
The Nervous System

Anatomy of the Nervous System

<table>
<thead>
<tr>
<th>Central Nervous System</th>
<th>Peripheral Nervous System</th>
<th>Brain Stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerebrum (Frontal, Parietal, Temporal &amp; Occipital Lobes)</td>
<td>Somatic Nervous System</td>
<td>Pons</td>
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<tr>
<td>Diencephalon</td>
<td>Autonomic Nervous System (Sympathetic &amp; Parasympathetic Divisions)</td>
<td>Medulla Oblongata</td>
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<tr>
<td>Brainstem</td>
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<td>Midbrain</td>
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<tr>
<td>Cerebellum</td>
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Cerebrum

- **Cerebrum cortex** is a sheet of tissue that measures 2-6 mm deep and makes up the outer layer of the brain
- The two sides **hemispheres** are linked by the corpus callosum
- The cerebrum has 4 lobes
  - Frontal lobe
  - Parietal lobe
  - Temporal lobe
  - Occipital lobe

Diencephalon

- **Thalamus**
  - Receives sensory information and relays info. to cerebral cortex
  - Plays a major role in arousal, sleep states, level of awareness
  - Also involved in consciousness. Major damage to this area can cause permanent coma
- **Limbic System**
  - Includes the hypothalamus, pituitary glands, hippocampus and several other areas
  - Areas control emotional states
- **Hypothalamus**
  - The size of a pea
  - Regulates blood pressure, HR, breathing, digestion/hunger, thirst, pain, pleasure, sexual satisfaction and anger

Brain Stem

- Includes the midbrain, pons, and medulla
- Controls the primitive functions of life: breathing, HR, and B/P
- Cranial nerves III through XII emerge from the brain stem

*Brain stem injuries often significantly alter the neurological assessment findings*
Cerebellum and Spinal Cord

**Cerebellum** - from the Latin word for “little brain”

- Contains 50% of all neurons in the brain, & 10% of volume

**Spinal Cord** - an extension of the central nervous system from the brain

Peripheral Nervous System

**Somatic Nervous System**
- receives external stimuli, regulates activities that are under conscious/voluntary control and coordinates body movement

**Autonomic Nervous System** – 2 divisions
- **Sympathetic Nervous System** – fight or flight
- **Parasympathetic division** – rest and digest

NEUROLOGICAL EXAM
Neurological Exam

These major areas of a neurological exam include 6 areas of assessment:

- Mental Status Exam
- Cranial Nerves
- Proprioception and Cerebellar Function
- Motor Function
- Sensory Function
- Deep Tendon Reflexes (DTR's)

*Choose components of neurological exam based on patient presentation and your goals*

Mental Status Exam

**Common Components**
- Alert and Oriented (A&O) x 3 – person, place, time
  (A&O) x 4 – person, place, time, situation
- Assessing situation – “tell me why you are here today”
- Glasgow Coma Score
- Remembering 3 unassociated objects for 5 minutes (short term memory)
- Counting back from 100 by 7s or 9s (calculation)
- Spelling the word WORLD backwards (calculation)
- Basic discussion (orientation, perception, thought process, insight, attention, mood, affect, speech)
- Writing a basic sentence (the dog is brown)
- Reading “touch your nose” then ask the patient to do what the written instructions tell them to do
- Having the patient reproduce a 5 sided figure (abstract)

<table>
<thead>
<tr>
<th>Glasgow Coma Scale (GCS)</th>
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<tbody>
<tr>
<td>Eye Opening</td>
<td></td>
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<tr>
<td>Spontaneous</td>
<td>4</td>
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<tr>
<td>To Verbal Command</td>
<td>3</td>
</tr>
<tr>
<td>To Pain</td>
<td>2</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
</tr>
<tr>
<td>Best Verbal Response</td>
<td></td>
</tr>
<tr>
<td>Oriented</td>
<td>5</td>
</tr>
<tr>
<td>Confused</td>
<td>4</td>
</tr>
<tr>
<td>Inappropriate Words</td>
<td>3</td>
</tr>
<tr>
<td>Incomprehensible Sounds</td>
<td>2</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
</tr>
<tr>
<td>Best Motor Response</td>
<td></td>
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<tr>
<td>Localizes Pain</td>
<td>5</td>
</tr>
<tr>
<td>Withdraws From Pain</td>
<td>4</td>
</tr>
<tr>
<td>Flexion to Pain</td>
<td>3</td>
</tr>
<tr>
<td>Extension to Pain</td>
<td>2</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
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</tbody>
</table>
Cranial Nerves

Assessment Guides:

- S = Sensory
- M = Motor
- B = Both

<table>
<thead>
<tr>
<th>CN</th>
<th>Name</th>
<th>Examination</th>
<th>S/M/B</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Olfactory</td>
<td>Smell, vision acuity/visual fields</td>
<td>S</td>
</tr>
<tr>
<td>II</td>
<td>Optic</td>
<td>Pupil activity/EOM</td>
<td>M</td>
</tr>
<tr>
<td>III</td>
<td>Oculo-motor</td>
<td>Downward and inward eye movements/EOM</td>
<td>M</td>
</tr>
<tr>
<td>V</td>
<td>Trigeminal</td>
<td>Corneal reflex/facial sensation/jaw movement</td>
<td>B</td>
</tr>
<tr>
<td>VI</td>
<td>Abducens</td>
<td>Lateral eye movement/EOM</td>
<td>M</td>
</tr>
<tr>
<td>VII</td>
<td>Facial</td>
<td>Facial impressions/tears/saliva/taste</td>
<td>B</td>
</tr>
<tr>
<td>VIII</td>
<td>Vestibulocochlear</td>
<td>(Acoustic) hearing/equilibrium</td>
<td>S</td>
</tr>
<tr>
<td>IX</td>
<td>Glossopharyngeal</td>
<td>Swallowing/tongue of palate/gag/speech</td>
<td>B</td>
</tr>
<tr>
<td>X</td>
<td>Vagus</td>
<td>Same as IX &amp; parasympathetic</td>
<td>B</td>
</tr>
<tr>
<td>XI</td>
<td>Spinal Accessory</td>
<td>Shoulder shrug/neck movements</td>
<td>M</td>
</tr>
<tr>
<td>XII</td>
<td>Hypoglossal</td>
<td>Tongue symmetry and position</td>
<td>M</td>
</tr>
</tbody>
</table>

Proprioception and Cerebellar Function

Proprioception and Cerebellar Function - Assessing posture, balance, & coordination. Assessment options include:

- Finger to nose
- Rapid alternating movements – thumb to finger tips alternating rapidly
- Heel to shin – can be done sitting or lying in bed
- Romberg Test – Stand with feet together first with eyes open – then close. Slight sway is normal
- Coordination – heel to toe walking or stand on each foot

Motor Function – walking, posture strength

- Have patient squeeze testers fingers, shrug shoulders, move against resistance
- Always compare one sides strength to other
- Grade strength on a scale 1-5

Babinski Reflex

There can be 3 responses:

- Flexor: the toes curve downward and the foot everts. Normal finding in all adults = "Negative Babinski"
- Indifferent: There is no response. Most common reasons are tester error; not enough pressure; or done too slowly so reflex not stimulated
- Extensor: The great toe dorsiflexes and the other toes ‘fan’ out. “Positive Babinski” indicating possible damage to the CNS.
Bedside Assessment

Initial assessment when interviewing the patient:
• Clarity of speech (CN IV)
• Hearing difficulties (CN VIII)
• Posture (motor function)
• Possibly their ability to walk (motor function)
• Jaw movements (CN V)
• Lateral eye movements (CN VII)
• Mentation (mental exam)
• Orientation during initial discussion (mental exam)

Bedside Assessment (continued)

Head to Toe Assessment (select)
• Furrow brows
• Raise eyebrows
• GPR (motor control movement)
• PERRLA (pupils, equal, round, reactive to light)
• Follow finger to nose (inward eye movements)
• Puff out cheeks
• Stick out tongue
• Smile
• Squint tests fingers
• Pronator drift
• Romberg test
• Heel to shin bilaterally
• "Push the gas pedal"
• "Toes to the nose"
• Walk across the room (can do heel to toe walk also)
• Access deep tendon reflexes (DTR's) if appropriate

If more thorough mental status exam is desired – add items such as:
• Spell the word WORLD backwards or serial 73 counting backwards as far as they can
• Writing a full sentence
• Listing 3 unrelated objects and asking them to repeat it back to them
• Reading a paragraph and doing what it says
• "Close your eyes"
• Swallow study

NIH Stroke Scale (NIHSS)

• Assess mental status
• Repeated over time to assess changes
• Specialized assessment tool for stroke patients
• If scored correctly, correlates with the size of the injury on neurological imaging
• Learn how to do the NIHSS
• Training on www.americaheart.org
NIHSS Stroke Scale

1. Level of Consciousness
2. Horizontal Eye Movement
3. Visual field test
4. Facial Palsy
5. Motor Arm
6. Motor Leg
7. Limb Ataxia
8. Sensory
9. Language
10. Speech
11. Extinction and Inattention

FAST

Use FAST to remember the warning signs:

FACE: Ask the person to smile. Does one side of the face droop?
ARMS: Ask the person to raise both arms. Does one arm drift downward?
SPEECH: Ask the person to repeat a simple phrase. Is their speech slurred or strange?
TIME: If you observe any of these signs, call 9-1-1 immediately.

Ischemic Stroke

Pathophysiology

- 80% - 85% of all strokes
- Decreased blood flow to the brain
  - Thrombosis, emboli (clot or plaque occlusion)
  - Small vessel disease (lacunar infarcts)
  - Large vessel disease (carotid stenosis)
- Leads to decreased tissue oxygenation & cell death if not treated promptly
- With early intervention, some ischemic neurons can be saved
TIA vs. Stroke

**TIA**: reversible neuro deficit  
- lasts <24 hours  
- no radiological changes

**Stroke**: FOCAL neuro deficit(s)  
- lasts > 24 hours  
- clinical presentation varies dependent on area of brain involved  
- elevated B/P common after stroke  
- also notes radiographic support denoting ischemic changes

Middle Cerebral Artery (MCA)

*Most common site*

*Symptoms dependent on location*

- Contralateral hemiparesis  
- Contralateral sensory loss  
- Contralateral visual loss  
- May include expressive or receptive aphasia  
- Elevated B/P common after stroke  
- Also noted radiographic support denoting ischemic changes

Hemorrhagic Stroke

- Usually result from HTN  
- Often involves small deep arteries  
- May affect areas of cerebrum  
- NO TPA, NO ANTIPLATELET AGENTS  
- Supportive care monitor for elevated ICP  
- First sign is typically a *change in the level of consciousness*  
- Change in *pupils* is a late and ominous sign!
## Mental Status Change/Confusion Assessment

### Mnemonic(s) to remember common causes of Mental Status Changes

<table>
<thead>
<tr>
<th>SMASHED</th>
<th>S</th>
<th>Substrates</th>
<th>Hyper/hypoglycemia Or severe infectious process</th>
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<tbody>
<tr>
<td>S</td>
<td>M</td>
<td>Meningitis Mental Illness</td>
<td>Meningitis or other CNS infection Functional psychosis</td>
</tr>
<tr>
<td>M</td>
<td>A</td>
<td>Alcohol</td>
<td>Intoxication or withdrawal</td>
</tr>
<tr>
<td>A</td>
<td>S</td>
<td>Seizures Stimulants</td>
<td>Seizure activity or postural state Cocaine, hallucinogens, Meth</td>
</tr>
<tr>
<td>S</td>
<td>H</td>
<td>Hyper- hyp-</td>
<td>Thyroidism, thermia, carbia Tension, thyroidism, thermia, hypoxia</td>
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<tr>
<td>H</td>
<td>E</td>
<td>Electrolytes Encephalopathy</td>
<td>High/low sodium, high calcium Hepatic, uremic, hypertensive</td>
</tr>
<tr>
<td>E</td>
<td>D</td>
<td>Drugs of any sort</td>
<td>All medications have side effects</td>
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</tbody>
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## Mental Status Change/Confusion Assessment

### Mnemonic(s) to remember common causes of Mental Status Changes

<table>
<thead>
<tr>
<th>AEIOU</th>
<th>A</th>
<th>Alcohol</th>
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<tbody>
<tr>
<td>E</td>
<td>E</td>
<td>Epilepsy</td>
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<td>I</td>
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<td>Insulin/Diabetes</td>
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<td>O</td>
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<td>Overdose</td>
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<tr>
<th>TIPS</th>
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<th>Trauma</th>
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<tr>
<td>I</td>
<td>I</td>
<td>Infection</td>
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<td>P</td>
<td>P</td>
<td>Psychiatric</td>
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<tr>
<td>S</td>
<td>S</td>
<td>Stroke</td>
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</table>

## Meningeal Signs

Meningeal irritation most commonly results from infection (meningitis) or intracranial hemorrhages.

**Signs Include:**

**Nuchal Rigidity** - Patient complains of stiff neck.

**Brudzinski's Sign** - Child lies flat and supine. When he tries to lift his head toward the sternum the knees and hips flex, accompanied by pain in the back of the neck.

**Kernig's Sign** - With child lying on their back, with their legs bent at the knee. Attempt to extend the hip by raising and supporting the heel, while straightening the leg with pressure to patient's knee, pain and resistance are seen with meningeal irritation.
Assessing Chest Pain

- Onset—sudden or gradual. Triggering factors like eating, exercise, rest, stressful situation, deep breathing or coughing
- Course since onset—how long did it last and how long between episodes
- Location—area of discomfort and possible radiation pain
- Quality—aching, burning, crushing, vise-like, or dull
- Quantity—Degree of interference with activity or sleep
- Setting—home, work, exercise, certain people, stressful activity
- Associated Symptoms—diaphoresis, nausea/vomiting, dyspnea, palpitations, dizzy, cyanosis of lips, pallor or anxiety
- What provides relief or aggravates? Rest, position change, medications (if nitro—how many to alleviate pain?) or pain medications

NOTE:
- Clots from the heart ➔ go to the brain (Stroke)
- Clots from the extremities ➔ go to the lungs (PE)
Cardiac Arrest

• Sudden loss of responsiveness
• No response to gentle shaking
• No normal breathing
• No signs of circulation
• No movement or coughing

Congestive Heart Failure

• Condition where the heart cannot pump blood effectively resulting in congestion of the pulmonary and/or systemic systems

<table>
<thead>
<tr>
<th>Left Pump Dysfunction</th>
<th>Right Pump Dysfunction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood from the Right Pump to Lungs</td>
<td>Venous Blood</td>
</tr>
<tr>
<td>Most common cause of RIGHT failure is Left Failure</td>
<td>Enters right atrium from Superior Vena Cava</td>
</tr>
<tr>
<td>Pulmonary Symptoms:</td>
<td>Systemic Symptoms:</td>
</tr>
<tr>
<td>Crackles in bases</td>
<td>• LE edema</td>
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<tr>
<td>Dyspnea</td>
<td>• Liver congestion</td>
</tr>
<tr>
<td>Orthopnea</td>
<td>• Ascites</td>
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<tr>
<td>Hypoxia</td>
<td>• JVD</td>
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Acute Coronary

For 20% of the population, the first sign of CAD will be a cardiac arrest

• Signs and Symptoms (Classic):
  - Chest pressure or pain (radiates to jaw +/- L arm)
  - Not relieved by rest of sublingual nitroglycerin
  - SOB
  - Diaphoretic, pallor anxiety
  - Nausea and vomiting

• Signs and Symptoms (Atypical):
  - Fatigue
  - Palpitations & dizziness caused by ischemia induced arrhythmias
  - Acute CHF
  - Pulmonary edema
  - Silent myocardial ischemia
  - Sudden cardiac arrest
Pulmonary Assessment

Evaluate: color, temperature, posture, & breathing

**Color**
- Red – infection, polycythemia, ↑B/P, allergies, meds., work of breathing
- Blue – cyanosis (often late and unreliable sign), central cyanosis is more reliable than peripheral
- White – pallor, anemia, shock, poor perfusion/circulation

**Temperature – Warm, hot, cold or clammy**

**Posture –** stooped posture or kyphosis will impede inspiration effort. Pursed lip breathing sign of ↑ effort to empty lungs of CO₂.
Pulmonary Assessment

Work of Breathing
Rate – Normal 12-20. Tachypnea, bradypnea, apnea, agonal, hypo-hyper ventilation

Rhythm – Regular/irregular, labored/unlabored, orthopnea, deep, shallow, gasping

Respiratory excursion – (depth) work of breathing symmetrical, absent breath sounds on one side, use of accessory muscles, abdominal breathing, nasal flaring or retractions

Palpitation – subcutaneous emphysema, pleural friction rub or fremitus

Common Respiratory Diseases

• Asthma – caused by inflammation of the airways. When an attack occurs, the muscles around the airways become tight and the lining of the air passages swell, reducing the amount of air passage and can hear the wheezing sound

• Bronchitis – inflammation of main air passages to lungs and increased mucous production

Note: There are obstructive and restrictive lung diseases

• COPD - (Chronic Obstructive Pulmonary Disease) is a progressive disease most often caused by exposure to noxious stimuli, often cigarette smoke

• Emphysema – Abnormal and permanent enlargement of airspaces distal to the terminal bronchioles, & destruction of alveolar walls & without obvious fibrosis
Common Respiratory Diseases

- **Pulmonary Fibrosis** – inflammation and scarring progressively developing in the alveoli/lungs
- **Obstructive Sleep Apnea (OSA)** – a condition where a person has episodes of blocked breathing during sleep causing apneic episodes

DELIRIUM & DELIRIUM TREMENS

Delirium

- **Delirium** is defined as an acute, reversible change in behavior characterized by a clouding of consciousness, mental incoherence, and difficulty maintaining concentration and attention
- May be related to an acute or chronic medical condition or may be substance induced
- Incidence highest among elderly
- Pneumonia and UTI most common causes of delirium in the elderly
Diagnostic Criteria for Delirium

A. A disturbance in attention (i.e. reduced ability to direct, focus, sustain, and shift attention) and awareness (reduced orientation to the environment)

A. The disturbance develops over a short period of time (usually hours to a few days), represents a change from baseline attention and awareness, and tends to fluctuate in severity during the course of the day

C. An additional disturbance in cognition (e.g., memory deficit, disorientation, language, visuospatial ability, or perception)

C. The disturbances in A and C are not better explained by another preexisting, established, or evolving neurocognitive disorder and do not occur in the context of a severely reduced level of arousal, such as coma

E. There is evidence from the history, physical examination, or laboratory findings that the disturbance of a direct physiological consequence of another medical condition, substance intoxication, or withdrawal (i.e. due to drug of abuse or to a medication), or exposure to a toxin, or is due to multiple etiologies

Alcohol Withdrawal and Delirium Tremens

- The brain adjusts to chronic alcohol use by attempting to minimize the effects of alcohol
- This leads to changes in a number of excitatory and inhibitory neurotransmitter systems which are affected by alcohol use

Symptoms:
- Anxiety, tremors
- Diaphoresis
- Nausea/Vomiting
- Insomnia
- Increased B/P, Pulse
- Delirium Tremens (DTs), confusion, agitation, hallucinations, disorientation
- Seizures

Identifying Delirium Tremens

- ANY patient with mental status changes and alcohol withdrawal
- Mental status changes = Delirium
  - Confusion, agitation associated with signs of withdrawal, disorientation, hallucinations (VISUAL hallucinations)
- Alcohol withdrawal = Physical symptoms
  - Tremors, nausea, vomiting, sweating, hypertension, tachycardia, fever, seizures
- Time course of complications after alcohol cessation:
  - 6 - 48 hours for seizures
  - 24 - 72 hours for DTs

Raynold, McIntyre, Hill & Woodside, 2004
DTs: High Risk Illness

- 5% of patients with alcohol withdrawal progress to DTs
- Mortality rate 35% if untreated
  - Less than 5% with early recognition and treatment
- Increased risk for death when present with:
  - High fever
  - Fluid or electrolyte imbalance
  - Comorbid illness such as pneumonia, hepatitis, pancreatitis
- DTs incurs increased risk of aspiration

Rayward, Mihalyn, Hill & Woodside, 2003

NEUROLEPTIC MALIGNANT SYNDROME (NMS)

DSM-5 Criteria
Neuroleptic Malignant Syndrome

- Hyperthermia (>100.4°F or 38.9°C at least x 2)
- Profuse diaphoresis*
- Extreme elevations in temperature reflecting a breakdown in thermoregulation, supports NMS diagnosis
- Generalized rigidity "lead pipe"
- Usually unresponsive to antiparkinsonian agents*
- Creatine kinase elevation (at least 4 x’s normal)
- Change in mental status, characterized by delirium or altered consciousness: stupor →-to coma (early sign)*
- May appear alert but dazed and unresponsive
- Tachycardia (rate >25% above baseline or fluctuation in B/P > 20mmHg diastolic or systolic: within 24 hrs.)
- Urine incontinence and pallor
- Tachypnea (rate >50% above baseline) and
- Respiratory distress resulting in metabolic acidosis, aspiration pneumonia, or pulmonary emboli and can lead to sudden respiratory distress
When to Re-Evaluate?

• Do you notice anything unusual or different?

• Never hesitate or wait to:
  – Take a new set of vital signs
  – Re-assess orientation
  – Notify nursing/physician
  – Communicate any changes or observations with peers

Do you have a process for Hand-Off Reporting?

The Joint Commission states that one of the primary findings resulting in sentinel events involves lack of communication.
Early Response

- A patient’s baseline condition begins to deteriorate a mean of 6.5 hours before an unexpected critical event or actual cardiac arrest
- 70% of such events are preventable
- *Rapid Response Teams* provide assistance with recognition and interventions directed toward patient’s changing medical state, to prevent a medical emergency

Chain of Survival

- **Early Access**
  - Recognizing the emergency and calling a Code Blue or Rapid Response Team as indicated
- **Early CPR**
  - To provide oxygen-rich blood to the heart and brain
- **Early defibrillation**
  - Using an AED to shock the heart to resume a normal rhythm
- **Early advanced life support**
  - Emergency medical services/Hospital Code Team responding quickly

Be Prepared When Calling the Physician...

- **(S)** Situation – Describe the current situation
- **(B)** Background – Provide pertinent background information related to the situation
  - Medications, allergies, lab results, admitting diagnosis, etc.
- **(A)** Assessment – Describe findings of your assessment or what you believe could be the problem
- **(R)** Recommendation – Provide your recommendation for interventions related to the current situation
Summary

• Medical disorders may lead to mental disorders, mental conditions may place a person at increased risk for medical disorders

• Care provided to treat people with mental health and medical comorbidities are proven effective and best for patient care

• Early recognition of medical and/or sudden mental status changes is required of all health professionals in the prevention of a medical emergency

References


• www.americanheart.org – Training in NIH Stroke (NIHSS)

• www.stroke.org/en-us/heart-care-professionals/nih-stroke