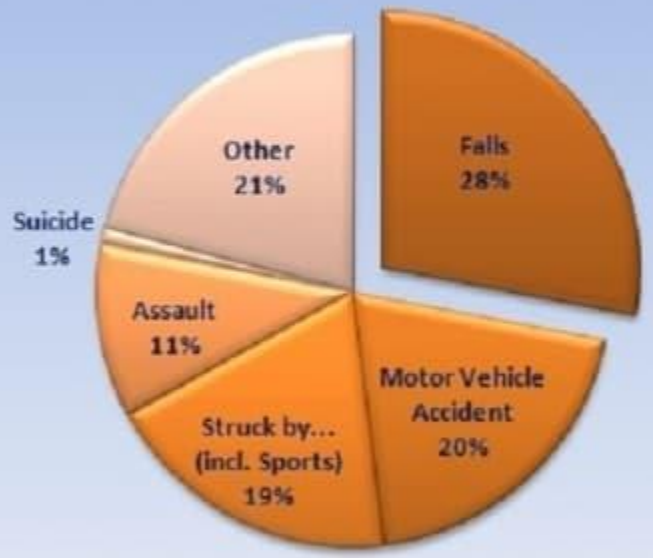
# TRAUMATIC BRAIN INJUIRY- ASSESSMENT & MANAGEMENT

# INTRODUCTION

- Traumatic brain injury (TBI) is a sudden injury that causes damage to the brain
- There were about 61,000 TBI-related deaths in the United States in 2019.
- It is estimated that nearly 1.5 to 2 million persons are injured and 1 million succumb to death every year in India.
- Sixty-nine million (95% CI 64-74 million) individuals worldwide are estimated to sustain a TBI each year

# Traumatic Injuries

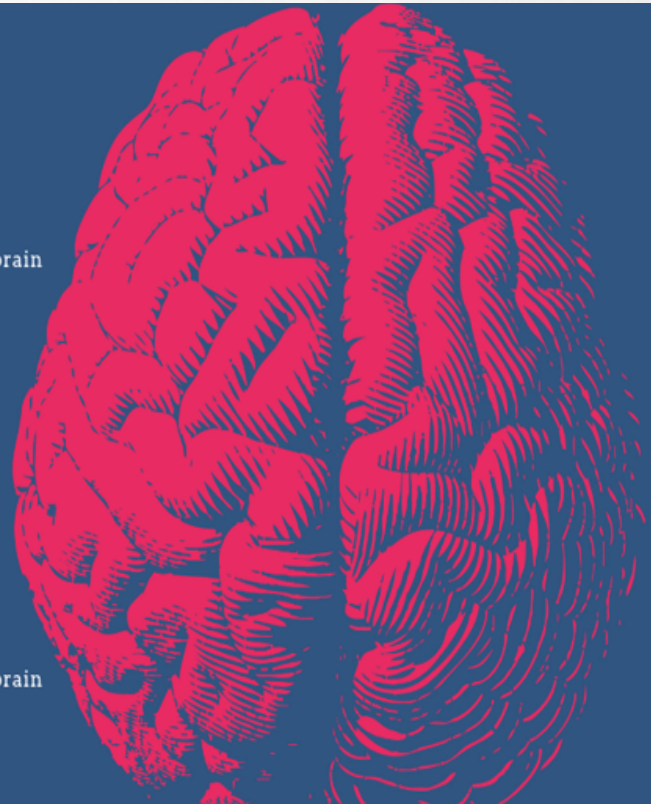
## Major Causes of Traumatic Brain Injuries




Source: National Center for Injury Prevention and Control, CDC

## Vehicle crashes

are the leading cause of brain injury.



## 2%

of the U.S. population, or 5.3 million individuals, currently live with a brain injury.

## Falls

are the leading cause of brain injury for the elderly.

## Every 15 seconds

is the rate at which someone new acquires a brain injury.

# ASSESSMENT

**DEMOGRAPHIC DETAILS**

- DATE
- NAME
- AGE/SEX
- ADDRESS
- OCCUPATION

1. **CHIEF COMPLAIN**
2. **HISTORY**

- *PRESENT HISTORY*
    - MODE OF ONSET
    - MECHANISM OF INJURY
    - DURATION
    - SPEECH
    - LEVEL OF CONSCIOUSNESS

- TREATMENT MEDICATION
- SPEECH SENSES
- *MENTAL STATE*

- *PAST HISTORY*
  - MODE OF  INJURY
  - MEDICAL HISTORY
  - PAIN ASSESSMENT

**ON OBSERVATION**

- POSTURE
- SPEECH
- MODE OF AMBULATION
- MUSCLE TONE
- WASTING OF MUSCLE
- ANY INVOLUNTARY MOVEMENT LIKE TREMORS

# ON EXAMINATION

- MEMORY:- IMMEDIATE

  SHORT TERM

  LONG TERM

- CALCULATION
- SPEECH
- BEHAVIOURS

# CRANIAL NERVE ASSESSMENT

1. OLFACTORY NERVE - SMELL
2. OPTIC NERVE. - VISION
3. OCULOMOTOR NERVE. - EYE BALL MOVEMENT
4. TROCHLEAR NERVE. - EYE BALL MOVEMENT
5. ABDUCENS NERVE. - EYE BALL MOVEMENT
6. TRIGEMINAL NERVE. - SENSORY SUPPLY TO THE FACE
7. FACIAL NERVE. - FACIAL EXPRESSIONS
8. VESTIBULOCOCHLEAR NERVE. -. HEARING APPARATUS & EQUILIBRIUM
9. GLOSSOPHARYNGEAL NERVE--. TESTE

10. VAGUS NERVE. - PHARYNX (MOTOR SUPPLY)

11. SPINAL ACCESSORY NERVE. - MOTOR SUPPLY TO SCM & TRAPIZIUS

12. HYPOGLOSSAL NERVE. - MOTOR SUPPLY TONGUE

## SENSORY EXAMINATION

- **SUPERFICIAL**
- **DEEP**
- **COMBINED**

## MOTOR EXAMINATION

- **MUSCLE TONE**
- **REFLEX. :-** SUPERFICIAL , DEEP TENDON , VISCERAL , ABNORMAL REFLEX.
- **ROM**
- **BALANCE**
- **SYNERGY**

Table 2: The Modified Ashworth Scale (Bohannon and Smith, 1987)

| Grade | Description |
|---|---|
| 0 | No increase in muscle tone |
| 1 | Slight increase in muscle tone, manifested by a catch and release or by minimal resistance at the end of the ROM when the affected part(s) is moved in flexion or in extension |
| 1+ | Slight increase in muscle tone, manifested by a catch, followed by minimal resistance throughout the reminder (less than half) of the ROM |
| 2 | More marked increase in muscle tone throughout most of the ROM, but affected part(s) easily moved |
| 3 | Considerable increase in muscle tone, passive movement is difficult |
| 4 | Affected part(s) rigid in flexion or extension |

| | |
|---|---|
| Level I | No response to pain, touch, sound or sight. |
| Level II | Generalized reflex response to pain. |
| Level III | Localized response. Blinks to strong light, turns toward/away from sound, responds to physical discomfort, inconsistent response to commands. |
| Level IV | Confused/agitated. Alert, performs motor activities but behaviour is non-purposeful, extremely short attention span. |
| Level V | Confused/non-agitated. Gross attention to environment, highly distractible, inappropriate verbalization. |
| Level VI | Confused/appropriated. Inconsistent orientation to time and place, consistently follows simple directions. |
| Level VII | Automatic/appropriated. Skills noticeably deteriorated. |
| Level VIII | Purposeful/appropriate. |

**Rancho Los Amigos Levels of Cognitive Functioning Scale**

| | Flexion Synergy Components | Extensor Synergy Components |
|---|---|---|
| Upper Extremity | Scapular retraction and elevation<br>Shoulder abduction, ext rot<br>Elbow flexion<br>Forearm supination<br>Wrist/finger flexion | Scapular protraction<br>Shoulder adduction, internal rotation<br>Elbow extension<br>Forearm pronation<br>Wrist/finger flexion |
| Lower Extremity | Hip flexion, abduction, external rotation<br>Knee flexion<br>Ankle DF, inversion<br>Toe DF | Hip extension, adduction, internal rotation<br>Knee extension<br>Ankle PF, inversion<br>Toe PF |

O'Sullivan & Schmitz, *Physical Rehabilitation*, 2007, Chapter 18.

| Glasgow Coma Scale | | |
|---|---|---|
| **Response** | Scale | Score |
| **Eye Opening Response** | Eyes open spontaneously | 4 Points |
| | Eyes open to verbal command, speech, or shout | 3 Points |
| | Eyes open to pain (not applied to face) | 2 Points |
| | No eye opening | 1 Point |
| **Verbal Response** | Oriented | 5 Points |
| | Confused conversation, but able to answer questions | 4 Points |
| | Inappropriate responses, words discernible | 3 Points |
| | Incomprehensible sounds or speech | 2 Points |
| | No verbal response | 1 Point |
| **Motor Response** | Obeys commands for movement | 6 Points |
| | Purposeful movement to painful stimulus | 5 Points |
| | Withdraws from pain | 4 Points |
| | Abnormal (spastic) flexion, decorticate posture | 3 Points |
| | Extensor (rigid) response, decerebrate posture | 2 Points |
| | No motor response | 1 Point |

**Minor Brain Injury** = 13-15 points; **Moderate Brain Injury** = 9-12 points; **Severe Brain Injury** = 3-8 points

# MANAGEMENT OF TBI

## EARLY MANAGEMENT:-

- MEDICAL TREATMENT FOLLOWING BRAIN INJURY STARTS AT THE SCENE OF THE ACCIDENT.
- EARLY RESUSCITATION WITH THE GOAL OF STABILIZING THE CARDIOVASCULAR AND RESPIRATORY SYSTEMS IS IMPORTANT TO MAINTAIN SUFFICIENT BLOOD FLOW AND OXYGEN TO THE BRAIN.

# ADVANCE TRAUMA LIFE SUPPORT(ATLS)

- **PRINCIPLES OF MANAGEMENT OF BRAIN INJURY SHOULD BE FOLLOWED– ABCDE PROTOCOL.**

1. AIRWAY CLEARANCE
2. BREATHING MANAGEMENT
3. CIRCULATION
4. DISABILITY MANAGEMENT
5. EVALUATION

# VITAL SIGNS MANAGEMENT

- SYSTOLIC BLOOD PRESSURE SHOULD BE KEPT ABOVE 90 MM HG AND OXYGEN SATURATION ABOVE 90%.

**TABLE 1.2**
**Goals of Treatment for Patients with TBI**

| | | |
|---|---|---|
| Pulse oximetry ≥ 95% | ICP 20–25 mm Hg | Serum sodium 135–145 Meq/L |
| $PaO_2$ ≥ 100 mm Hg | $PbtO_2$ ≥ 15 mm Hg | INR ≤ 1.4 |
| $PaCO_2$ 35–45 mm Hg | CPP ≥ 60 mm Hg | Platelets ≥ 75,000/$mm^3$ |
| SBP ≥ 100 mm Hg | Temperature 36.0–38°C | Hemoglobin ≥ 7 g/dL |
| pH 7.35–7.45 | Glucose 80–180 mg/dL | |

*CPP*, cerebral perfusion pressure; *ICP*, intracranial pressure; *INR*, international normalized ratio; $PaCO_2$, partial pressure of carbon dioxide; $PaO_2$, partial pressure of oxygen; $PbtO_2$, local brain tissue oxygen; *SBP*, systolic blood pressure; *TBI*, traumatic brain injury.
From ACS TQIP. *Best Practices in the Management of Traumatic Brain Injury*; 2015. https://www.facs.org/~/media/files/quality programs/trauma/tqip/traumatic brain injury guidelines.ashx; with permission.

# PRIMARY EXAMINATION

- **SIGNS OF FOCAL NEUROLOGICAL DEFICIT**

1. FRONTAL LOBE SIGN
2. PARIETAL LOBE SIGN
3. TEMPORAL LOBE SIGN
4. OCCIPITAL LOBE SIGN

- **INVESTIGATION AND DIAGNOSIS**

1. CT SCAN
2. MRI

- **MEDICATION**

1. ANTI SEIZURE DRUGS
2. DIURETICS
3. COMA INDUCING DRUGS

- **SURGERY**

1. REMOVAL OF CLOTTED BLOOD
2. REPAIRING OF SCULL FRACTURE
3. BLEEDING IN THE BRAIN
4. OPENING A WINDOW IN THE SKULL

# *PHYSIOTHERAPY MANAGMENT*

*THE MANAGMENT GOAL DEPENDS UPON THE LEVEL OF ALERTRNESS, CONSCIOUSNESS AND ABILITY TO COMPREHEND THE COMMONDS.*

(A) FOR UNCONSCIOUSNESS PATIENT.

(B) FOR CONSCIOUS PATIENT

## MANAGMENT OF UNCONSCIOUSNESS PATIENT

1. RESPIRATORY CARE

2. PREVENT SECONDARY COMPLICATIONS

3. PREVENT CONTRACTURE AND DEFORMITY

4. PREVENT & TREATMENT PRESSURE SORE

5. MAINTAIN NORMAL JOINT ROM IN ALL THE JOINT

- ***MANAGMENT OF CONSCIOUS PATIENTS***

1. *NORMALIZE THE TONE AND IMPROVE MUSCLE STRENGTH*

- HYPOTONICITY:- ICE BRISK, MET, SUSPENSION THERAPY AND AQUATIC EXERCISE.
- HYPERTONICITY:- ICE PACK, PNF TECHNIQUE, PASSIVE STRETCHING, ORTHOTIC SUPPORT.

2. IMPROVE THE VOLUNTARY CONTROL

3. TRAIN FOR BALANCE AND EQUILIBRIUM

- ONE FOOT STANDING TRAINING

- ONE FOOT STANDING BALANCE WITH HIP90° FLEXION
- ONE FOOT STANDING BALANCE WITH FORWARD BENDING
- BALANCE BOARD EXERCISES
- IMPROVE STEPPING STRATEGIES

https://erp.csjmu.ac.in/WebPages/Public/StudentServices/frmStudentverification.aspx

4. ENHANCE MOTOR RELEARNING AND TRAINING

5. IMPROVE OVERALL FUNCTIONAL CAPABILITIES

6. PREVENT ALL POSSIBLE SECONDARY COMPLICATIONS

# 7. PROVIDE PSYCHOLOGICAL SUPPORT AND DEVELOP GOOD RAPPORT WITH THE PATIENT

ONE FOOT STANDING TRAINING.

BALANCE BOARD EXERCISE

# 8. AID IN EARLY AMBULATION AND TRANSFER ACTIVITIES

- PRINCIPLES OF TRAINING OF TRANSFER TECHNIQUE FOR PHYSIOTHERAPIST.
- GAIT TRAINING

# REFERENCES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4. Susan B. O'Sullivan, Thomas J. Schmitz George D. Fulk Physical Rehabilitation

# THANK YOU