

Treatment Algorithm in Traumatic Brain Injuries



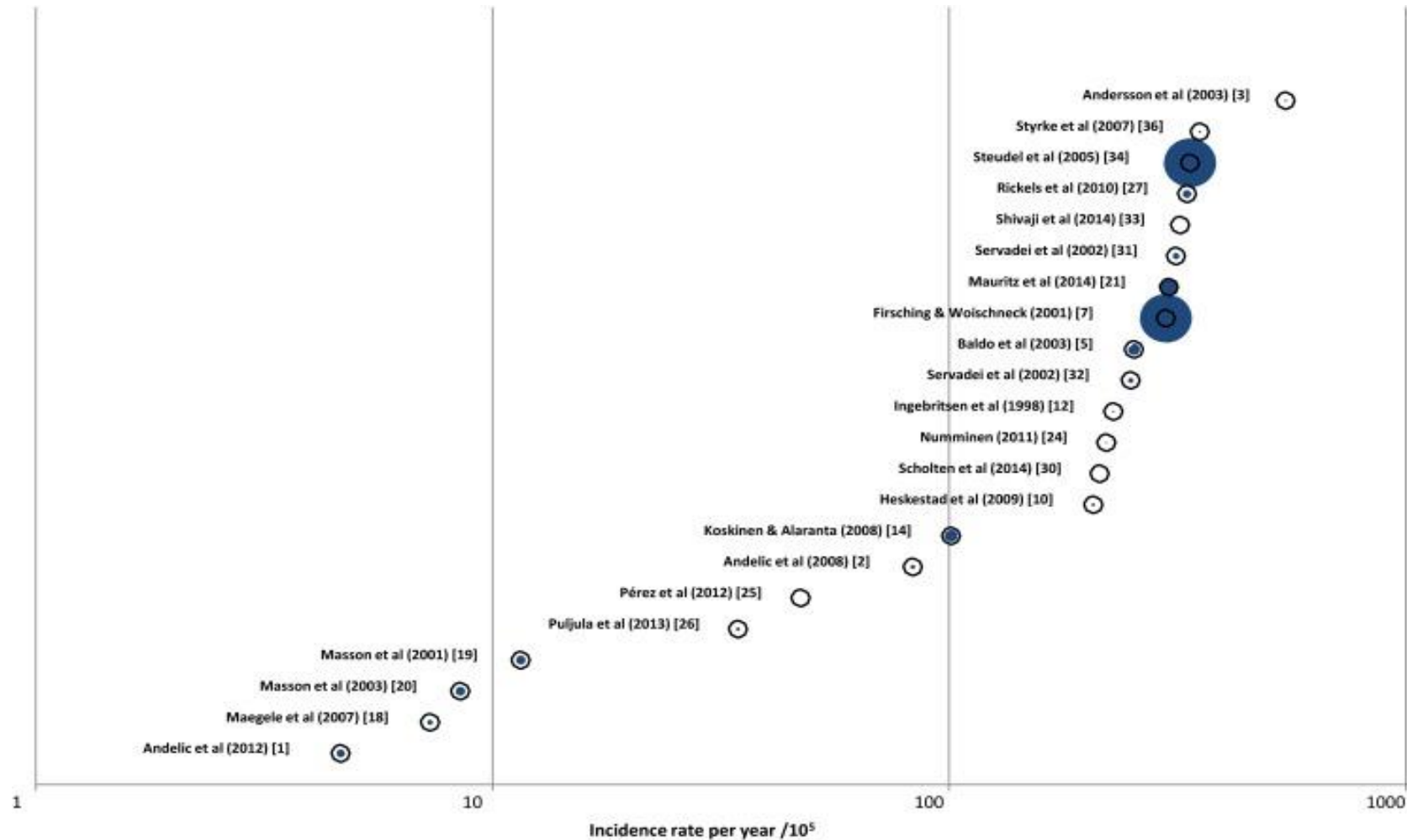
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SITEMSH 2018 - Arosa

Outline

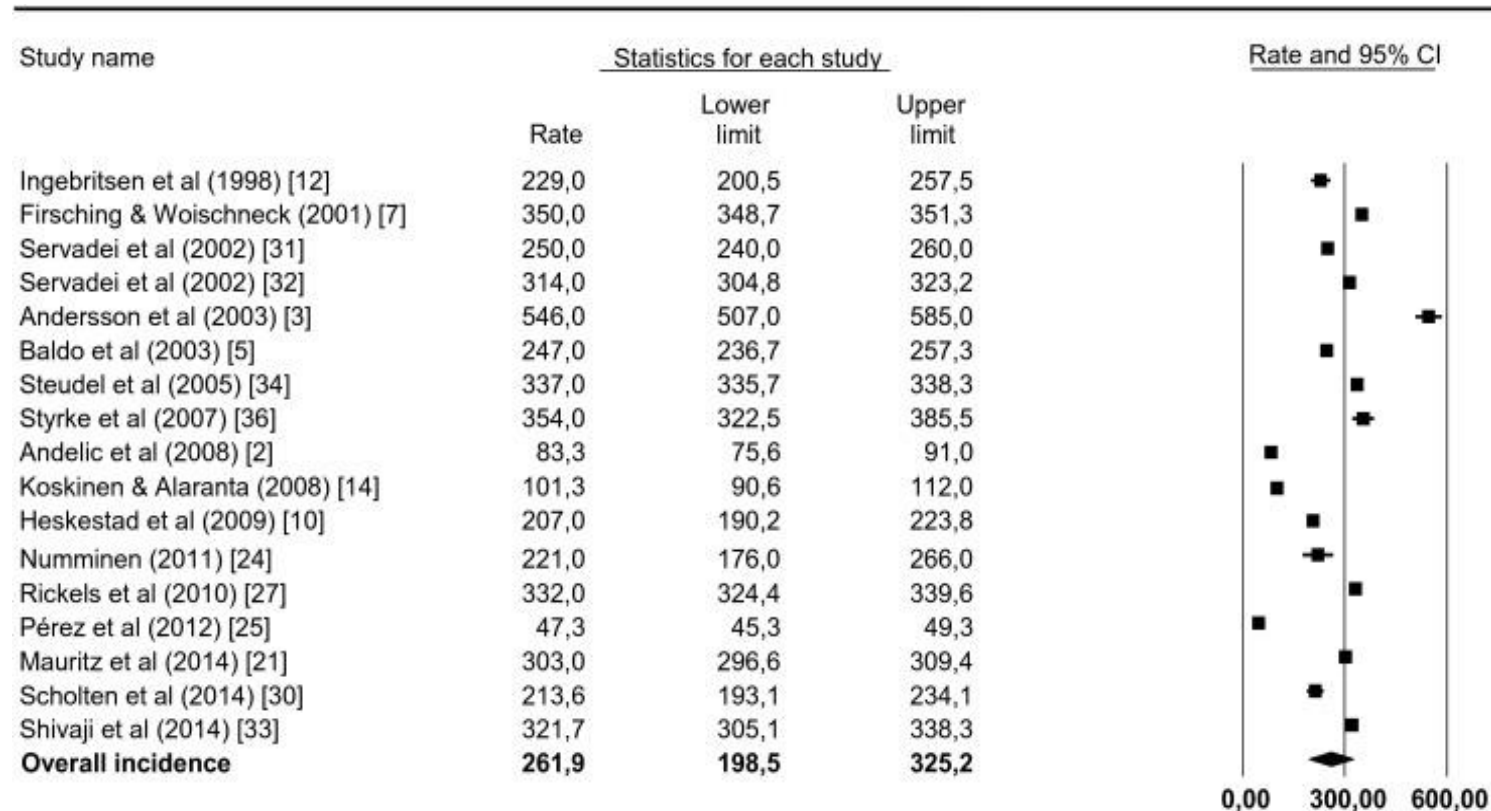
- Epidemiology
in wintersports
- Classification
- Management



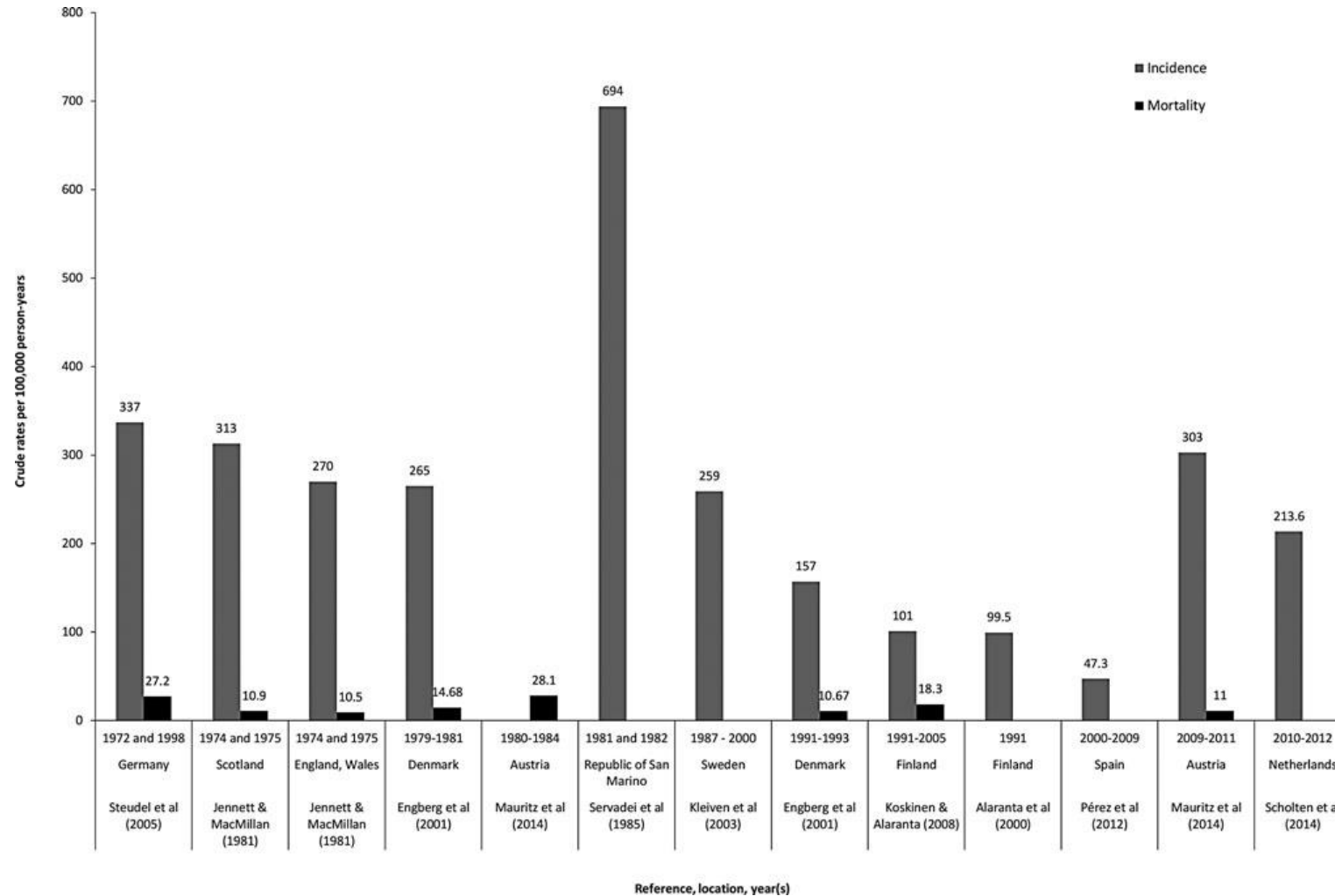
Traumatic brain injury incidence per 100'000 population per year



Meta analysis on 17 studies focusing on patients with all TBI severities



Review Traumatic brain injury incidence and mortality (crude) rates per 100'000 population per year



Brazinova A et al 2015

International review of head and spinal cord injuries in alpine skiing and snowboarding

Akery A et al 2008

- The overall incidence of **injuries of all types** while skiing or snowboarding is relatively low Langran M 2002

In the 1970's	5-8 injuries/skier days	
currently	2-3 injuries/skier days	Koehle et al 2002
- This major reduction was attributed primarily to the improvement in equipment Ackery A et al 2008
- In Canada were 50% (95% CI 1.3 to 1.8) more likely to have head and neck injury than alpine skiers Hagel BE et al 2004

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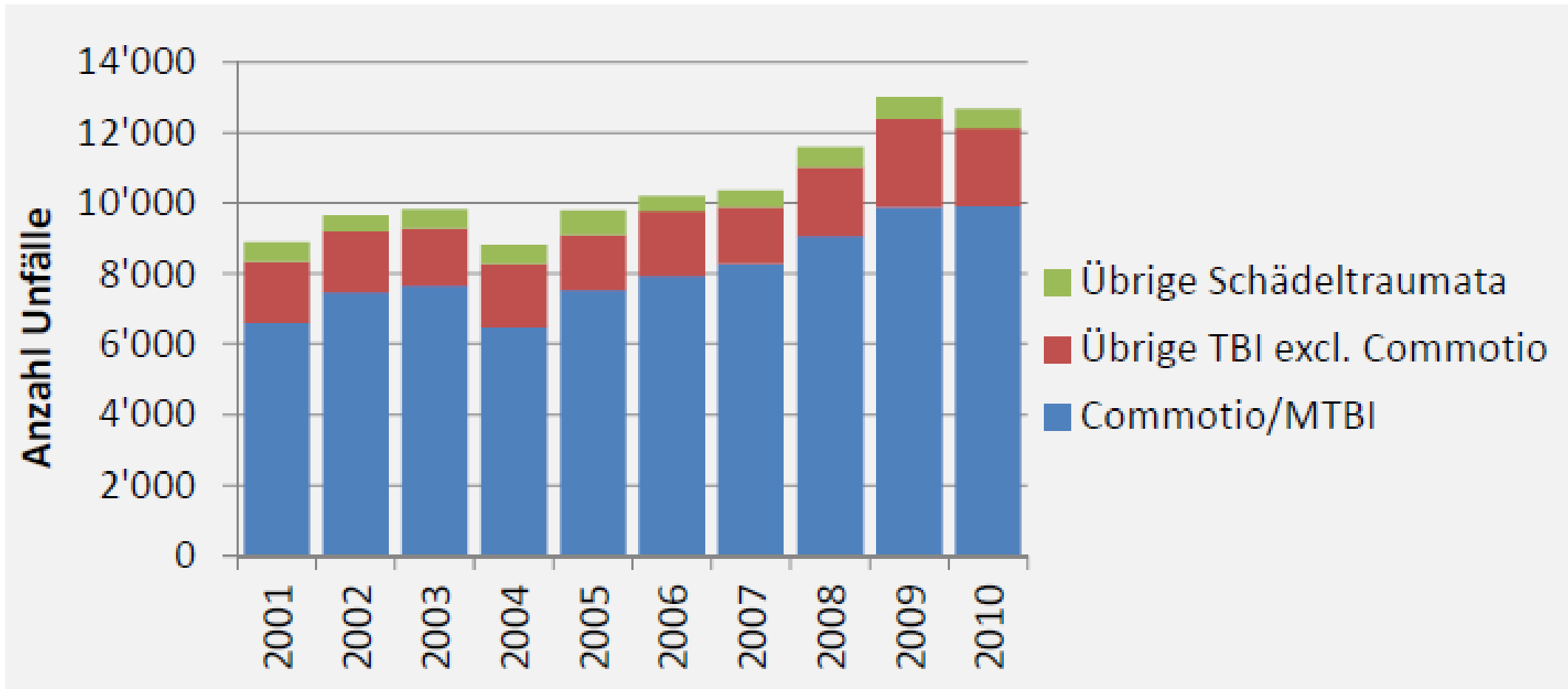
- Head injuries increased from 5.7% to 8.9%, concussions increased from 2.8% to 4.8%
Deibert MC et al 1998
- Head injuries in skiing increased from 12% in 1993 to 15% in 1997.
- In snowboarding the estimated number of head injuries increased from 1000 in 1993 to 5200 in 1997
US Consumer Product Safety Commission 1999

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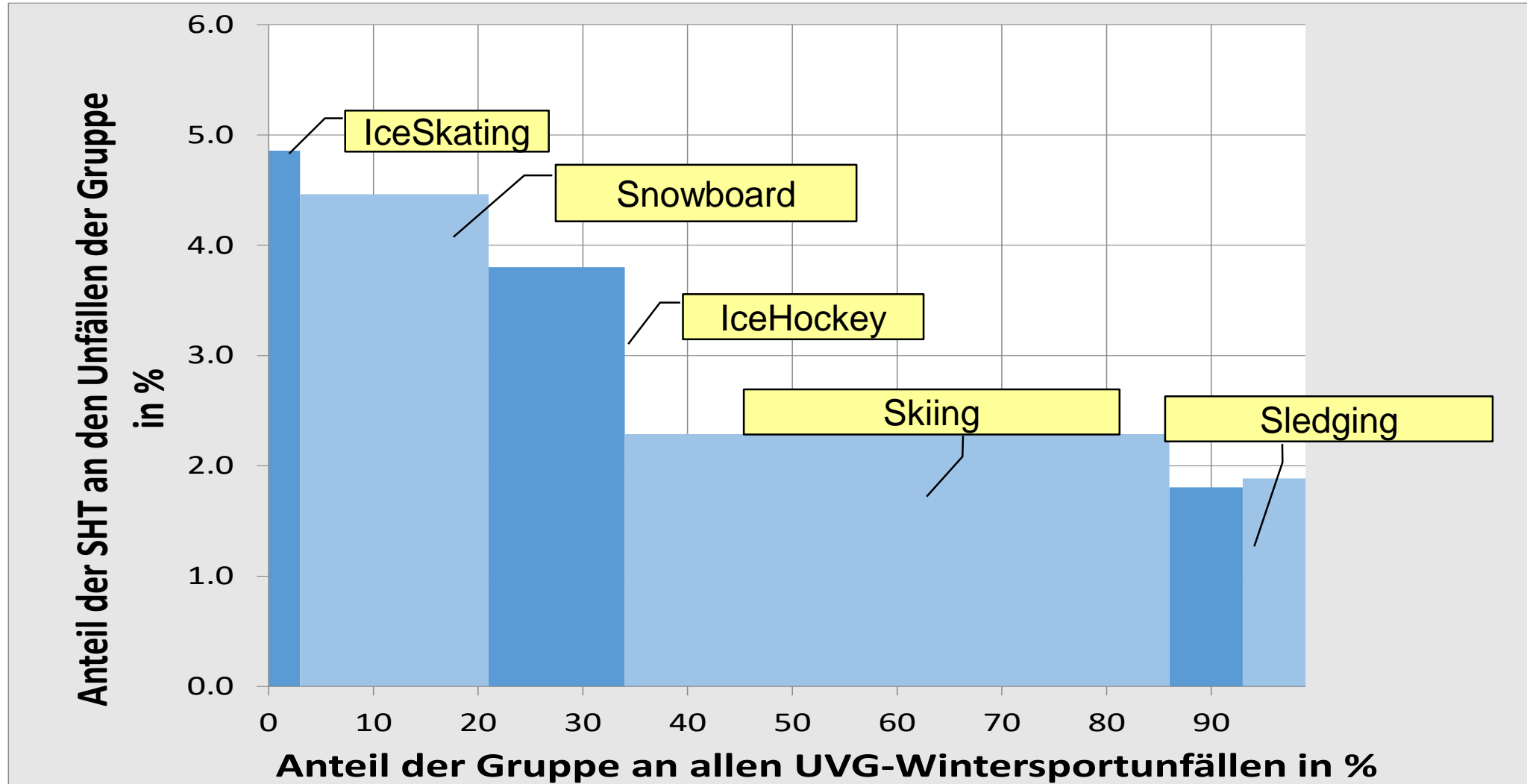
- Skiers had a greater proportion of concussions than snowboarders (60% vs 21%)
Hentschel S et al 2001
- Snowboarders had a much higher proportion of more severe brain injuries (29% vs 15%)
Hentschel S et al 2001
- Concussions represented 11% of all injuries, and most head injuries were concussions (83%)
Bridges EJ et al 2003

Epidemiology in Switzerland



Quelle: SSUV Statistikpool Stand 2012I
Registrierungsjahre 2003-2012
Fälle mit ausgewählten Hauptdiagnosen
Hochrechnung aus Stichprobe

Epidemiology



Definition of TBI

‘An alteration in brain function, or other evidence of brain pathology, caused by an external force’

(Menon DK et al 2010)




Classification of TBI

Classification	Characteristics
Mild Category 1	GCS = 15 No risk factors or only 1 minor risk factor present (CHIP Rule) Head injury, no TBI
Mild Category 2	GCS = 15 With risk factors: ≥ 1 major or ≥ 2 minor risk factors
Mild Category 3	GCS = 13-14
Moderate	GCS = 9-12
Severe	GCS ≤ 8
Critical	GCS = 3-4, with loss of pupillary reactions and absent or decerebrate motor reactions

Acute Management of TBI on scene - NICE

- Initially assessment according to Advanced Trauma Life Support (ATLS)
- Attempt full cervical spine immobilisation
- Maintain cervical spine immobilisation until full risk assessment including clinical assessment (and imaging if deemed necessary) indicates it is safe to remove the immobilisation device
- Make standby calls to the destination emergency department for all patients with GCS 8 or less
- Manage pain effectively because it can lead to a rise in intracranial pressure
- Provide reassurance, splintage of limb fractures and catheterisation of a full bladder, where needed
- Transportation by helicopter – time is brain
- Consider Impact of hypovolemia, hypotonia, and hypoxia on outcome

Glasgow Coma Scale

Behaviour	Response
 Eye Opening Response	4. Spontaneously 3. To speech 2. To pain 1. No response
 Verbal Response	5. Oriented to time, person and place 4. Confused 3. Inappropriate words 2. Incomprehensible sounds 1. No response
 Motor Response	6. Obeys command 5. Moves to localised pain 4. Flex to withdraw from pain 3. Abnormal flexion 2. Abnormal extension 1. No response

BEHAVIOR	RESPONSE	SCORE
Eye opening response	Spontaneously	4
	To speech	3
	To pain	2
	No response	1
Best verbal response	Oriented to time, place, and person	5
	Confused	4
	Inappropriate words	3
	Incomprehensible sounds	2
	No response	1
Best motor response	Obeys commands	6
	Moves to localized pain	5
	Flexion withdrawal from pain	4
	Abnormal flexion (decorticate)	3
	Abnormal extension (decerebrate)	2
	No response	1
Total score:	<i>Best response</i>	15
	<i>Comatose client</i>	8 or less
	<i>Totally unresponsive</i>	3

Mild Traumatic Brain Injury (GCS = 13 – 15)

Category 1
Head Injury
 GCS = 15
 No risk factors

Discharge home

Category 2
 GCS = 15
 + risk factors

CT mandatory

Category 3
 GCS = 13 - 14

CT mandatory

Skull fracture (linear, depressed, basal)
 Haematoma
 Brain edema
 Contusion zones
 Pneumocephalus

GCS 15 Focal neurological deficit
 Prolonged pt amnesia/agitation
 Severe headache Persistent
 vomiting Skull(base) fracture – CSF
 leakage Multitrauma Coagulation
 disorder Intoxikation Suspected non-
 accidental injury

Discharge home Age>5, if
 Age <5 warning instructions

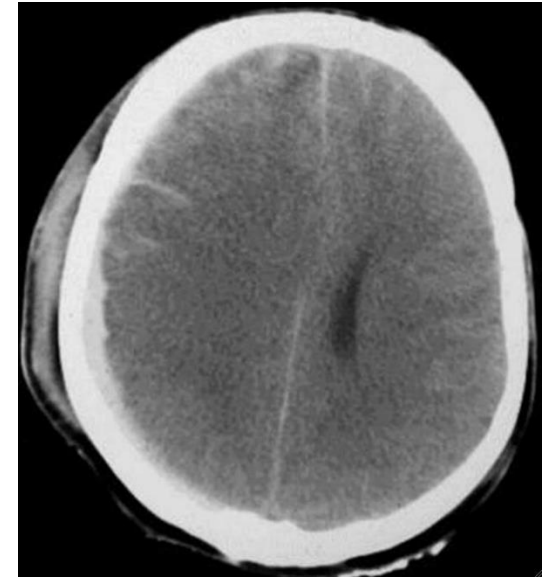
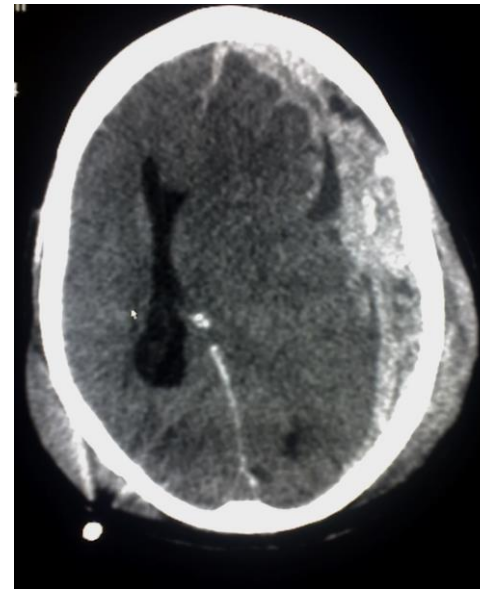
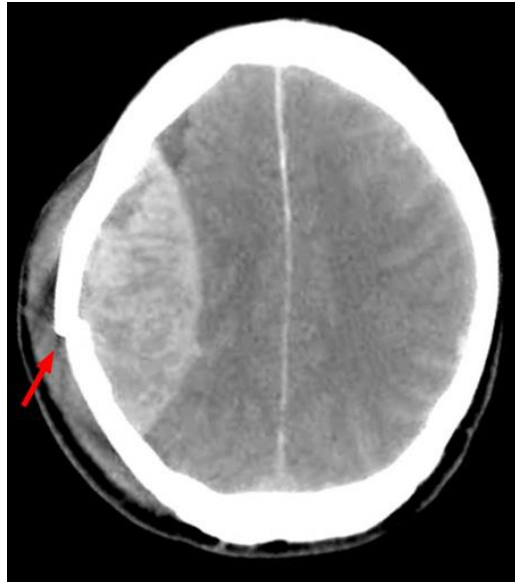
Indication for operation

Admit to Neurotrauma
 Center

Hospital Admission Observe >24 Consider
 consult neurotrauma center repeat CT or MRI

Complications

GCS	Pathol. CT	%	contusion	aEDH	aSDH	edema	SAB
15	95 / 2179	4	39	6	23	2	36
14	118 / 775	16	63	14	29	0	54
13	48 / 173	28	30	7	15	6	12



Management concussion in sports

Best practice recommendations

- Onsite evaluation e.g. SCAT (www.cjsportmed.com) ImPACT (www.impact.com)
- Medical evaluation - exclusion structural lesion
- Physical and cognitive rest until all symptoms are resolved
- Implementation of a graded program of exertion (6 step protocol)
- No premature return to activity

Mc Crory et al 2013

Take home

- Head injuries comprise only 3–15% of all injuries in skiers and snowboarders
- The leading cause of death and catastrophic injury is TBI, in both skiing and snowboarding
- It appears that the incidence of TBI is increasing
- Management of TBI includes prevention of secondary damage
- MTBI's are 80 – 90% of all head injuries
- Intracranial complications of MTBI are infrequent (10%), but potentially life threatening (case fatality rate 0.1%)
- Standardize Acute Management incl. Return to play, sports, school, work

Prevention



