

  
**A Matter of Time: Anoxic Brain Injury Case Studies- An Overview**
  
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## Objectives

- Participants will be able to identify variable causes of anoxic BI
- Participants will be able to identify interventions that may be utilized to assist in the recovery from ABI
- Review several case studies




## ANOXIC BRAIN INJURY

- Anoxic brain damage is injury to the brain due to a lack of oxygen.
- Hypoxia is the term to describe low oxygen.
- **Cerebral hypoxia** is a form of **hypoxia** (reduced supply of **oxygen**), specifically involving the **brain**; when the brain is completely deprived of oxygen, it is called *cerebral anoxia*.




## Causes of Cerebral Anoxia

<ul style="list-style-type: none"> <li>• <b>Cardiac Arrest</b></li> <li>• Asthma</li> <li>• Anemia</li> <li>• Status epilepticus</li> <li>• <b>Choking</b></li> <li>• Drowning</li> <li>• Strangulation</li> <li>• Smoke inhalation</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Drug overdose</b></li> <li>• <b>Shock</b></li> <li>• Crushing of the trachea</li> <li>• Ascent from deep water diving</li> <li>• Flying in high altitudes without a pressurized cabin</li> <li>• The “Fainting” game</li> </ul>
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## Anoxic Brain Injury

- Approximately 180,000- 450,000 people in the United States are dying because of sudden **cardiac arrest** per year
- ~100,000 people are treated in the United States each year for out of hospital cardiac arrest (OHCA)
- Improved pre- hospital emergency care, Pts surviving resuscitation and suffering severe hypoxic brain damage is increasing
- 7.6% of treated OHCA patients survive to hospital discharge
- Less than 30% of patients who are admitted to the ICU after OHCA will be discharged from the hospital
- Broad spectrum: from full recovery- coma- death
- Trials show 27% of post hypoxic coma Patients regain consciousness within 28 days, 9% remain comatose or vegetative, 64% died.

Hertz and Bellmark  
Lippincott Williams & Wilkins  


## Case Study 1- Derek

- 23 year old male s/p v-fib arrest secondary to aspiration pneumonia
- **Down and unconscious for unknown period of time**
- 20minutes of CPR; epinephrine x2; bicarbonate x1; shock x1
- Blood alcohol content= 438 at admission; urine toxicology screen= negative
- Past medical history: hearing loss in R ear; depression
- Past social history: Independent prior to admission and worked in family business



## Case Study 1- Derek

- Inpatient Brain Injury Rehabilitation
- Disorders of Consciousness Program
- Paroxysmal Sympathetic Hyperactivity
- Tracheostomy and PEG
- 5 weeks post event
- ~ 6 week length of stay

## Case Study 1- Derek

- Occupational Therapy:
  - Eye opening 100% with no command following noted on evaluation
  - No auditory startle or flexion withdrawal in all four extremities
  - Total assist for self care and transfers
  - Nystagmus during questionable visual tracking

## Case Study 1- Derek

- One week post OT evaluation:
  - Minimal visual tracking
  - Unable to cross midline visually
  - Cervical range of motion and upper extremity passive range of motion
- 2 weeks post OT evaluation:
  - Occasionally vocalizing on command
  - Remains total assistance for sitting balance, transfers, and self care skills
  - Able to attend to midline visually for up to 10 seconds
- 3-4 weeks post OT evaluation:
  - Vocalizing throughout sessions; facial grimacing; and facial twitching
  - Family training and education
  - Fluctuating attention to auditory stimulation
  - Fluctuating body centered command following
- 5-6 weeks post OT evaluation:
  - Family training and education
  - Localization to auditory stimulus
  - Able to localize and fixate on a target visually with head turns.

## Case Study 1- Derek

- Speech Therapy:
  - Demonstrated reflexive swallow 4 times on evaluation
  - Strong cough present and requiring suctioning to clear secretions from tracheostomy
  - Nonverbal and did not follow commands on evaluation
  - PMV trialed
  - Coma Recovery Score completed= 3 out of 23

## Case Study 1- Derek

- One week post ST evaluation:
  - Eye opening 100% of sessions
  - Spontaneous vocalizations
  - Tolerating PMV for ~45mins with stable saturation levels
  - Visual startle and flexion withdrawal in bilateral lower extremities noted.
- 2 weeks post ST evaluation:
  - Trach capped- decannulation
  - Perseverative vocalizations
  - Tracking loud auditory stimulation on the left
- 3-4 weeks post ST evaluations:
  - Coma recovery scale ongoing
  - Auditory localization
  - Eye opening without simulation
  - Oromotor movement
- 5-6 weeks post ST evaluations:
  - Continues to demo auditory localization
  - Fluctuating visual startle
  - Reflexive vocalizations
  - Family training

## Case Study 1- Derek

- Physical Therapy
  - Total assistance level for bed mobility and transfers (quad pivot & hoyer); ambulation and stairs not appropriate on evaluation
  - Eye opening 100% of session
  - Spasticity noted on R hemi body with flaccidity on the left
  - Vital Signs stable

### Case Study 1- Derek

- One week post PT evaluation:
  - Eyes open 75 – 100 % of session
  - Cervical and lower extremity passive range of motion w bilateral lower extremity flexor withdraw
  - Standing Frame 12 minutes, fluctuating vital signs
  - Total assistance bed mobility and transfers
- 2 weeks post PT evaluation:
  - Continue passive range of motion
  - Sitting balance 20 minutes total assistance
  - Standing Frame 15 minutes, fluctuating vital signs
  - Total assistance bed mobility and transfers
- 3-4 weeks post PT evaluation:
  - Total assistance bed mobility and transfers
  - Assessed for Tilt in space wheelchair Family / Caregiver training and education
  - Erigo 20 minutes
- 5-6 weeks post PT evaluation
  - Complete Family / Caregiver training and education
    - Bed mobility & Bed <=> wheelchair transfers
    - Car transfer
    - Dependent wheelchair carry up and down stairs
  - Letter of medical necessity tilt in space wheelchair and standing frame

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### Case Study 1- Derek

- Summary
  - 6 week length of stay
  - Coma recovery scale progressed 3 → 7 out of 23
  - Pt decannulated but continued with PEG
  - Total assistance for self care, mobility, and communication/feeding
  - d/c to home with family providing 24 hour care; home care services; tilt in space wheelchair and shower chair
  - Per report continues to be in a vegetative state

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### Case Study 2- Alex

- 31 year old male found down from presumed heroin overdose
- **Oxygen saturations on room air at 70%**
- Received Narcan without improvement
- Rhabdomyolysis; right lower extremity compartment syndrome; fasciotomy
- Past medical history: depression/ anxiety; opioid dependence
- Past social history: independent prior to admission

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### Case Study 2- Alex

- Inpatient Brain Injury Rehabilitation
- PEG placement
- Paroxysmal Sympathetic Hyperactivity
- Spasticity and Heterotrophic Oscifaction
- ~4 weeks post event
- 5 week length of stay

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### Case Study 2- Alex

- Occupational Therapy:
  - Restlessness and perseverative
  - Decreased orientation
  - Total assistance for self care and transfers on evaluation
  - Decreased sitting balance
  - Flexion withdrawal noted in bilateral upper extremities.

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### Case Study 2- Alex

- One week post OT evaluation:
  - Bilateral digit mobilization
  - Total assistant for self care and transfers
  - Improved command following during dressing tasks
  - Reaching and gross grasping tasks
- 2 weeks post OT evaluation:
  - Botox injections to bilateral hands
  - Grooming tasks at Maximum assistance level
  - Introduced self feeding at maximum assistance level
  - Emotional lability limiting sessions
- 3-4 weeks post OT evaluation:
  - Self feeding at minimal assistance level with adaptive equipment
  - Simple community integration at wheelchair level
  - Completing fine motor coordination games
  - Family education
- 5 weeks post OT evaluation:
  - Supervision for grooming tasks
  - Maximum to moderate assistance level for stand pivot transfers
  - Decreased mood and affect limit sessions
  - Completing simple IADL tasks at Moderate assistance level

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## Case Study 2- Alex

- Speech Therapy
  - Duotube in place on evaluation
  - Max cues needed to attend and track visually
  - Orally defensive to toothette swab on evaluation
  - No oral manipulation or oral prep during PO trials on evaluation

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## Case Study 2- Alex

- 1 week post ST evaluation
  - Following one step body centered commands
  - Spontaneous speech
  - Completing automatic speech tasks
- 2 weeks post ST evaluations
  - On full nectar thick liquid diet
  - Communicating wants/ needs
- 3-4 weeks post ST evaluation
  - CLQT
  - Attempting to independently self correct language/ word finding errors
  - Oriented
  - Ipad tasks
- 5 weeks post ST evaluation
  - Increased time required to complete tasks
  - Sorting/ matching tasks
  - Improved recall
  - Able to interact with staff while completing tasks

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## Case Study 2- Alex

- Physical Therapy:
  - Total assistance for bed mobility and transfers (quad pivot); ambulation and stairs not appropriate on evaluation
  - Poor sitting balance = total assistance
  - Emotional lability and Decreased orientation
  - More active movement seen in left lower extremity greater than right
  - Spasticity Right Lower extremity

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## Case Study 2- Alex

- One week post PT evaluation:
  - Bilateral lower extremity range of motion
  - Standing Frame 25 minutes
  - Total assistance bed mobility and transfers
  - Ambulation 8 feet assist x 2 and R knee extension orthosis
- 2 weeks post PT evaluation:
  - Right lower extremity passive range of motion . Right knee - 30 degrees from full extension/ Right knee ratchet orthosis
  - Sitting balance 15 minutes moderate to maximal assistance
  - Standing Frame 25 minutes
  - Total assistance bed mobility and transfers
  - Ambulation 8 feet assist x 2 and Right knee extension orthosis
- 3-4 weeks post PT evaluation:
  - Right lower extremity passive range of motion . Right knee ratchet orthosis
  - Sitting balance 20 minutes supervision to minimal assistance
  - Maximal assistance bed mobility and transfers
  - Ambulation 50 feet maximal assistance Bilateral platform wheeled walker and transfers
- 5-6 weeks post PT evaluation
  - Moderate assistance bed mobility and transfers
  - Ambulation 50 feet minimal assistance Bilateral platform wheeled walker

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## Case Study 2- Alex

- 5 week length of stay
- Progressed Rancho 3 → to Rancho 6
- Heterotrophic Ossification
- Moderate assistance for transfers and ambulation
- Supervision for eating and word finding deficits
- d/c to SNF and eventually to community
- By report recent overdose and d/c back to community

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## Case Study 3- Gary

- 67 year old male suffered cardiac arrest while in his car resulting in a crash
- **Extraction from car delayed CPR**
- **CPR initiated for 20 minutes**
- Ejection fracture 30-35%
- Past medical history: hypertension; coronary artery disease; gout
- Past social history: insurance company owner; married; independent prior to admission

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## Case Study 3- Gary

- Inpatient Brain Injury Rehabilitation
- LifeVest
- ~2 weeks post event
- 5 week length of stay

## Case Study 3- Gary

- Occupational Therapy
  - Decreased orientation
  - Confused/ confabulation
  - Apraxic
  - Total assistance level with self care tasks and transfers

## Case Study 3- Gary

- One week post OT evaluation
  - Total assistance for matching/sorting tasks
  - Poor command following/ apraxia
  - Completing simple gross motor tasks
- 2 weeks post OT evaluation
  - Completing simple money management/ coin ID
  - Completing self care tasks with Minimal assistance to maximum assistance
  - Improved attention to tasks up to 40mins in a therapy session
  - Requires increased time and one step cues
- 3-4 weeks post OT evaluation
  - Completing fine motor coordination tasks
  - Minimal assistance for self care tasks
  - Continues to present with apraxia
  - Behavior limiting sessions
  - Misuse of objects during self care tasks
  - Minimal assistance for IADL tasks
- 5 weeks post evaluation
  - Continues to demonstrate poor insight into deficits
  - Computer use tasks
  - Decreased safety awareness, memory deficits

## Case Study3- Gary

- Speech Therapy
  - Decreased verbalizations
  - Fatigue/ lethargy limiting evaluation
  - Decreased orientation/ memory/ recall
  - Apraxia of object use noted during swallowing evaluation- DII with thins- orally defensive

## Case Study 3- Gary

- One week post ST evaluation
  - Apraxia of objects during meals
  - Diet upgrade to regular diet with thin liquids
- 2 weeks post ST evaluation
  - Decreased insight and awareness into deficits
  - Behavior limiting sessions
  - 75% accuracy with object naming
  - Family education in regards to POC
- 3-4 weeks post ST evaluation
  - Completing simple organizational tasks
  - Continues to demonstrate decreased orientation
- 5 weeks post ST evaluation
  - Continues to complete simple organizational tasks
  - Able to complete social conversation about personal history
  - Unable to provide detailed conversations in regards to goal setting or discharge planning

## Case Study 3- Gary

- Physical Therapy
  - Decreased orientation
  - Confused/ confabulation
  - Low blood pressure
  - Bilateral lower extremity strength against gravity
  - Apraxic
  - Poor sitting balance
  - Bed mobility and transfers total assistance
  - Ambulation and stairs not tested

## Case Study 3- Gary

### One week post PT evaluation

- Decreased attention
- Vital signs stable
- Bed mobility and transfers moderate to maximal assistance of 1
- Ambulation wheeled walker 64 feet moderate to maximal assistance of 1

### 2 weeks post PT evaluation

- Bed mobility and transfers minimal to moderate assistance
- Ambulation wheeled walker 200 feet minimal to moderate assistance

### 3-4 weeks post PT evaluation

- Gout flare
  - Bed mobility and transfers minimal to moderate assistance
  - Ambulation wheeled walker 5 feet minimal to moderate assistance =antalgic
- ### 5 weeks post PT evaluation
- Bed mobility and transfers minimal assist
  - Ambulation wheeled walker 400 feet minimal assist
  - Stair negotiation 12 steps bilateral hand rails (per home setup) minimal assistance
  - Completed family care giver education

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## Case Study 3- Gary

- 5 week length of stay
- Progressed from Rancho 4 → Rancho 5
- Minimal assistance level for transfers, ambulation, and self care skills
- Decreased insight into deficits, impulsivity, and decreased memory
- d/c to home with family and 24/7 supervision from Pts wife and family
- Per report still presents with decreased insight; independent with self care skills and ambulation; requires supervision for IADL tasks

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## Other cases

- 60 year old male- drug overdose; myoclonic choreiform movements; limited family support- d/c to SNF
- 35 year old male- drug overdose; spasticity and myoclonic; limited family support- d/c to SNF
- 24 year old male- suicide attempt- strangulation; myoclonic; d/c to home with family
- 28 year old male- aspiration pneumonia; cortical blindness; d/c to home with family
- 43 year old male- cardiac arrest; down for ~20mins; CPR; myoclonic; d/c home with family
- 44 year old female- drug overdose; brief CPR at scene; flat affect/ severe memory deficits; d/c to home with family

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## Conclusion

- Multiple causes for anoxic brain injury
- Amount of time a patient is down in the field without care appears to impact recovery
- Recovery from an anoxic brain injury appears longer than a traumatic brain injury
- Regardless of functional level and burden of care, significant family/ caregiver support results in an improved potential for discharge to home

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## QUESTIONS??

## References

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