


# Journey of an acquired brain injury due to opioid overdose: An acute to subacute rehabilitation perspective.

Presenters:  
Tara Lopez, MS CCC SLP CBIS



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## Disclosure

Relevant Financial Relationships:


- Currently full-time salaried employees of HMH JFK Johnson Rehabilitation Institute



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## Objectives


1. Identify pathophysiology and cognitive impairments resulting from an anoxic brain injury.
2. Cite barriers and limitations associated with Hypoxic-Ischemic Brain injury due to drug overdose.
3. Describe traditional and non-traditional treatment strategies to target language and cognitive linguistic skills.
4. Participants will be able to apply learned knowledge through a presented retrospective case studies




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## Opioids

- Substance that binds to opioid receptors in the central nervous system (CNS)
- Can be:
  - a) Endogenous –produced by the brain and have multiple functions/actions within the body (i.e. endorphin)
  - b) Naturally occurring from opium poppy (i.e. Morphine and codeine)
  - c) Semi-synthetic (i.e. Heroin) or synthetic compounds (i.e. methadone, fentanyl)
- Triggers analgesic and euphoric effects





(Lyden & Binswanger, 2010)



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## Prevalence

- Nation wide public health crisis
- Significant increase in overdoses due to heroin and fentanyl versus pharmaceutical opioids
- According to Salani et al. (2020), from July 2016-September 2017:
  - 30% increases in opioid overdoses treated in US emergency departments
  - Overdoses in large cities increased 54%
  - Approximated 70% increased in overdoses treated in emergency departments within the Midwestern states
- Opioid overdose is now the 2<sup>nd</sup> leading cause of accidental deaths in the US secondary to MVA





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## Respiratory Depression

- Respiratory drive begins in brainstem and is modified by inputs from cortex, central brainstem, and peripheral chemoreceptors in the carotid and aortic bodies
- Respiratory Rhythm is the most altered and sensitive aspect of respiration when opioids are used
- Respiratory Depression:
  - 1. Changes respiratory pattern
  - 2. Changes of tidal volume
- Results in denying oxygen to the brain leading to anoxia, ischemia, hypoxia and hypercapnia
- Overdose Reversal Agent- Naloxone (NARCAN)

(Pattinson, 2009)





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## Naloxone (NARCAN)

- Overdose Reversal Agent- Naloxone (NARCAN)\*\*
- How does it work?
  - Acts as opioid antagonist in order to obtain partial or complete reversal of an opioid overdose
- Due to significant rise in opioid use there as been a significant rise in Narcan Administration over the past few years due to:
  - Rise in users
  - Increased access
  - Increased availability

(Cash et al., 2018)



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## Naloxone Administration

**TABLE 2. Rates of emergency medical services (EMS) naloxone administration events and opioid overdose deaths — National EMS Information System (NEMIS) and CDC National Vital Statistics System, United States, 2012–2016\***

Year	NEMIS† EMS naloxone administration events rate (95% CI)		CDC* opioid-involved death rate (95% CI)
	Overall	Suspected opioid*	
2012	573.6 (565.9–577.3)	230.6 (228.3–233.0)	7.4 (7.3–7.5)
2013	666.0 (662.0–669.9)	275.1 (272.5–277.6)	7.9 (7.8–8.0)
2014	691.3 (687.4–695.1)	300.3 (297.7–302.8)	9.0 (8.9–9.1)
2015	805.1 (801.3–809.0)	383.4 (380.7–386.1)	10.4 (10.3–10.5)
2016	1,004.4 (1,000.1–1,008.7)	505.2 (502.1–508.3)	13.3 (13.2–13.4)
% Change**	→ 75.1	119.0	→ 79.7



(Cash et al., 2018)

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## Question:


How does an increase in Narcan Administration relate to rehabilitation?



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## Hypoxic-Ischemic Brain Injury

- **Hypoxic:** Restricted oxygenation to brain
- **Anoxic:** Total lack of oxygenation to the brain
- Prolonged, limited, or inadequate oxygen to the brain
- Key factors include:
  - Duration of hypoxia
  - Area of the brain most affected
  - Pre-morbid function
- Cumulative damage can occur with multiple instances of overdoses
- **Ischemic:** Low blood pressure



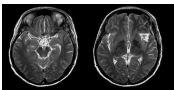
(Schultz, 2018)

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## Neuroimaging



- CAT Scan
- MRI
- Clinical Presentation
  - Imaging does not consistently correlate with clinical presentation



(Hong et al., 2019)

- Imaging studies of drug abusers has revealed :
  - Brain Atrophy
  - Focal demyelination
  - Hyper intense lesion
  - Focal perfusion deficits
  - Metabolic disturbances
  - Neurochemical abnormalities
  - Structural abnormalities in white matter

(Weis & Blüntner, 2015)

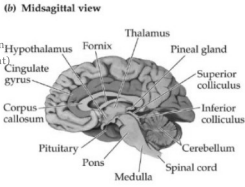



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## The Brain

Specific areas susceptible to Hypoxic-Ischemic injury:

- **Neocortex:** Involves higher level of functioning (sensory perception, generation of motor commands, spatial reasoning, conscious thought)
- **Hippocampus:** Involves regulating motivation, emotion, memory\*\*\*
- **Basal Ganglia:** Motor learning, initiation, executive function, emotions
- **Cerebellum:** Relaying motor and sensory signals to cerebral cortex
- **Thalamus:** "Fight or flight" response, fear, stress, emotion
- **Amygdala:** "Fight or flight" response, fear, stress, emotion
- **Brainstem:** Regulation of heart, respiration, sleeping, eating
- **Occipital-parietal cortex:** Visuo-spatial imagery and vision
- **Frontal Lobe:**



(b) Midsagittal view


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## The Frontal Lobe

- Maintains robust afferent and efferent connections throughout CNS
- Acts as a relay system transmitting high-level auditory, somatosensory and visual information in order to organize an individuals behavior
- Activating –Inhibiting-Integrating** Ideomotor and sensorimotor activity
- Essential in a variety of cognitive, behavioral, and emotional functions

•Executive function supported by frontal lobe:

- Goal identification
- Planning
- Organizing
- Task persistence
- Inhibition
- Initiation and drive



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## Frontal Lobe

TABLE 6.2. Application of Executive Function Model to Functional Activities

Domain of executive function model	Dysexecutive syndrome applied to communication disorder	Dysexecutive syndrome applied to grocery shopping
Initiation and drive	Does not initiate conversation; exhibits flat affect with limited expression	Does not initiate going to grocery store even when refrigerator is empty
Response inhibition	Makes inappropriate comments; does not wait for turn in conversation	Impulsive shopping; buys unnecessary items that look appealing during the shopping excursion
Task persistence	Loses interest in conversation; cannot maintain topic	Does not get all the items on the list
Organization	Poor verbal organization; jumps from topic to topic; seems to talk "around a subject" and not get to the main idea	Does not make a grocery list; does not use aisle heading to shop in an organized manner; inefficient use of time when gathering groceries
Generative thinking	Unable to generate conversation; seems to have little to say; has difficulty responding to open-ended questions	If desired item is not available, cannot generate appropriate substitute
Awareness	Seemingly unaware of communication deficits; does not seem to notice if others are not interested in topic	Is not aware that getting groceries is an act of concealment

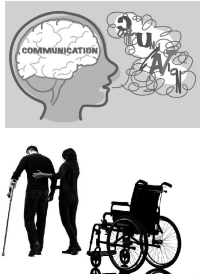
(Bohlborg & Mateev, 2001)

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## Resulting Impairments

- Oxygen deprivation can lead to:
  - Language Impairments
  - Dysphasia
  - Cognitive Impairments
  - Mobility



(Corrigan & Adams, 2019)

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## Emotional Changes

- Lability
- Impulsivity
- Irritability
- Apathy
- Affect



(Corrigan & Adams, 2019)

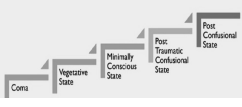
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## Disorders of Consciousness (DOC)

Definition="A state of impaired consciousness as a result of an injury to the brain"

- Levels of Consciousness:
  1. Coma (Lowest functioning)
  2. Vegetative
  3. Minimally Conscious (Highest functioning)
- Arousal and Awareness play a key role in determining a patient's DOC level



(Kolokowsky-Hayner et. al., 2015)

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## Language Impairments

**Expressive Language Deficits**

- Inability or impaired ability to express themselves
- Decreased verbal fluency
- Anomia
- Poor verbal initiation
- Verbose/ Tangential speech
- Confabulation

**Receptive Language Deficits**

- Inability or impaired ability to understand language
- Decreased auditory processing
- Poor command following



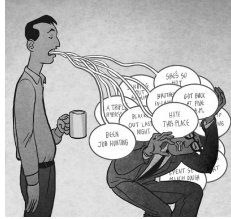
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### Language Impairment cont.

#### **Pragmatic Deficits**

- Inadequate turn taking
- Decreased eye contact
- Inappropriate topic selection
- Inappropriate commentary



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### Implications of Hypoxic-Ischemic Injury

Results of language and/or cognitive impairments can lead to:

- Disrupted family communications
- Decrease in an individuals social interaction and quality of interactions
- Independence within the community
- Academic success
- Successful reintegration into competitive work environment



(MacDonald, 2017)

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### Role as a Speech Language Pathologist

- Evaluate patients language & cognitive abilities
- Evaluate Patients swallowing
- Develop a plan of intervention
- Educate patient and family regarding communication and cognitive impairments, progress, and use of learned strategies
- Collaborate with fellow professions to address patient's needs



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### Language Assessments

- Boston Diagnostic Aphasia Examination (BDAE)
- Boston Naming Test (BNT)
- Western Aphasia Battery (WAB)
- Additional Assessments:**
  - Coma Recovery Scale-Revised(CRS-R)



(Chapey, 2008)

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### Coma Recovery Scale Revised (CRS-R)

- The JFK Coma Recovery Scale (CRS) was first described in 1991 by Giacino, Kezmaryski, DeLuca and Cicerone.
- It is a standardized neurobehavioral assessment measure designed for use in individuals with disorders of consciousness(DOC)
- The CRS was developed to further monitor patients at levels I through IV on the Levels of Cognitive Functioning Scale (AKA Ranchos Los Amigo Scale).
- Primary Purpose: To Monitor Course of Recovery

(Giacino, 2004; Slomine, 2019)

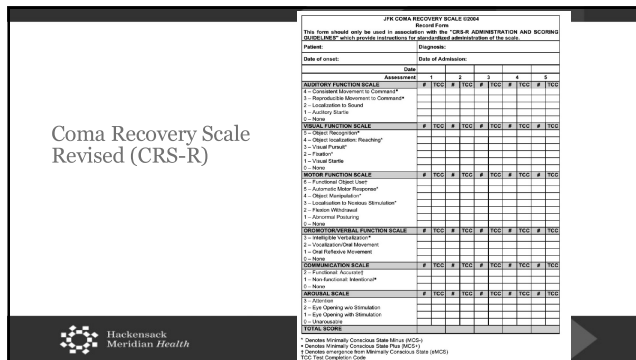
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### Coma Recovery Scale Revised (CRS-R)

- Consists of 6 hierarchically-arranged items reflecting brainstem, subcortical, and cortically-mediated behaviors
- Lowest score on each subset represents reflexive behavior
- Highest score on each subtest represents cortically-mediated behavior
- Subtests:
  1. Auditory Function
  2. Visual Function
  3. Motor Function
  4. Oromotor/Verbal Function
  5. Communication
  6. Arousal
- Total Score ranges 0-23

(LaPorta, 2013; Gerrard, 2014).

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### Cognitive-linguistic Assessments

- Scales of Cognitive Ability for Traumatic Brain Injury (SCATBI)
- Ross Information Processing Assessment (RIPA)
- Cognitive Linguistic Quick Test (CLQT)
- The Orientation Log (O-LOG)
- The Cognitive Log (Cog-LOG)
- The Cognitive Log (Cog-LOG)
- Functional Assessment of Verbal Reasoning and Executive Strategies (FARVES)
- Montreal Cognitive Assessment (MOCA)
- Measure of Cognitive Linguistic Abilities (MCLA)

(Chapey, 2008)

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### Treatment Approaches

**Traditional**

- Clinician led
- Face-to-face drill
- Structured Treatment setting/location
- Structured activities
- Hierarchy
- Paper-pencil

**Non-traditional**

- Can have patient led activities
- Unstructured tasks
- Therapy integrated in community based events
- iPad based apps
- Functionally Based

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### Principles of Cognitive Rehabilitation

1. Environmental (Quiet to Distracting)
  - Utilizes modification of the environment
  - As patient improves, stimuli(i.e. distraction) are gradually re-introduced
2. Task Complexity (Simple to Complex)
  - Begin with simple tasks and progress to more complex tasks
  - Can be decreased or increased based on accuracy and or time
3. Cognitive Distance (Concrete to Abstract)
  - Relates to complexity of information available
  - Picture of Color object->Black & white picture->line drawing-> word->spoken

(Rohakowsky-Hayner et al., 2016)

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### Evidence Based Treatment-Language

- Semantic Feature Analysis
- Schuell's Stimulation Approach
- Melodic Intonation Therapy
- Verb Network Strengthening Treatment (VNeST)

(Chapey, 2008)

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### Evidenced Based Treatments-Cognition

- Errorless Learning
- Prospective Memory Process Training (PROMPT)
- Attention Process Training (APT)
- External aids
- Training Task-specific routines

(Sohlberg & Mateer, 2001)

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### External Aids

- Effective in targeting memory, attention, executive function deficits
- Lists, calendars, charts, memory books
- Memory Books Integration
  1. Acquisition
  2. Application
  3. Adaptation



(Sohlberg & Mateer, 2001)



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### Barriers to therapy

- Decreased insight and self awareness
- Decreased safety awareness
- Increased impulsivity
- Challenges of addiction
  - Recovery and rehabilitation from substance abuse



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### Types of Awareness

1. Anticipatory
2. Emergent
3. Intellectual



(Abreu et al., 2001)



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### Measurements of Awareness

- Clients verbal description of functioning
- Comparison of Patients reported function with a professionals report
  - Patient Competency Rating
- Accuracy perception measures
- Change Assessment Scale(URICA)



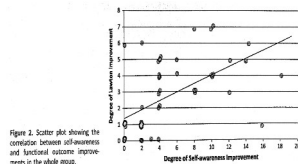
(Sohlberg & Mateer, 2001)



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### Treatment Approaches targeting Awareness

- Treatment towards increasing awareness:
- Test-retest
  - Reflection
  - Target "black and white" treatment tasks
  - An increase in self-awareness leads to meaningful gains on daily living



(Willalobos et al., 2010)



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How do these deficits relate to the continuum of care?



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### Neuroplasticity and intensity

- Neuroplasticity: the brains ability to change/alter in response to injury and develop new neurological networks to regain function
- Research suggest a complex correlation with frequency and amount of intervention in relation to recovery



(Sohlberg & Mateer, 2001)

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### Acute Care

- Initial evaluations performed
- Baseline level of deficits achieved
- Typically consulted and seen every 2-7 days
- Duration Varies: 15-60 min or more if needed

Clinical Presentation might exhibit:

- Poor Arousal
- Delayed processing
- Sustaining substance withdrawal (i.e. shaking, sweating, insomnia, vomiting, muscle & bone pain, etc.)
- Increased tone
- Low vocal quality
- Decreased ability to speak
- Confusion
- Disorientation
- Tremors
- Decreased Attention
- Dysphasia

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### Inpatient Rehabilitation

- Re-evaluated upon
- Evaluations typically consist of standardized assessments and scales to determine pt's safety, level of impairment, balance, etc
- Received therapy 5x a week per discipline

Clinical Presentation might exhibit:

- Improving auditory comprehension and verbal expression
- Improved arousal
- Improved orientation
- Emergence of notable cognitive deficits
- Increased strength
- Decreased tone



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### Subacute Rehabilitation

- Re-evaluated upon admission
- Evaluations consist of standardized assessments and scales
- Frequency of therapy varies by facility
  - 2-5x/wk- 30-60 min
  - Depending on tolerance
  - Can Vary\*\*

•Continue to exhibit improvements in varying categories.

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### Case Studies

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### Case Study #1

Pt is a 33 y/o male with PMH of opioid and alcohol abuse who was found unresponsive on 1/16/2019 by his roommate with vomitus and sonorous respirations. Down time unknown. EMS was called and he was intubated in the field. Pt was brought to Hackensack University Medical Center. He received Advanced Cardiac Life Support(ACLS) protocol for multiple cardiac arrests. Hospital course was complicated by multiple system organ failure (i.e. shock liver and acute kidney injury). Pt w/ multiple episodes of aspiration PNA. He suffered from frequent fevers believed to be central.



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### Case Study-Imaging


**CT Head without Contrast**  
 Revealed B/L infarcts in globus pallidus with loss of gray white differentiation  
 -MD Suspected presentation appeared to exhibit anoxic encephalopathy

**Video EEG**  
 • Consistent with anoxic brain injury






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### Social History





Prior to overdose:  
 • PT was on temporary disability from working as sheet metal operator  
 • Lives in an apartment with roommate  
 • Mother was involved and lives in North Carolina  
 • Has a girlfriend  
 • Hx of drug/ETOH abuse  
 • Pt's mother reported when "visiting patient over Christmas she suspected he was drinking too much but never explored it further."  
 • Family denied knowledge of any other substance abuse hx/use

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### Case Study #1: Acute Care

- Pt unresponsive and "not interactive"
- Severe impairments in all areas of speech, physical, and occupational therapy areas
- Decreased reflexive responses
- Pt transferred to Long Term Acute Care (LTAC) at Kindred with goal for respiratory and ventilation weaning.
- Following LTAC, pt discharge to Kessler Inpatient Rehabilitation






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### Case Study #1: Inpatient Rehabilitation

- Presented with severe Disorder of Consciousness (DOC) profoundly impacting all expressive and receptive language
- No longer on mechanical ventilation




**Skills Exhibited over course of his stay:**  
 -No meaningful communication.  
 -Reaction to noxious stimulation via limb contractures, vocalizations(moaning), and flexion withdrawal  
 -Pt visually tracks inconsistently but no fixation  
 -No command following  
 -Dependent for transfers, mobility, and self care

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### Case Study #1: Inpatient Rehabilitation



- Duration at this level of care: 35 days ( w/ intermittent re-admissions to acute care)
- Pt w/ poor medical stability
- No large change in pt's presentation over course of inpatient rehab stay

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### Case Study #1: Subacute Rehabilitation

- Pt was no longer on mechanical ventilation
- Assessed utilizing Coma Recovery Scale-R(CRS)
- Pt was still storming, had a trach, full of wounds and contractors

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### Case Study #1: Subacute Rehabilitation

Coma Recovery Scale-R (CRS-R)	Initial Admission : 6/10/19 & 6/28/19	7/11/19 & 7/23/19	9/10/19	10/23/19	12/18/19	Discharge 2/21/2020
Auditory PKN :	2 Localization to sound	2 Localization to sound	2 localization to sound	3 Reproducible mov. to command	3 Reproducible mov. to command	2 Localization to sound
Visual Function:	1-Visual Startle	1 Visual Startle	3-Pursuit of eye movements	5-OB1 Recognition	5	2-Fixation
Motor Function	2-Flexion Withdrawal	2 Flexion Withdrawal	3-Localization to noxious stim	3-Localization to noxious stim	5-Automatic Motor Response	3-Localization to noxious stim
Oromotor/Verbal Function	2-Vocalization/Oral Movement	2 Vocalization/ Oral Movement	2 Vocalization/ Oral movement	2 vocalization/ Oral movement	2 Vocalizations/ oral movement	2
Communication Scale	0-None	0-None	0-none	0-none	0-none	0-none
Arousal Scale	1-Eye Opening w/ stimulation	2-Eye Opening w/o stimulation	2-Eye Opening w/o stimulation	2	2	1
TOTAL SCORE:	8/23	9/23	12/23	15/23	17/23	10/23
Tolerance of Trach. Plugging/PMV	Tolerated digital occlusion for 2 min	Tolerated PMV for 30 min session	Tolerates tracheal plugging for 30 min	Inconsistent tolerance of plug	Inc'd plugging tolerance	Inc'd plugging tolerance

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### Across the Continuum of Care

Domain:	Acute	Inpatient Rehab	Sub-Acute	Discharge
CRS R Score:	N/A	N/A. However pt exhibited localization to sound, withdrawal to noxious stim, vocalization, no command following	17/23 * Best	10/23
Trach plug/valve	N/A Vent dependent	Dec'd tolerance of trach occlusion		Inc'd tolerance for 30-60 min
Dysphagia	N/A	Reflexive swallow w/ thermal stim	Trial N: tsp and inc'd facilitation of swallow	Trial K: tsp and inc'd facilitation of swallow
Arousal	Vent dependent w/ minimal eye opening	Eye opening w/ stimulation	Eye opening w/o stimulation	Able to maintain sustained eye opening

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### Following Subacute

- Quality of Life
  - Patient
  - Family
- Increase in Spasticity
- Wounds
- Reoccurring hospitalizations



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### Case Study #2

Pt is a 27 y/o male who presented to the Hospital of the University of Pennsylvania Hospital on 10/23/18 after suffering cardiac arrest 10/23/2018 from an opioid overdose. Now with hypoxic encephalopathy. Hospital course was complicated by persistent fevers, respiratory distress, ventilator-dependent respiratory failure(VDRF), and dysphagia. Trach and PEG were placed. He continued to present with autonomic dysfunction and paroxysmal autonomic instability with dystonia and baclofen pump was placed 12/13/18. Following pump placement, pt w/ improvements in fevers, hypertension, and dystonia.

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### Case Study #2-Imaging

**CT Head without contrast**

Did not show any acute hemorrhage

**EEG**

- Consistent with encephalopathy



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### Social History #2

Prior to overdose:

- Working full time in construction
- Associate's degree in criminal justice
- Lives in a house with significant other
- Hx of smoking, ETOH, drug use both opioids and benzodiazepine.
- History of drug rehabilitation(2 wk inpatient program in 2015 for "pill")
- Family reported pt is a "great person and great friend"



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### Case Study #2: Acute Care

- Vent dependent initially and weaned off
- Storming
- NPO
- Poor arousal
- Duration in Acute Care: 64 days

Domain	Severity
Dysphasia	Severe
Motor Speech	Severe
Auditory Comp.	Severe
Verbal Expression	Severe
Orientation	Severe
Insight/Awareness	Severe
Attention	Severe
PS/R/TO	Severe
Memory	Severe
Physical Therapy	Severe
Occupational Therapy	Severe



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### Case Study #2: Inpatient Rehabilitation

Coma Recovery Scale-R (CRS-R)	Initial Admission : 12/19/18
Auditory FXN :	3 –Reproducible movement to command
Visual Function:	0-None
Motor Function	2-Flexion Withdrawal
Oromotor/Verbal Function	0-None
Communication Scale	0-None
Arousal Scale	2-Eye Opening w/o stimulation
TOTAL SCORE:	7/23

- Diet: NPO
- Was assessed utilizing CRS-R and was in a Minimally conscious state
- Severe in all domains and dependent with physical and occupational therapy
- Pt was decannulated during inpatient stay



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### Case Study #2: Subacute Rehabilitation

Domain	Severity	Observation
Dysphasia	Mild	Diet: Bite Size solids with thin liquids
Motor Speech	Moderate	Moderate Dysarthria
Auditory Comp.	Mild	
Verbal Expression	Mod	Expression impaired 2' motor speech deficits
Orientation	Mild	
Insight/Awareness	Moderate	Poor insight to cognitive deficits; Inc'd awareness to physical deficits
Attention	Mild-Mod	
PS/R/TO	Mod-Sev	Severe Problem solving and reasoning; Moderate thought organization deficits
Memory	Mod-Sev.	Severe Immediate Memory/ Moderate Recent memory
Physical Therapy	Mod-Sev	CS static sitting; Max assist standing; Ambulation Mod Assist x 2
Occupational Therapy	Mod-Sev	Dec'd ROM for b/l UE's. Max assist for ADL's dec'd strength, endurance, grip strength. Max assist bathing, dressing UB-LB, transfers and mod assist for grooming.



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### Case Study #2: Subacute Rehabilitation-Discharge

Domain	Severity	Observation
Dysphasia	WFL	Regular solids with thin liquids
Motor Speech	Mild-Mod	
Auditory Comp.	Mild	Requires inc'd processing time . Noted baseline Auditory processing deficit
Verbal Expression	WFL	Functional
Orientation	WFL	
Insight/Awareness	Mild	
Attention	Mild	
PS/R/TO	Mild-WFL	Notable improvements in multiple RIPA, SCATBI subtests
Memory	Range	Formally: Severe Immediate Mem**/ WFL: Recent Memory
Physical Therapy	Mild	Transfers-Mod Stand pivot; Ambulation CG with walker; CG for standing
Occupational Therapy	Mild	Supervision for toileting, CG shower/tub; Min assist UB & LB dressing. B/L UE-dec'd motor control, in spasticity, and good strength in available range



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### Case Study #2- Across the Continuum

Domain	Acute Care	Inpatient Rehabilitation Adm.	Subacute Rehabilitation Adm.	Discharge
Dysphasia	Severe-NPO	Severe-NPO	Mild- Bite size w/ thin	WFL-Reg. w/ thins
Motor Speech	Severe	Severe	Moderate	Mild-Moderate
Auditory Comp.	Severe	Severe	Mild	Mild
Verbal Expression	Severe	Severe	Moderate	WFL
Orientation	Severe	Severe	Mild	WFL
Insight/Awareness	Severe	Severe	Moderate	Mild
Attention	Severe	Severe	Mild-Moderate	Mild
PS/ R/TO	Unable to assess	Unable to assess	Moderate-Severe	Mild-WFL
Memory	Unable to assess	Unable to assess	Moderate RM; Severe IM	Mild RM; Severe IM
Physical Therapy	Severe	Dependent	Moderate-Severe Max assist standing; Mod x2 walk w/ walker	Mild; Mod stand pivot transfer; ambulation CG w/ walker; CG for standing
Occupational Therapy	Severe	Dependent	Moderate-Severe Impaired vision, max assist toilet transfer & hygiene, UB and dressing	Mild-Supervision w/ toileting, CG shower/tub; Min assist UB & LB dressing. B/L UE-dec'd motor control, spasticity, and good strength in available range



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### Case Study #2: Where is the patient now?

- Discharged to Residential Program
- Continuing to receive skilled ST,OT, PT
- Enjoying time with friends and family
- Engaging in personal hobbies such as golf and the beach



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### Case Study # 3

Patient is a 24 y/o male with PMH of Bipolar disorder, Asthma, and heroin abuse. He was found unresponsive and bleeding. Narcan was administered in the field with little effect. Upon admission, patient was intubated and mechanically ventilated. He was in acute renal failure, febrile, and hypotensive. Initial diagnosis of septic shock, Rhabdomyolysis, and anoxic encephalopathy was made. He exhibited stiffness in extremities. MD reported spasticity could be a result from hypoxic or hypercapnic brain injury. A psychiatric consult indicated possible intentional suicide attempt. Pt was extubated the next day and noted to be tremulous and agitated. Pt exhibited intermittent diaphoresis and was suspected of opiate withdrawal.



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### Case Study-Imaging

#### CT Head without contrast

No evidence of acute intracranial hemorrhage, vasogenic edema, mass-effect or extra-axial collection. Sulci and ventricles are normal in size and configuration

#### MRI

Revealed prominent confluent white matter signal changes

#### EEG

- Revealed generalized slowing of the background, but no seizure activity



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### Social History

Prior to overdose:

- Working full time in construction
- 1 year of college education
- Lives at home with his parents with siblings including 1 sibling with autism
- Social ETOH use
- Family reported patient with a hx of Cannabis, Xanax, Cocaine use, Heroin use intranasal 4-5 times a week for the past 3 years
- History of drug rehabilitation(3 wk inpatient program)



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### Case Study #3: Acute Care

Domain	Severity	Observation
Dysphasia	Mod-severe	Diet:NPO->upgraded to Puree w/ Honey (5 days s/p admission)
Motor Speech	Moderate	Oral weakness in lips and tongue. Fair speech intelligibility. Decreased vocal volume and rate of speech. Dysphonia
Auditory Comp.	Moderate	Following 2 unit commands
Verbal Expression	Moderate	Verbal Fluency:4 items within 60 seconds
Orientation	Severe	Oriented to person
Insight/Awareness	Severe	
Attention	Moderate	
PS/R/TO		Unable to formally assess
Memory	Severe	Unable to recall 3 units of new information presented
Physical Therapy	Severe	Dependent Max assist for rolling, transfers, sitting
Occupational Therapy	Severe	Dependent Max assist for rolling, transfers, sitting



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### Case Study #3: Inpatient Rehabilitation

Domain	Severity	Observation
Dysphasia	Moderate	Diet: Dental soft solids w/ honey thick liquids
Motor Speech	Moderate	Dysphonia. Fair speech intelligibility. Decreased vocal volume
Auditory Comp.	Moderate	Following 2 unit commands
Verbal Expression	Moderate	Verbal Fluency: 1 items within 60 seconds; utilize simple sentence
Orientation	severe	Oriented to person
Insight/Awareness	Moderate	
Attention	Mild	
PS/R/TO	Severe	
Memory	Severe	
Physical Therapy	Moderate	Modified SPT, moderate assist w/ rolling, sitting, sit to stand
Occupational Therapy	Moderate-severe	Impaired vision, Myoclonus and hypertonic UE's, max assist toilet transfer & hygiene. Upper body dressing-min; lower body dressing-max



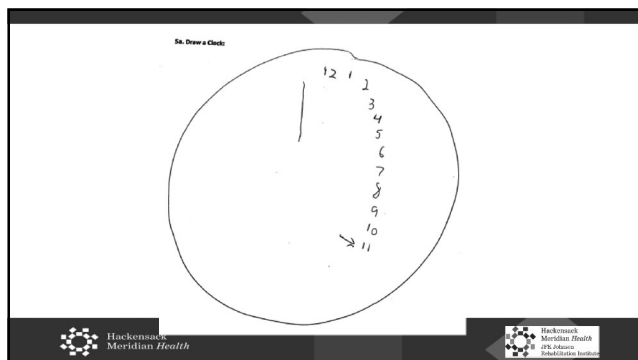
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### Case Study #3: Subacute Rehabilitation

Domain	Severity	Observation
Dysphasia	WFL	Diet: Regular solids with thin liquids
Motor Speech	WFL	Noted lingual and labial fasciculations
Auditory Comp.	Mild	Dec'd multi-unit command following, delays aud. Processing
Verbal Expression	Mild	Anomia in conversation
Orientation	Mild	
Insight/Awareness	Moderate	
Attention	Mild-Mod	
PS/R/TO	Moderate	
Memory	Moderate	Inc'd difficulty w/ recent memory versus immediate memory
Physical Therapy	Mild	Close supervision-static tasks, ambulation. Supervision for Dynamic
Occupational Therapy	Mild	ROM for b/l UE's-WFL. However dec'd strength, endurance, grip strength. Close supervision bathing, dressing UB+LB, transfers, grooming. Cognition impacts ADL's



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### Case Study #3: Subacute-Discharge

Domain	Severity	Observation
Dysphasia	WFL	Regular solids with thin liquids
Motor Speech	WFL	
Auditory Comp.	Mild	
Verbal Expression	WFL	
Orientation	WFL	
Insight/Awareness	Mild	
Attention	Mild	
PS/R/TO	Mild-Mod	Notable improvements in multiple RIPA, SCATBI subtests
Memory	Moderate	Dec'd recall of multi-unit information
Physical Therapy	Mild	Independent on Unit; supervision with dynamic tasks
Occupational Therapy	Mild	Independent toilet transfer, hygiene, upper body & lower body dressing. RUE-WFL, LUE-mildly dec'd strength, coordination, FMC

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### Across the Continuum

Domain	Acute Care	Inpatient Rehabilitation	Subacute Rehabilitation	Discharge
Dysphasia	Mod-severe Puree w/ Honey	Moderate- Dental Soft w/ Honey	WFL-Reg. w/ thins	WFL-Reg. w/ thins
Motor Speech	Moderate	Moderate	WFL	WFL
Auditory Comp.	Moderate	Moderate	Mild	Mild
Verbal Expression	Moderate	Moderate	Mild	WFL
Orientation	Severe	Severe	Mild	WFL
Insight/Awareness	Severe	Moderate	Moderate	Mild
Attention	Moderate	Mild	Mild-Moderate	Mild
PS/R/TO	Unable to assess	Severe	Moderate	Mild-Moderate
Memory	Severe	Severe	Moderate	Moderate
Physical Therapy	Severe	Moderate. Modified SPT, moderate assist w/ rolling, sitting, sit to stand	Close Supervision	Independent on Unit; supervision with dynamic tasks
Occupational Therapy	Severe	Impaired vision, max assist toilet transfer & hygiene, UB dressing-max	Close Supervision	Mild; Independent toilet transfer, hygiene, UB & LB dressing, RUE-WFL, LUE-mildly dec'd strength, coordination, FMC

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### Case Study #3: Where is the patient now?

• 3 years and 2 months clean  
 • Graduated from half-way house and living independently with his fiancé  
 • Employed Full Time  
 • Started a family

“Why did I go to hibachi two nights in a row? Then to think I couldn’t walk before and I almost put my self in the position where I could’ve never done that again.”  
 “I have found purpose and haven’t really looked back”

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### What comes after subacute rehabilitation?

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### Substance Misuse

- Substance Misuse:** Consumption of alcohol and illegal drugs and the use of prescribed drugs exceeding the prescribed amount of use of another persons prescribed drugs.
- Substance Use Disorder:** involves continued substance use despite health psychological, or social consequences.

(Kolakowsky-Hayner et al., 2016)

- Approximately 10% of the general population has been diagnosed with a substance use disorder.
- The risk of returning to substance misuse after sustaining an injury is 10x more likely.

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### Substance Misuse

- Rehabilitation, services, and treatment are more effective if substance misuse is addressed
- Involve Trained Professional such as psychologist, behavioral health.
- Key Components to utilize in therapy:
  - Establish Rapport
  - Open-ended questioning
  - Reflective listening
  - Motivational interviewing( to support patient's readiness to change)

(Kolakowsky-Hayner et. al., 2016)



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### Substance Misuse-Modifications

- Modify materials presented
- Paraphrase concepts-Use concrete examples and incorporate visual aids
- Involve family or friends to reinforce goals
- Provide direct feedback
- Keep in mind poor insight and awareness
- Avoid Confrontation=Shut down
- Non-Compliance

(Kolakowsky-Hayner et. al., 2016)



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### Dual Diagnosis Programs

- Programs targeting/ providing resources for TBI and substance abuse and addition
  - Programs can include but not limited to detoxification, individual therapy, group therapy, addiction counseling, 12-step programs, and relapse prevention program
- Limited programs available
- Due to limited availability, it is empirical that an individuals, comprehension, expression, and cognitive abilities are at the level where substance abuse rehabilitation is appropriate



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### Multi-disciplinary Approach

- Doctors
- Nurses
- Speech, occupational, and physical therapist
- Neuropsychologist
- Social Workers
- Behavioral Health professionals
- Psychologists/Counseling
- Nutrition



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### Journey of Rehabilitation:



"Faith, Hard Work, and Determination"- S.M.



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Questions?



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