CONTINUED

Concussion: Management, Intervention, & Rehabilitation

Nov 13: Concussion Management Update: Recommendations from the Berlin Meeting
Tamara McLeod, PhD, ATC, FNATA

Nov 14: Chronic Post-Concussion Syndrome: Psychological and Cognitive Implications for Treatment
Brady Whetten, PT, DPT, GCS

Nov 15: Concussion: Conditioning the Brain and Body for Return to Sport
Guest Editor: Mike Studer, PT, MHS, NCS, CEEAA, CWT

Nov 16: Concussion and the Older Adult: Does Age Make a Difference?
Debbie Struiksma, PT, NCS

Nov 17: The Management of Cervicogenic Pain and Headaches After Concussion
Rene'e James, MSPT, OCS, CMP and Bailey Denno, PT, DPT

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Concussion and the Older Adult

Does Age Make a Difference?

DEBBIE STRUIKSMA PT, NCS ☀ ***COMPLETE BALANCE SOLUTIONS***

Orange County, CA

DEBSTRUIKSMA@GMAIL.COM

Objectives

5

Identify	5 components of subjective and objective exam for the older adult with concussion
Identify	3 elements unique to the intervention and management of the older adult with concussion
Identify	2 factors relative to prognosis of the older adult with concussion
Identify	3 areas of gaps in the literature on mTBI in the older adult

Overview of mTBI in Older Adult

6

- Epidemiology
- Diagnosis
- Comorbidities
- Health Care Utilization

Epidemiology: Growing Problem

7

- TBI's per year for > 65 years: over 200,000
- Burden On Emergency Departments
- Causes Range
  - 60% Falls
  - 8% MVA
  - 6% Struck by object
  - 1% Assaults
  - 25% Unknown

Papa et al 2012; Faul et al 2010

Epidemiology: Growing Problem

8

- Incidence
- Limitations in the Literature
- Many incidents go unreported

Papa et al 2012; Harvey et al 2012; Albrecht et al 2016

9

Diagnosis

- Typical Classification of TBI - Glasgow Coma Scale
- CT Scan
- Anticoagulant Use: increased risk of intracranial bleeding

Freire-Aragon et al; Papa et al 2012

Diagnosis: CT Scan

10

- Canadian CT Head Rule, any 1 of the following
  - High Risk Factors
  - Medium Risk Factors
- Limitation: Elderly fit into the high risk factor just because of age

Steill et al 2001

Diagnosis: Biomarkers

11

- S100B Protein
- May Reduce CT scan Costs
- Limitations for the Elderly

Biberthaler et al 2006; Freire-Aragon et al 2017

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Co-morbidities

- Elderly vs. Young
- HTN
- Alcoholism
- Diabetes, Arrhythmias, COPD
- Neurodegenerative Disorders

Mosenthal et al 2004; Thompson et al 2012

Health Care Utilization

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- Costs for TBI in the US as whole
- Annual Treatment Costs: about $76,000
- Focus is on Cutting Costs
- Opportunities

Papa et al 2012; Thompson et al 2012

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Assessment - Multisystem Approach

- Overwhelming
  - Lack of Management
  - Multiple Areas of Assessment
- Streamlined Exam for Young but Not for Elderly
- Typical Scenario for mTBI in elderly

Subjective Exam: Health History

15

- You might be the First
- Mortality
- Important Areas to Screen

Papa 2012; Thompson et al 2012

Subjective Exam: Medications

16

- Anticoagulants
- Anti-hypertensives
- Psychotropics

Subjective Exam: Injury/Fall History

17

- Risk of Returning to ED
- Multiple Head Injuries
- Components of fall – identify trends

Southerland et al 2016; Yee et al 2017

Subjective Exam: General Systems Screening

18

- Respiratory
- Autonomic
- Cardiac
- Mental Status

19

Subjective Exam: Mental Status

- Depression
- Cognition
  - Mini Mental
  - Mini Cog
  - AD8 Dementia Screening

Matuszak et al 2016; Yesavage et al; Ozen et al 2015

Self Report Measure: Post Concussion Symptom Scale

20

- Headache
- Pressure in Head
- Neck Pain
- Nausea and Vomiting
- Balance Problems
- Dizziness
- Noise Sensitivity
- Feeling Slowed Down
- Don't feel right
- Sensitivity to Light
- Visual Disturbances
- Fatigue
- Trouble Falling Asleep
- Drowsiness
- Irritability
- Sadness
- Nervousness
- Feeling more Emotional
- Feeling Foggy
- Difficulty Concentrating
- Difficulty Remembering
- Confusion

Lovell et al 2006; Chen et al 2007

Subjective Exam: Self Report Measures

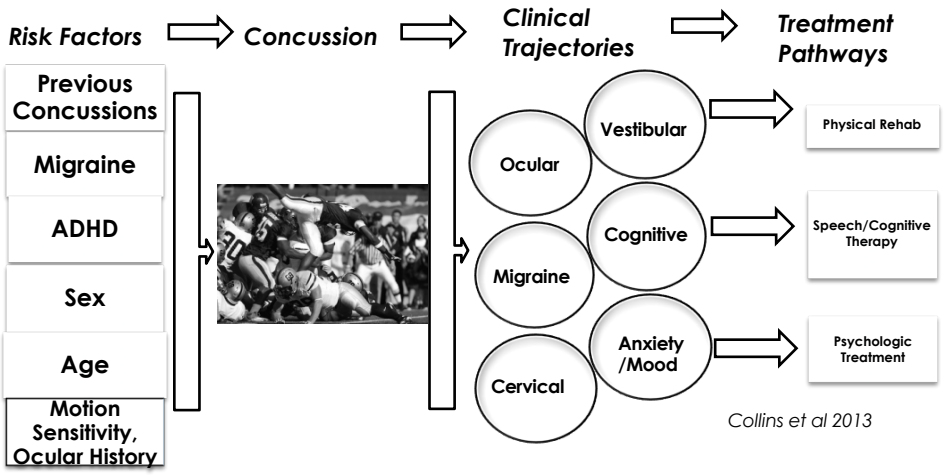
21

- Activities Specific Balance Confidence Scale
- Dizziness Handicap Inventory
- Headache Disability Inventory
- Neck Disability Index

Rehabmeasures.org; Jacobson et al 1994

22

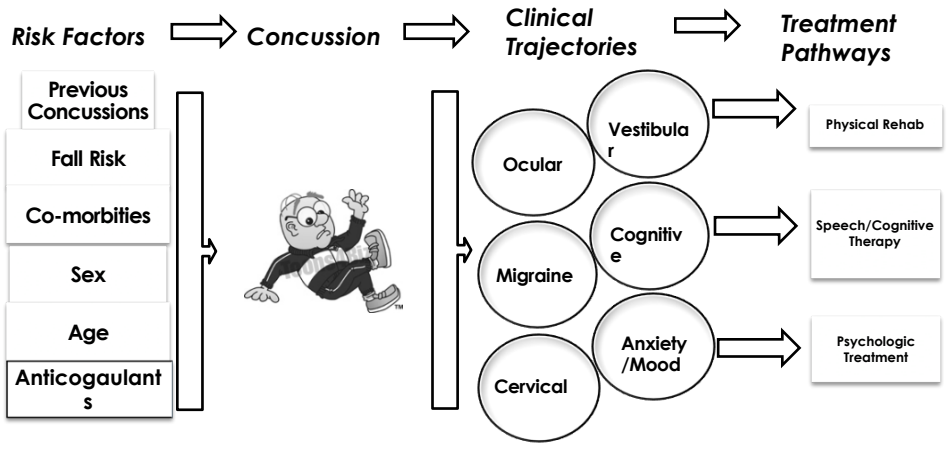
Multisystem Approach:



Collins et al 2013

23

Multisystem Approach:



Post Concussion Symptom Scale

24

- Headache
- Pressure in Head
- Neck Pain
- Nausea and Vomiting
- Balance Problems
- Dizziness
- Noise Sensitivity
- Feeling Slowed Down
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- Sensitivity to Light
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- Sadness
- Nervousness
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- Feeling Foggy
- Difficulty Concentrating
- Difficulty Remembering
- Confusion

Musculoskeletal System: Upper Quarter

25

- Migraine and Cervical Clinical Trajectories
- ROM/Strength & Recruitment patterns
- Assess joint mobility
- Posture
- Proprioception: JPE and SPNTT

Schneider et al 2014; Morin et al 2016

Joint Position Error Test

26

- Measuring Cervical Afferents
- Patient stands 90 cm from target with head lamp, adjusted to the center of the target. Patient closes eyes and turns head in 1 direction and returns head to the middle. Measure how far patient is from target after return to the center

Treleaven et al 2006

Joint Position Error Test

27

- http://www.skillworks.biz/news/520810

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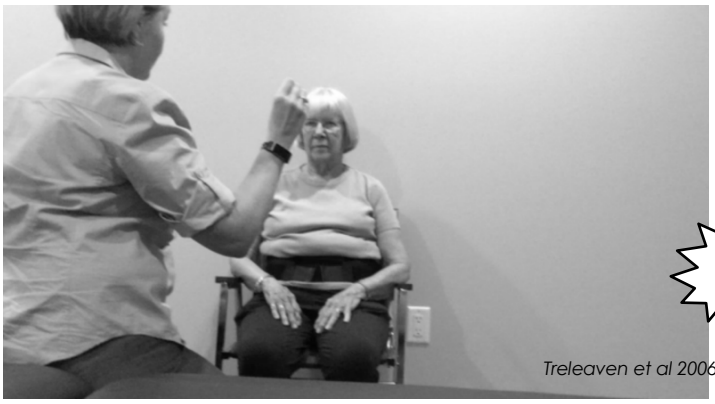
Smooth Pursuit Neck Torsion Test



Treleaven et al 2006

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Musculoskeletal System:
Lower Quarter

Ataxia or Vestibular Clinical Trajectory

Strength/ROM

Sensation

Pain

Gait

Vestibular Assessment

30

- **Vestibular and Ocular Trajectories**
- **Peripheral and Central Injuries**
- **VOMS**
- **BPPV**

Mucha et al 2014; Sogebi et al 2014

VOMS

31

Vestibular Oculomotor Test	Not Tested	Headache 0-10	Dizziness 0-10	Nausea 0-10	Fogginess 0-10	Comments
Baseline Symptoms						
Smoooth Pursuits						
Saccades - Horizontal						
Saccades - Vertical						
Convergence Near Point						(Near Point in cm): Measure 1: _____ Measure 2:_____ Measure 3:_____
VOR - Horizontal						
VOR - Vertical						
Visual Motion Sensitivity Test						

Mucha 2014

VOMS

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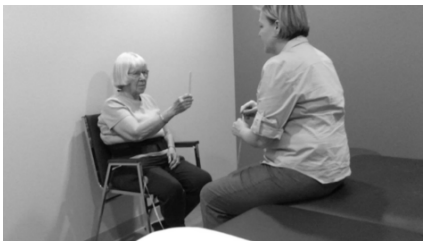
Smooth Pursuit

Convergence



VOMS

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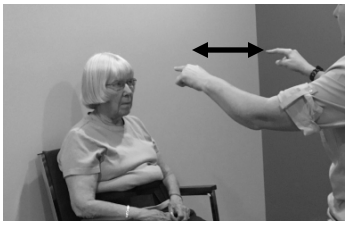
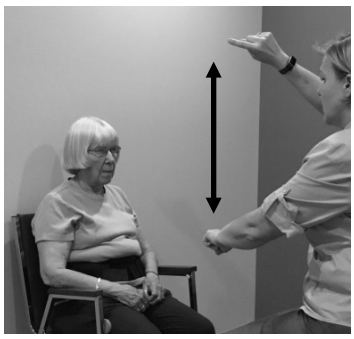
Horizontal Saccades

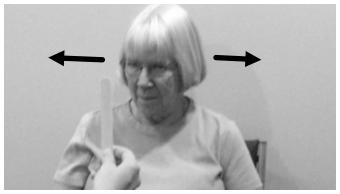


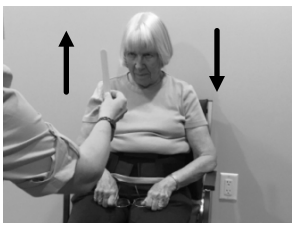
Vertical Saccades



VOMS

34





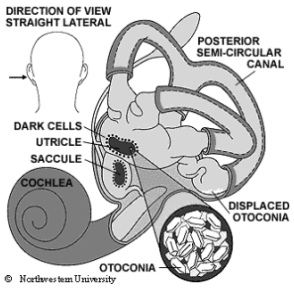
Horizontal & Vertical VOR

Visual Motion Sensitivity

35

Vestibular Assessment: Positional Testing for BPPV

- Common cause of dizziness in elderly
- 30% of mTBI cases
- Displaced Otoconia
- "Spinning Sensation"



Hoffer et al 2004; Ogahalia et al 2000

Graphic: dizziness-and-balance.com

BPPV treatment

36

- Consider Position Adjustment
- BPPV First
- Test All Canals

Vision and Oculomotor Function

37

- Ocular, Migraine, & Vestibular Trajectories
- Blurred vision, Light Sensitivity and Diplopia
- Oculomotor Impairments that can occur
- Complete Components of VOMS

Capo-Aponte 2012

Misalignment: Cover Test

38

- Wear corrective lens
- Head straight
- Remove the cover, look for any refixation movements. Repeat

Misalignment: Cover Uncover Test

- Same Parameter as Cover Test
- Attention is now on the covered eye
- Look for any refixation movements of that eye. Repeat

Saccades: King-Devick Test

40

- Assess saccade function
- Read each card out loud
- Note Increase in Symptoms
- Research

Coordination & Balance Reactions

41

- Ataxia & Vestibular Trajectories
- Rapid Alternating Movements
- Berg Balance Test
- Dynamic Gait Index
- Functional Gait Assessment
- Instrumented Tests

Rehabmeasures.org ; Hoffer et al 2009

Sensorimotor Processing

SOT

mCTSIB

43

Autonomic System

- Buffalo Concussion Treadmill Test
  - Treadmill testing in elderly mTBI has not been studied
  - Adapt to fit the functional ability of the population
- Test for Orthostatic Hypotension
- Complaints of temperature changes

GAP

Leddy et al 2013

44

Referrals & Recommendations

Ocular	•Neuro Optometry
Migraine	•Neuro Optometry •Neurology
Cervical	•Recommending Open Mouth X-Rays
Vestibular	•Neurology or ENT
Cognitive	•Speech •Neuropsychology
Anxiety/Mood	•Neuropsychology •Gerontology
Ataxia	•Neurology

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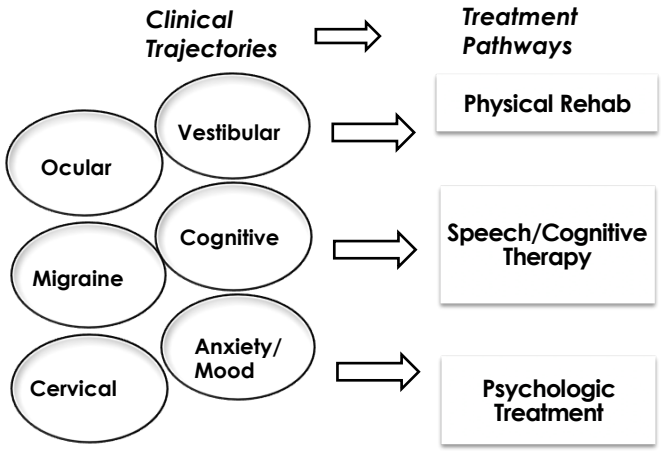
Interventions:



Vestibular

46

- Symptom Management
- Habituation Activities
- VOR Exercises

Vestibular Exercises

47

Oculomotor

48

Smooth Pursuit	•Use 2 decks of cards, one is face up on the wall and one is in the hand
Saccades	•Saccades between 2 targets
Convergence	•Pencil Push Ups •Brock String

Oculomotor Exercises

- Pencil Push Ups
- Brock String

Sensory Re-Weighting

50

Cervical & Postural Interventions

51

- Chin Tuck to target deep neck Flexors without pulling in accessory muscles
- Chin Tuck with head movement and Head Lamp
- Exercises to improve scapular stabilization and mobility

52

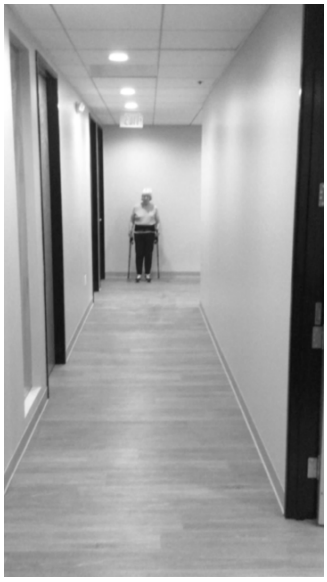
Migraine Management

- Identify Triggers
- Postural Education
- Referral to Optometry
- Track Symptoms

Exertional

53

- Walking program
- Treadmill program
- Consider Assistive Device



Cognitive Issues

54

- Consider Neuro-psychology testing
- Speech Therapy Referral
- Discuss Safety
- Geriatrician
- Repeat Falls that occur during the plan of care

Outcomes: Elderly TBI vs Younger

55

- **Functional Outcomes**
- **Discharge Disposition**
- **Less likely to return to work or live independently**
- **Overall Psychosocial Outcomes: 60% vs 20%**
- **Glasgow Comma Scale as a Predictor**

LeBlanc 2006; Rothweiler 1998

Outcomes for elderly mTBI

56

- **Depends on definition of outcome**
- **Cognitive performance**
- **Variability in Literature**

Deb 1998; Goldstein 1994; Mosenthal 2004

57

Case Examples

PATIENT A – 68 YR OLD FEMALE

Patient A

58

- **68 year old female**
- **Initial complaint: frequent falls**
- **Referred initially by Kineseologist and then had her ENT write a referral**
- **C/O falling 1 time per month, with frequent near falls throughout the day**
- **Falling began occurring after eye surgery in 2014 for vision changes and eye issues**
- **Upon Interview:**
  - **Falls with blows to head 4 times in 2 years – most recent 3 months prior**
  - **Falls occur in visually challenging environments**
  - **She has hit posteriorly 1 time, anteriorly 3 times**
  - **Since the last head impact she reports**
    - **Dizziness**
    - **Worsening Balance**
    - **Fatigue**

Patient A

59

- PMHX
  - OA lumbar spine
  - Neuropathy
  - Hypothyroidism
  - Glaucoma and Visual Changes
- Medications
  - Synthoid and duloxetine
- Imaging
  - MRI 3 yrs ago shows "abnormal spot in the back of my brain"
- Denies Neck Pain
- Depression Controlled
- Denies worsening visual changes since head injuries
- Denies changes is Cognition
- Uses a cane occasionally
- Drinks a glass of wine occasionally
- She is married, husband has early signs of dementia and she has limited support of her children

Patient A

60

- Mini Mental 30/30
- Vitals: negative for orthostasis
- ABC: 53%
- DHI: 34/100
- Post Concussion Symptom Scale
  - Score 22/132
  - Balance, Dizziness, Fogginess, Fatigue

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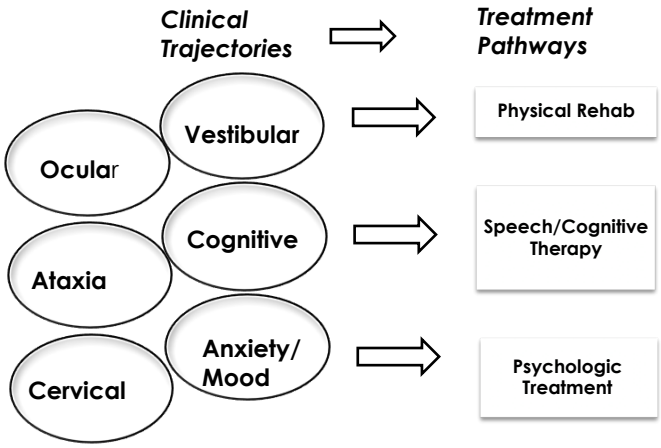
Interventions:



Patient A

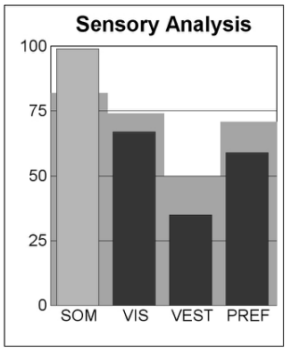
62

- Education
- FGA: 17/30
- Strength/Sensation: 4/5 hip and Vibration Intact
- Cervical Spine: clear
- VOMS: Score 14; Convergence 10 cm
- VORcx, Head Thrust, DVA normal

Patient A

63

- Treadmill Testing: Unremarkable
- Sensory Organization Testing



Patient A: problem list

64

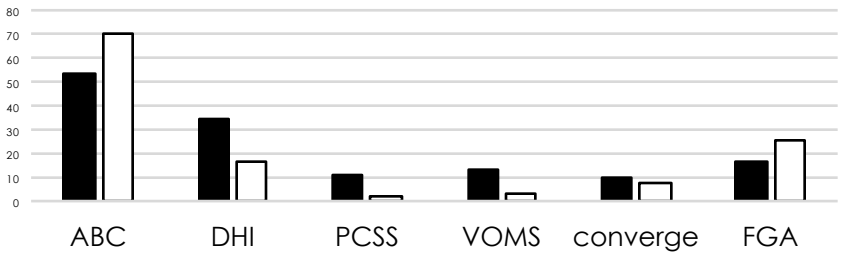
- Impaired strength LE
- Fall Risk
- Movement Quality was poor with delayed balance reactions, premature reaching
- Convergence was abnormal

Patient A: Interventions

65

- Referral to Neurologist
- Sensory Re-Weighting Exercises
- Vestibular Exercises
  - VOR exercises
  - Pencil Push Ups
- Balance Reaction Training

Patient A: Outcomes



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Case Examples

PATIENT B – 77 YR OLD FEMALE

Patient B

68

- **77 year old female**
- **Initial complaint: Dizziness**
- **Referred by ENT**
- **C/O falling 3 times per year**
- **Reports history of 4 concussions with most recent 3 months ago. Diagnosed with Subdural Hematoma.**
- **Daughter reports cognitive changes recently**
- **Has seen P.T. for neck and back pain after previous falls**
- **Dizziness Description**
  - **Typically 3/10**
  - **Worst 9/10**
  - **No complaints of spinning**
  - **Denies visual changes**
  - **Sometimes has headaches**

Patient B

69

- PMHX
  - HTN
  - Seizures
  - Hypothyroidism
  - Osteoporosis
  - Incontinence
  - Right TKR
  - A-fib
- Imaging
  - MRI small vessel ischemic changes
- Medications
  - Vitamins and Supplements
  - Levothyroxine
  - Digoxin
  - Donepezil
  - Tolterodine Tartrate
  - Warfarin
  - Fentenyl Patch
- Depression Controlled
- No assistive device
- Lives with Daughter

Patient B

70

- Mini Mental 22/30
- Vitals: negative for orthostasis
- ABC: 30%
- DHI: 36/100
- Post Concussion Symptom Scale
  - Score 28/132
  - Headach, Trouble Sleeping, Memory

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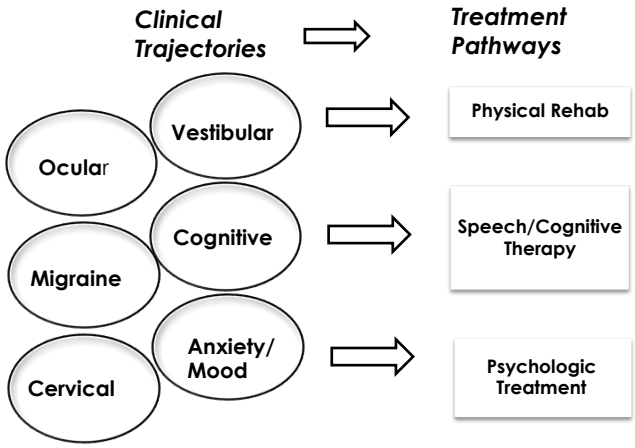
Interventions:



Patient B

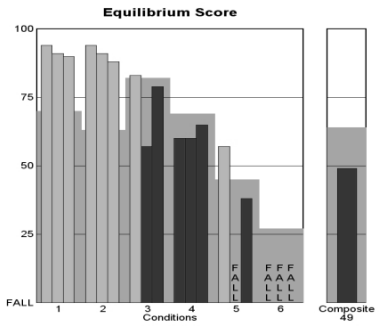
72

- Education: Safety & Neuro-Cog Testing
- FGA: 15/30
- VOMS: Score 29; Convergence 10 cm
  - Diplopia with Smooth Pursuit
- Dynamic Visual Acuity Test: 5 line degradation
- Positive Right Head Impulse test
- Negative for BPPV

Patient B

73

- Treadmill Testing: Unremarkable
- Cervical
- Sensory Organization Testing



Patient B: problem list

74

- Impaired VOR
- Fall Risk
- Motion Sensitivity
- Convergence was abnormal
- Impaired Oculomotor Function: Diplopia with Smooth Pursuits
- Cognitive Changes

Patient B: Interventions

75

- Referrals
- Vestibular Exercises
- Oculomotor Exercises
  - Pencil Push Ups
- Balance Reaction Training

Symptoms of Headache and Dizziness Fluctuated day to day

Patient B

76

- Function
- FGA: 15/30 → 17/30
- ABC: 30% → 53%
- VOMS: Unchanged
- Limitations: Oculomotor, Co-morbidities, Cognition

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International Conference of Vestibular Rehabilitation: Advancing Practice

- **"Vestibular Rehab Spanning the Globe"**
- **Hilton Palmer House Hotel, Chicago, IL**
- **August 17-19, 2018**
- **Sponsored by the Academy of Neurologic Physical Therapy**
- **#APTAICVR**
- **#globalvestib**
- **Website: z.umn.edu/31go**

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