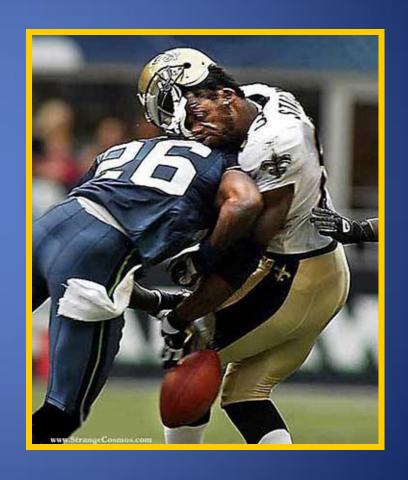
Concussions: Diagnosis and Current Management

Christopher Tangen, D.O. 1-24-14

Introduction

- Definition
- History
- Diagnosis
- Management
- Return to play
- Controversies



Concussion- Defintion

- Zurich Nov 2012:
- "a brain injury"
- "a complex pathophysiological process affecting the brain, induced by biomechnical forces"



Background

- Caused by:
 - "impulsive" forces transmitted to the head
- Symptoms:
 - typically rapid onset, or sx's over minutes/hours
- Neuropathologic changes:
 - Functional but not structural injury
 - No abnormalities on current standard neuroimaging

Background

Up to 3.8 million concussions/year in US

50% unreported

- Highest incidence in football
 - hockey, rugby, soccer, basketball, wrestling

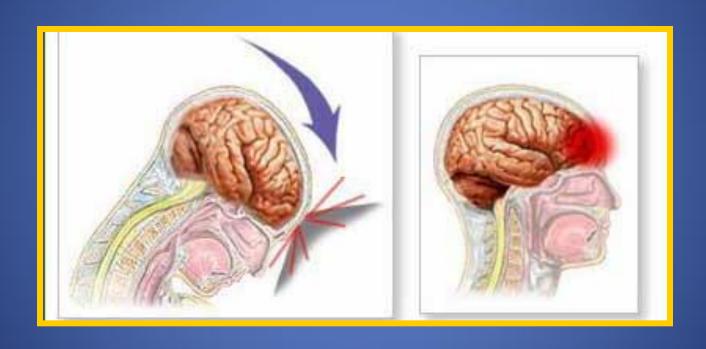








Pathophysiology



Pathophysiology

- Metabolic changes in IC and EC environment
 - Inc Na/K ATPase activation
 - Hyperglycolosis
 - High energy demand
- Decreased cerebral blood flow
 - Widespread cerebral neurovascular constriction
- Resultant metabolic mismatch

History of Concussion Care

- Before 2001- "grading"
 - Mostly based on LOC (10%)



- 2001- 1st International Conference on Concussion in Sport- Vienna
 - Abandoned grading
 - established no RTP same day, and RTP protocol

History of Concussion Care

- 2004- 2nd International Conference- Prague
 - "Simple" vs "Complex" (length of sx's)
 - first SCAT card "Sport Concussion Assessment Tool"



1st SCAT- 2004

The SCAT Card (Sport Concussion Assessment Tool) MEDICAL EVALUATION

Name:		Date:		
Sport/Team:		Mouth Guard?	Υ	N
1) SIGNS				
Was there loss of co	onsciousness (or unresponsiveness?		
Was there seizure of				N
Was there a balanc	e problem/uns	teadiness?	Υ	N
2) MEMORY				
Modified Maddocks	questions (ch	eck those correct)		
At what venue are v	ve? Wh	ich half is it?		
Who scored last? _	What tea	m did we play last? _	_	
Did we win last gan	ne?			
3) SYMPTOM S	CORE			
		s (from "SYMPTOMS	" bo	ox on othe
side of the card) =				
4) COGNITIVE		NT		
(Check those corre				
5 word recall	Immediat			
(Ex	amples)	(after concentra	tion	tasks)
Nord 1	cat			
Vord 2	pen			
Vord 3	snoe			
Nord 1 Nord 2 Nord 3 Nord 4	book			
Word 5	car			
Months in reverse of		ose incorrect) ov-Oct-Sep-Aug-Jul		
		OR		
Digits backwards (c		rrect)		
5-2-8	3-9-1			
6-2-9-4	4-3-7-1			
8-3-2-7-9	1-4-9-3-6			
7-3-9-1-4-2	5-1-8-4-6	-8		
Ask delayed 5-wo	rd recall now			
5) NEUROLOG	ICAL SCRE			
Speech		Pass		Fail
	nile	_		
Eve Metion and Du	ulio			
Pronator Drift				
Eye Motion and Pup Pronator Drift Gait Assessment	screening =	bnormality necess	itate	es form

6) RETURN TO PLAY

ATHLETES SHOULD NOT BE RETURNED TO PLAY THE SAME DAY OF INJURY.

When returning athletes to play, they should follow a stepwise symptomlimited program, with stages of progression. For example:

- 1. rest until asymptomatic (physical and mental rest)
- 2. light aerobic exercise (e.g. stationary cycle)
- 3. snort-specific training
- 4. non-contact training drills (start light resistance training)
- full contact training after medical clearance
- 6. return to competition (game play)

There should be approximately 24 hours (or longer) for each stage and the athlete should return to stage 1 if symptoms recur. Resistance training should only be added in the later stages.

Medical clearance should be given before return to play.

INSTRUCTIONS:

This card is for the use of medical doctors, physiotherapists of athletic therapists. In order to maximize the information gathered from the card, it is strongly suggested that all athletes participating in contact sports complete a baseline evaluation prior to the beginning of their competitive season. This card is a suggested guide only for sports concussion and is not meant to assess more severe forms of brain injury.

Signs:

Assess for each of these items and circle - Y (yes) or N (no)

Select any 5 words (an example is given). Avoid choosing related words such as "dark" and "moon" which can be recalled by means of word association. Reach each word at a rate of one word per second. The athlete should not be informed of the delayed testing of memory (to be done after the reverse months and/or digits). Choose a different set of words each time you perform a follow-up exam with the same candidate.

SYMPTOMS: Headache, "pressure in the head", neck pain, balance problems or dizziness, nausea or vomiting, vision problems, hearing problems or ringing in the ears, "don't feel right", feeling "dinged" or "dazed", confusion, feeling slowed down, feeling like in a "fog", drowsiness, fatigue or low energy, emotional, irritable, difficulty concentrating or remembering

Concentration/Attention:

Ask the athlete to recite the months of the year in reverse order. starting with a random month. Do not start with December of January. Circle any months not recited in the correct sequence.

For digits backwards, if correct, go to the next string length. I incorrect, read trail 2. Stop after incorrect on both trials.

Neurologic Screening:

Trained medical personnel must administer this examination These individuals might include medical doctors, physiotherapists or athletic therapists. Speech should be assessed for fluency and lack of slurring. Eye motion should reveal no diplopia in any of the 4 planes of movement (vertical, horizontal and both diagonal planes). The pronator drift is performed by asking the patient to hold both arms in front of them, palms up, with eyes closed. A positive test is pronating the forearm, dropping the arm, or drift away from midline. For gait assessment, ask the patient to walk away from you, turn and walk back.

Return to Play:

A structured, graded exertion protocol should be developed: individualized on the basis of sport, age and the concussion history of the athlete. Exercise or training should be commenced only after the athlete is clearly asymptomatic with physical and cognitive rest. Final decision for clearance to return to competition should ideally be made by a medical doctor.

This tool represents a standardized method of evaluating people after concussion in sport. This tool has been produced as part of the Summary and Agreement Statement of the Second International Symposium on Concussion in Sport, Prague, 2004. For more information see the "Summary and Agreement Statement of the Second International Symposium on Concussion in Sport" in

Clinical Journal of Sports Medicine 2005; in press

British Journal of Sports Medicine 2005;39: 196-204

Neurosurgery 2005; in press Physician and Sportsmedicine 2005; in press

History of Concussion Care

- 2008- 3rd International Conference- Zurich
 - Abandoned "Simple vs Complex"
 - RTP expanded
 - Adult athletes may RTP more quickly. Namely "American football" players
 - Objective balance testing added
 - "BESS" Balance Error Scoring System
 - Greater recognition to neurophyscologic testing
 - Did not consider NP testing the standard of care
 - Difference between adolescents and adults (briefly) acknowledged

SCAT2











Sport Concussion Assessment Tool 2

Sport Concussion Assessment Tool 2		
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Cognitive & Physical Evaluation

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				What mont							0	1
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	ss of consciousness or unresponsiveness?		N	What is the			42				0	1
If yes, how lo				What year		ie wee	ik.				0	1
	balance problem/unsteadiness?		r N	What time		now?	heithi	nih	our		0	1
						III.			001)			of 5
Physical sign	ns score (1 point for each negative response)		of 2	Orientatio								01.5
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Eye opening	in response to pain		2	words as y	ou can n							
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Oriented			5	apple	0 1	0	1	0		paper	monkey	
				carpet	0 1	0	1	0		sugar	perfume	
	response (M)			saddle	0 1	0	1	0		sandwich	sunset	lemo
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				each string le the rate of or	ngth. Stop ne per seco	after in nd.	corre	t on	both tr	ials. The dig	its should b	e rear
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- *McCrea M, Randolph C, Kelly J. Standardized Assessment of Concussion: Manual for administration, scoring and interpretation. Waukesha, Wisconsin, USA.
- ⁹ Maddocks, Dt.; Dicker, GD; Saling, MM. The assessment of orientation following concussion in athletes. Clin J Sport Med. 1995;5(1):32–3
- ⁶ Guskiewicz KM. Assessment of postural stability following sport-related concussion. Current Sports Medicine Reports. 2003; 2: 24-30

 2 McCrory P et al. Summary and agreement statement of the $2^{\rm nd}$ International Conference on Concussion in Sport, Prague 2004. British Journal of Sports Medicine. 2005; 39: 196-204

History of Concussion Care

- 2012- 4th International Conference- Zurich
 - Published March 2013
 - Recommended all athletes have a clinical neurological assessment (and cognitive function assessment)
 - But formal NP testing is NOT required for all athletes
 - "insufficient evidence to recommend the widespread routing use of baseline neuropsychological testing"
 - NO same day RTP

SCAT 3

SCAT3™



Sport Concussion Assessment Tool - 3rd Edition

Date Clinic of Injury.

Glasgow coma scale (GCS)

Best eye response (E)

Bye opening to speech

No verbal response

No motor response

Extension to pair

Localizes to pace

Ciniambod

Tyre opening sportuneously

Best verbal response (V)

Sest motor response (MI)

Abnormal flexion to pur-

Glasgow Coma score (E + V + M)

SCS should be recorded for all although to load of subsequent determination.

Eye osiening in response to pain

What is the SCAT3?1

The SCATB is a standardized tool for evaluating injuried attlieten for concussion. and can be used in attents, aged from 18 years and other 8 supersedes the only and SCAT and the SCAT2 published in 2005 and 2009, respectively. You younget sersors, ages 12 and under phase use the CNM SCATS. The SCATS is designed for use to medical professionals. If you are not scalified, please use the Sport coon Recognition Tool. Presence believe lessing with the SCAT3 can be halpful for interpreting polytopally test scients.

Specific enthurtions for use of the SCATS are provided on page 3: If you are not nium with the SCATX, please need through these instructions carefully. This tool may be firely capied in its current form for distribution to individuals, teams, groups and organizations. Any revision or any reproduction in a digital form resures approved by the Consussion in Sport Group.

medical professional. The SCAT3 should not be used salely to make, or exclude, the diagnosis of concussion in the absence of clinical judgement. An artists may have a concussion even if their SCATE is "normal"

What is a concussion?

custon is a disturbence or team function caused by a direct or indirect force to the head. It results in a sariety of rico-specific signs, and/or symptoms (some Continues should be supported in the insured of any one or more of the

- Symptoms in p., Newbertell, or
- Physical signs is g., unsteadiness), or
- strepained brain function in a confusion or

SIDELINE ASSESSMENT

Indications for Emergency Management

NOTE: A fit to the head can sometimes be associated with a more sensus brain roury. Any of the following surnants consideration of activating emergency procedures and urgent transportation to the nearest hospital:

- Ginemus Coma score into than 15
- Deteriorating mental status
- Posintial spiral injury
 Prograssiae, sensetting symptoms or new neurologic signs.

Potential signs of concussion?

If any of the following signs are observed after a direct or indirect blow to the haid, the athlete Should stop participation, be evaluated by a medical professional and should not be permitted to return to sport the same day if a

Any toss of consciousness?	THE P	E
"9" so, hose long?"		
Balance of motor exponing too towards, the Salvard revenues, etc.)	B	늴
Disprientiation or confusion (sealing to respond appropriately to surctional)	· Er	13
Loss of memory	THE P	

Disprientation or confu	assist Staphilely to the	pood standardens	N surcion(7
Loss of memory			2.50
"If an, Nove long""			

"Before or after	the injury?"			
Stank or vacant	ook:			
Voible facul inju	ry in combi	nation with	any of	the above

What remain are no at today?	-	
Which had is 6 new? Who occured last in this mutch?		
What team did you play last week/game?	-	
Did your team win the last game?		
	rly and is hell souther or	
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Madicia, scor is sellated to pilote Sagress of common or	th and is not seen the se	

Any athlete with a suspected concussion should be REMOVED FROM PLAY, medically assessed, monitored for deterioration G.e., should not be left alone) and should not drive a motor vehicle until cleared to do so by a medical professional. No athlete diagnosed with concussion should be returned to sports participation on the day of Injury.

Child SCAT 3

Child-SCAT3™ 🗒 FIFA 🖁 👐 🖉 🗲 EI







Sport Concussion Assessment Tool for children ages 5 to 12 years

114

What is childSCAT371

The Chief CAFF is a Uninterline and the evaluation report children for interchoise and care for used in Wildem agod from 3 to 12 years, it supervises, the original SUAT and the NCATZ published in 2003 and 2003, imperiodly. To visit persons, ago, 12 year and one, phose on the SCATZ. The SMGSCATZ is beigned to use to method professionals. If you are not qualified, places and the Sport Concursion Recognition Staff Presented Squatter letting with the Child Colf I can be height for interpreting pain inper test score

Specific minimization for use of the Child ScAT and provided on open 3, thy ou are not familiar and in the Shad ScAT, I pleas and exhapit from its minimization consider. The time of the five Specific is the stress that the stress them the provided in the stress that the stress that the provided in the stress that the stress and and terminal from the stiglist finite require algorithm for the connection of the provided in the stress that the st

K opcycline is a disturbation in facility function request by a direct or indirect force to the head. It would be a country for a country of non-specific right and/or symptoms (the fittine hybrid behalf and make). es. Cancessia should be suspected in the present of any one or more of the following.

(lymptom) (e.g., headache), or -Physical signs to g., unsheadmend, or compared from function (e.g., confusion) or -Alternmal behaviour (e.g., change in personality).

SIDELINE ASSESSMENT

Indications for Emergency Management

NOTE: X hit to the head can sometimes be associated with a more severe brain injury. If the concussed child displays any of the following, then do not proceed with the ChildSCATE instead activate emergency procedures and urgent transportation to the rewest hospital.

- Charman Come screen best than 16
- Potential spinal trying
- Progressive, worsening symptoms or new neurologic signs.
- Recorded edelition
- Evidence of skull fracture Front Non-stratic sections
- Couputopathy

five opening in regionar to part

History of Neurosurgery (og Shunt) Multiple injuries

Glasgow coma scale (GCS) Best eye response (E)

Eye opening to speech	- 3
fyes opening sportaneously	4
Best verbal response (V)	
No vertial response	
Incomprehenable sounds	2
hypotophale words	./3
Confused	4
Driented	1.5
Best motor response (M)	

Extension to pain - ---Abnormal flexion to pair - 19 - 4 1.0 Localisms to pain - 6 Glangow Coma score (E + V + M)

GCS absold he recorded by all arrience in case of subsequent determination

Potential signs of concussion?

If any of the following some are observed after a direct or indirect bloss to the and should not be permitted to return to sport the same day if a sombation

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"If so, how long?"				
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Discrimination or confusion (nakiny to expend agreement) to quadronal?		¥	N	
Loss of memory:	m	Ÿ	N	
"If so, how long?"				
"Before or after the injury?"				
Blank or vacant look	ш	٧	N	
Visible facul injury in combination with any of the above.		۲	14	



FROM PLAY, medically assessed and monitored for deterioration G.e., should not be left alone). No child diagnosed with concussion should be returned to sports participation on the day of injury.

Child Misableshis asset is for solution diagnosts of consecsion solly and it and sould be said bedding.

BACKGROUND

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Europer.	Date of Assessment	
Sport/learn/school:		-
Age	Gerder:	III M III
Current school year grade		
Dominant hand:	Tright III left	E telbe
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For Parent/carer to complete:	NATURAL DE LA CONTRACTOR DE LA CONTRACTO	
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When eas the insid-learnt concussion?		
Place long sees the recovery from the most re-	cent concussion?	
mas the child over been hospitalized or field in stone ICT or MRIS for a head repry?		my me
this, the child ever been diagnosed with head	Learnington to prefor	BUY BUY
Does the child have a learning disability, dysk ADD/RDHD, secure disorder?	reia.	11 III
His the child ever been diagnosed with depri arranty or other psychiatric disorder?	MARK.	田・田・
Has anyone in the family ever been diagnose any of these problems?"	t with	Brille
is the child on any medications? If yes, please	14000	图Y 图A

MEANS OF ST CONSTRUCTOR ASSESSMENT TOOK 3 FRAME 9

80 1016 Community in Spirit Street

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SHIPP WATER DOCUMENT CONTROL VALUE OF THE STATE OF THE ST

80 1016 Community in Spirit Street

Concussion Diagnosis

- An athlete that shows any feature of a concussion
 - Immediate removal from practice/play
 - Urgent evaluation by a physician or other licensed healthcare provider (ex: athletic trainer)
 - Attention to C-spine



Concussion signs/symptoms

- Headache- most common
- "Pressure in head", neck pain, n/v, dizziness, blurred vision, balance problems, sensitivity to light/noise, feeling slowed down, feeling like "in a fog", "don't feel right", difficulty concentrating/remembering, fatigue or low energy, confusion, drowsiness, trouble falling asleep, more emotional, irritability, sadness, nervous or anxious

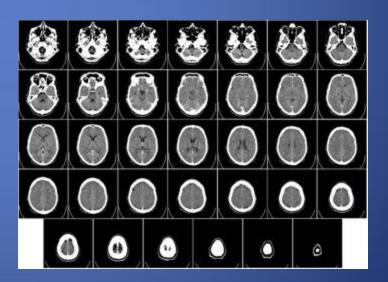
Different Clinical Presentations

- Concussions can manifest
 - Symptoms
 - Headache
 - Physical signs
 - LOC, amnesia
 - Behavioral changes
 - Mood changes
 - Cognitive impairment
 - School
 - Sleep disturbance
 - Insomnia



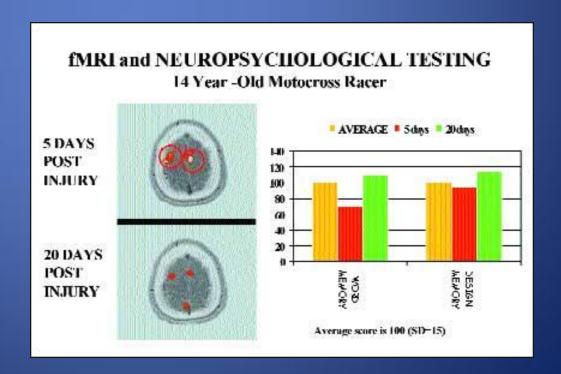
Other tools

- Imaging
- Neuropsychological testing
- Genetic testing



Imaging

- Likely in an emergency room setting
- Plain films, CT, MRI- no standard structural changes
- fMRI



Neuropsychological testing

- Common
 - Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT)
 - Automated Neuropsychological Assessment Metrics (ANAM)
 - Cogsport
- Neurologic and cognitive eval should be a part of preparticipation exam, but NP testing is not required/recommended for all athletes

ANAM



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If your unit is deploying within the next 12 months and needs ANAM to please send an e-mail including all pertinent contact information to <u>usarmy.jbsa.medcom.mbx.otsg-anam-operations@mail.mil</u> for more in the ANAM Schedule at 210-916-9231.

There is a major focus on cognitive assessment for Service Members. The con injuries seen during conflicts in which Service Members may be injured by exp concussions, also known as mild traumatic brain injury (mTBI).

A brain injury that may result from such blasts can range from mild to severe.

An mTBI/concussion may cause changes which include a slower reaction time, sleep difficulty. These symptoms may result in decreased performance. Perfo

One reason that an mTBI/concussion can go unnoticed is that symptoms may may not have visible external injuries.

Dumaca of the ANAM.

Neuropsychological testing

- Computerized NP testing
 - Administer pre-season before head injures
 - If a concussion is suffered- wait until asymptomatic, retest, compare to baseline
 - Use retest results as adjunct to clinical picture
 - Most helpful in conjunction with NP consult, or in athletes with prolonged symptoms
 - No relationship between NP testing and school performance

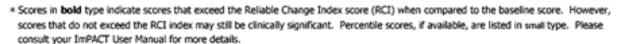
ImPACT example



Mark

Exam Type	Baseline	Post-	Post-	Post-	Post-	Post-
Exam Type		concussion	concussion	concussion	concussion	concussion
Date Tested	09/21/2004	10/08/2004	10/12/2004	10/15/2004	10/19/2004	10/27/2004
Last Concussion		10/07/2004	10/07/2004	10/07/2004	10/07/2004	10/07/2004
Exam Language	English	English	English	English	English	English
Test Version	2.2.729	2.2.729	2.2.729	2.2.729	2.2.729	2.2.729

Composite Scores *												
Memory composite (verbal)	93	75%	66	1%	57	<1%	63	<1%	87	55%	88	55%
Memory composite (visual)†	70	23%	41	<1%	49	1%	47	<1%	55	3%	66	12%
Visual motor speed composite	45.88	85%	46.38	86%	40.13	65%	38.93	57%	45.85	85%	41.90	72%
Reaction time composite	0.54	46%	0.60	22%	0.66	6%	0.54	46%	0.62	15%	0.54	46%
Impulse control composite	8		14		10		16		10		11	
Total Symptom Score	0		14		3		1		0		0	



[†] Clinical composite score is available only for exams taken in ImPACT version 2.0 or later.

Genetic testing

Not standard of care

- APOE e4 (apolipoprotein e4)
 - Study limitations- small sample sizes, use of selfreported concussions, lack of control groups

Management

- Cornerstone of treatment: REST
 - Cognitive and Physical

Gradual RTP



Stepwise RTP

- Athlete must remain asymptomatic
 - Day 1- no activity
 - Day 2- light aerobic exercise
 - Day 3- sport-specific training
 - Day 4- non-contact training drills
 - Day 5- full-contact practice
 - Day 6- return to play

Return to play

- What if symptoms return?
 - Return to previous level?
 - Start over at day 0?
 - adolescents

Pharmacologic managment

- No NSAIDs or aspirin after concussion
- Omega-3-FA
 - Prelim encouraging data in mice
- Targeting symptoms (ex: sleep)
- Or targeting underlying pathophys
 - Antidepressants
 - Experienced provider

Complications/controversies of concussions

- Second Impact Syndrome
- Decreased threshold
- Female gender
- Legislation
- Prevention



Second Impact Syndrome

- Rare- only found in adolescents
- Literature- case reports
 - Ongoing sx after 1st concussion
 - Witnessed 2nd event with rapid deterioration
 - Evidence of cerebral swelling- brain herniationdeath
- Past 15 years- approx 100 cases reported

Decreased threshold

- Evidence suggests that a second blow before the brain recovers results in worsening metabolic changes within the cell
- When premature activity (cognitive or physical) occurs before complete recovery- the brain may be vulnerable to prolonged dysfunction
- Previous concussion assoc with higher risk of sustaining another concussion
- Greater number/severity/duration of sxpredictors of prolonged recovery

Female gender



- More reported symptoms than men
- Cognitive impairment 1.7x more common than men
- With similar rules- reported incidence is higher in females
- Estrogen and diff cerebral blood flow may influence severity and outcome
- Is female gender a risk factor? Merely a predictor of symptom reporting?

NFL





NFL

- Generated most policy changes
- 4300+ out of ~12000 players filed over 200 lawsuits (\$765m ruling)
- Cannot lead with helmet; closer kickoffs
- Athletic trainer in game booth
- Sideline/locker room assessment by team doctors
- Independent neurologists

Legislation

- Zackery Lystedt
 - 2006 Washington State
 - Middle school football- head injury before 1st concussion healed





Lystedt Law

- Athletes, parents and coaches must be educated about the dangers of concussions each year.
- If a young athlete is suspected of having a concussion, he/she must be removed from a game or practice and not be permitted to return to play. When in doubt, sit them out.
- A licensed health care professional must clear the young athlete to return to play in the subsequent days or weeks.

Ohio House Bill 143

- Governor John Kasich signed youth concussion bill into law 12/20/12
- Parents need to sign letter showing understanding of this law
- Concussed athlete removed from sports
- Written clearance by physician or other licensed health care provider (in conjunction with a physician)

Prevention

Education

- ?helmets
- ?mouth guards
- ?neck strengthening



Summary

- Up to 3.8 million/year in US (underreported)
- No RTP same day
- Stepwise RTP
- NFL/Legislation



References

- Aubry, Cantu, et al. Summary and agreement statement of the 1st International Symposium on Concussion in Sport, Vienna 2001. Clin J Sport Med 2001;12:6
- McCrory, et al. Summary and agreement statement of the 2nd International Conference on Concussion in Sport, Prague. 2004. Br J Sports Med 2005;39:196-204.
- McCrory, et al. Consensus statement on concussion in sport-the 3rd international conference on concussion in sport held in Zurich, November 2008. Phy Sportsmed 2009;37:141-59
- McCrory, et al. Consensus statement on concussion in sport-the 4rd international conference on concussion in sport held in Zurich, November 2012. Br J Sports Med 2013;7:250-58.
- Harmon, et al. American Medical Society for Sports Medicine position statement: concussion in sport. Br J Sports Med. 2013
- Darling, S. et al. CJSM 2013: 0; 1-6. Evaluation of the Zurich Guidelines and Exercise Testing for Return to Play in Adolescents Following Concussion
- Weinberger; Briskin. Sports-Related Concussion. Clin Ped EM. Dec 2013. 14:4.