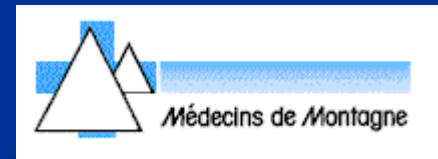


Severe injuries on the slopes

*MH Binet, JD Laporte, B Audema, JM Bertrand,
Centre médical Avoriaz FRANCE*

**Sitemsh congress
Iran December 2015**



Rescue organization

Stakeholders:

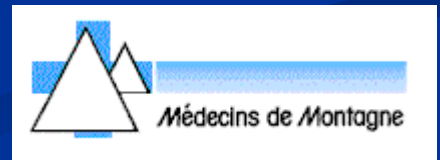
Ski patrollers

Medical facilities in the resorts

Healthcare emergency helicopter

Public or private hospital valley

General or specialized reference hospital



Regulation structure

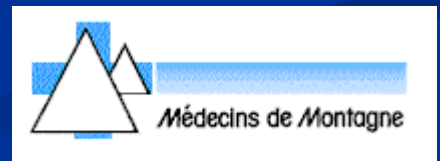
- **Stakeholders:**

Patroller at the scene of the accident

Central track / resort rescue service

Regulation of healthcare emergency helicopter

112 Emergency calls (tel 15 in France)



Local medical facilities

- Radiography equipment
- Echography
- Senior emergency and trauma on duty
- Experienced nurses and radiographer technician
- Resuscitation material

Helicopter base in Avoriaz

30 ski resorts at less of 7 min flight

- 1 call center with an operator
- 2 crews (pilot-mechanic)
- 2 helicopters
- 1 doctor (emergency)

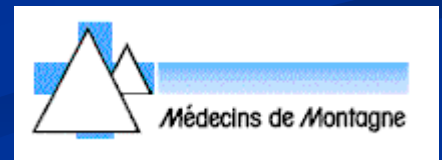


Valley public hospitals (Thonon, Sallanches), private hospital (Annemasse) less than 10 minutes flight

CH Annecy (angioplasty, embolization) 20 min

CHU Grenoble 45 min

HU Geneva 15 min



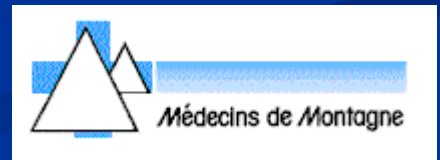
What are the severe injuries?

4% of all accidents require immediate hospitalization

5500 patients, with 175 cases of life-threatening

1 accident in 10 is linked to a collision (more head injuries)

Snowpark: increased severity of accidents



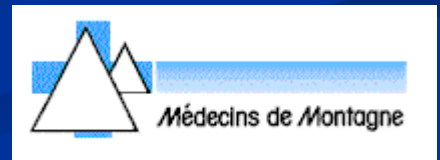
What can be done on the slopes?

- management of pain: Morphine, Ketamine, ALR, femoral blocks
- preparation for transport
- packaging, extraction
- ressuscitation, intubation: ISR
- fibrinolysis

Rescue organization

Taken into hospital by helicopter comes after load regulation for injured or sickness such as:

- femur fractures
- open leg fractures
- severe head injuries
- myocardial infarction
- stroke



Rescue organization

- Severe head injuries are transported to an adequate hospital if :

GCS <13

Focal neurological signs

evident skull fracture

Multiple trauma associated

Statistics

7 winter seasons



5206 helicopter rescue without medicalisation

1595 helicopter rescue with medicalisation (**200 per season**)

- 651 sent to local medical structure
- 758 sent directly to hospital
- 172 secondary hospitalization (after stop in the medical structure)

What are the severe traumas?

Head injuries : 28 %

Polytraumas : 22%

Rupture intra abdominal: 21%

Rachis : 16%

Blunt injuries: 4%



What causes for direct hospitalisation?

Traumas: 870 patients : 92%

Medical disease: 73 patients 8%

Death on the slopes: 12 patients 1,3%

Severe polytraumas: 89 patients 9%

Femur fractures: 210 patients 22%

Leg fractures: 131 patients 14%

Myocardial infarction: 28 patients 3%

Total cardiac arrest : 16 1,6%

Stroke: 13 1,3%



Cardiacs arrest with succeeded resuscitation

Medical causes: 14

Traumas : 2

Without sequelae: 7 (50%)

Coming from :

- Acute coronarial disease: 8 including 7 survival without sequelae
- cerebral hemorrhage : 1
- Hypokalemia: 1
- Abdominal hemorrhage: 1
- unknown causes: 4

Exemple: situation on the slopes











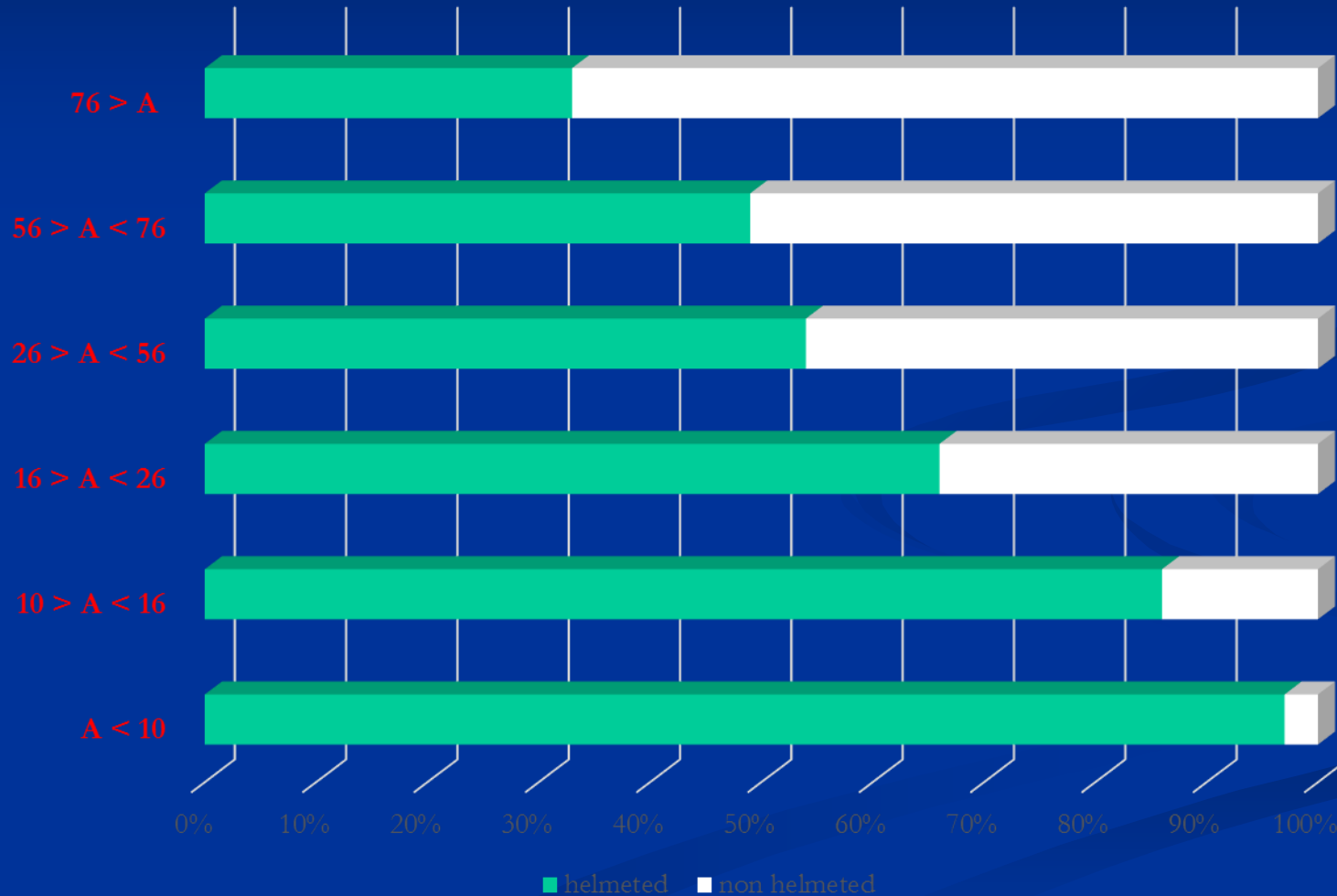


Other exemple: head injuries

- Despite a number of helmeted skiers growing each season, head injuries are always very commun.
- With helmeted heads concussions haven't disapeared, they are only less severe.

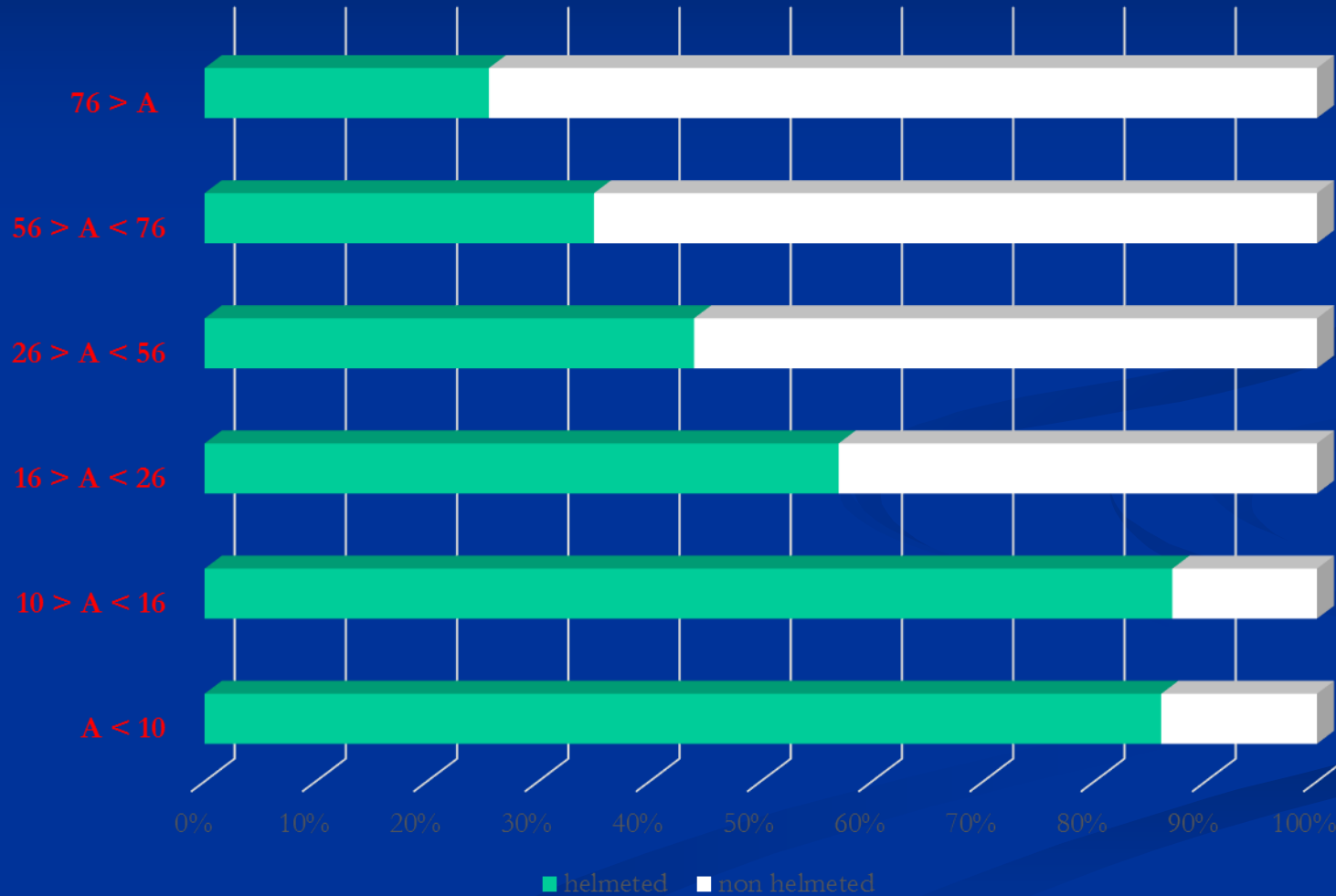
Helmet and control group

% helmeted



Helmet and injured

% helmeted



Helmet utilization rate

- The rate of helmet use is very high for children in France since the campaigns launched in the 90's.
- for adults there is an improvement for the last 5 years, but the rate is still not very high compared to other countries.

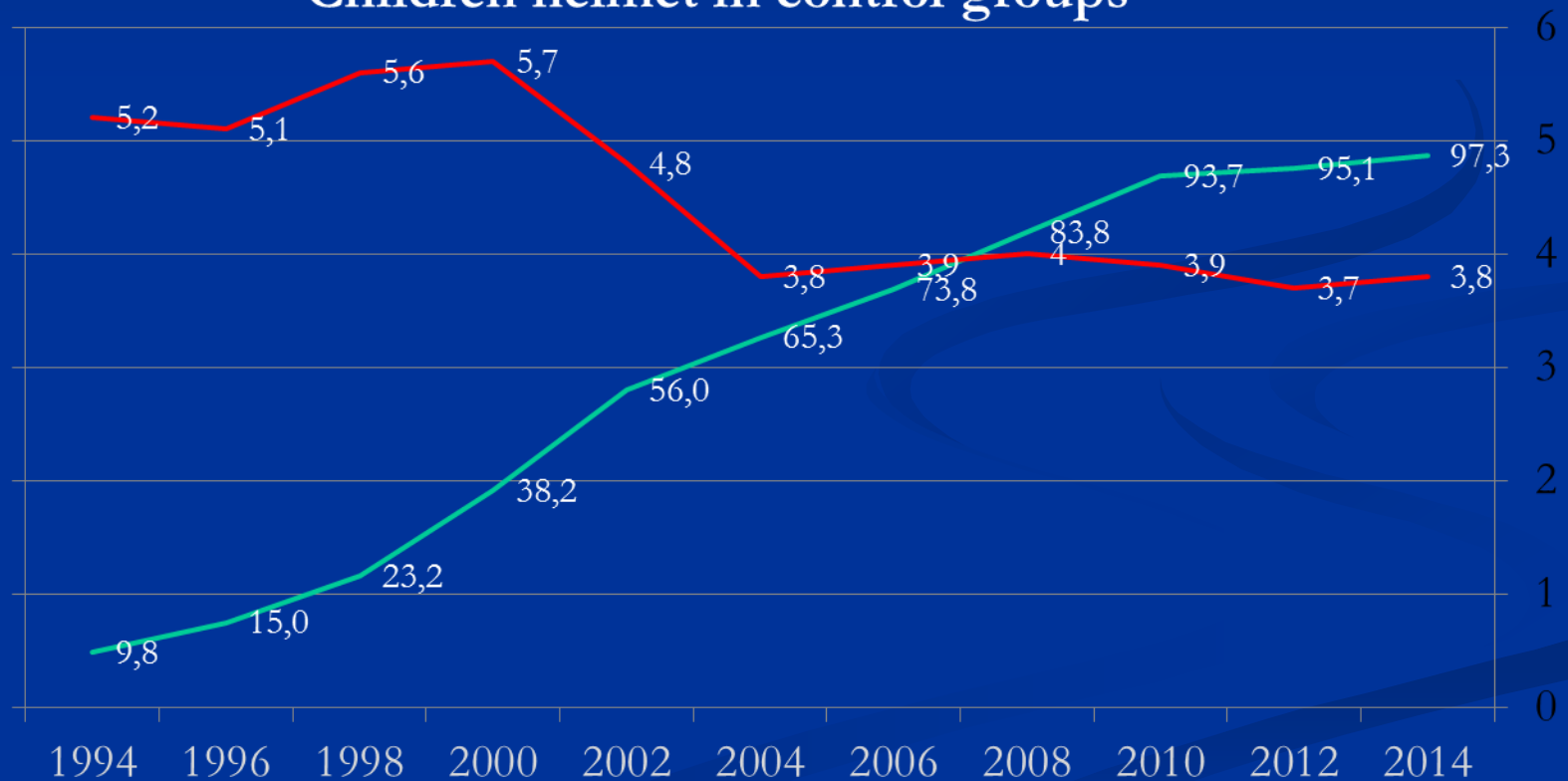
Children and helmets (until 12 years old)

Children helmet in control groups



Children and helmets (until 12 years old)

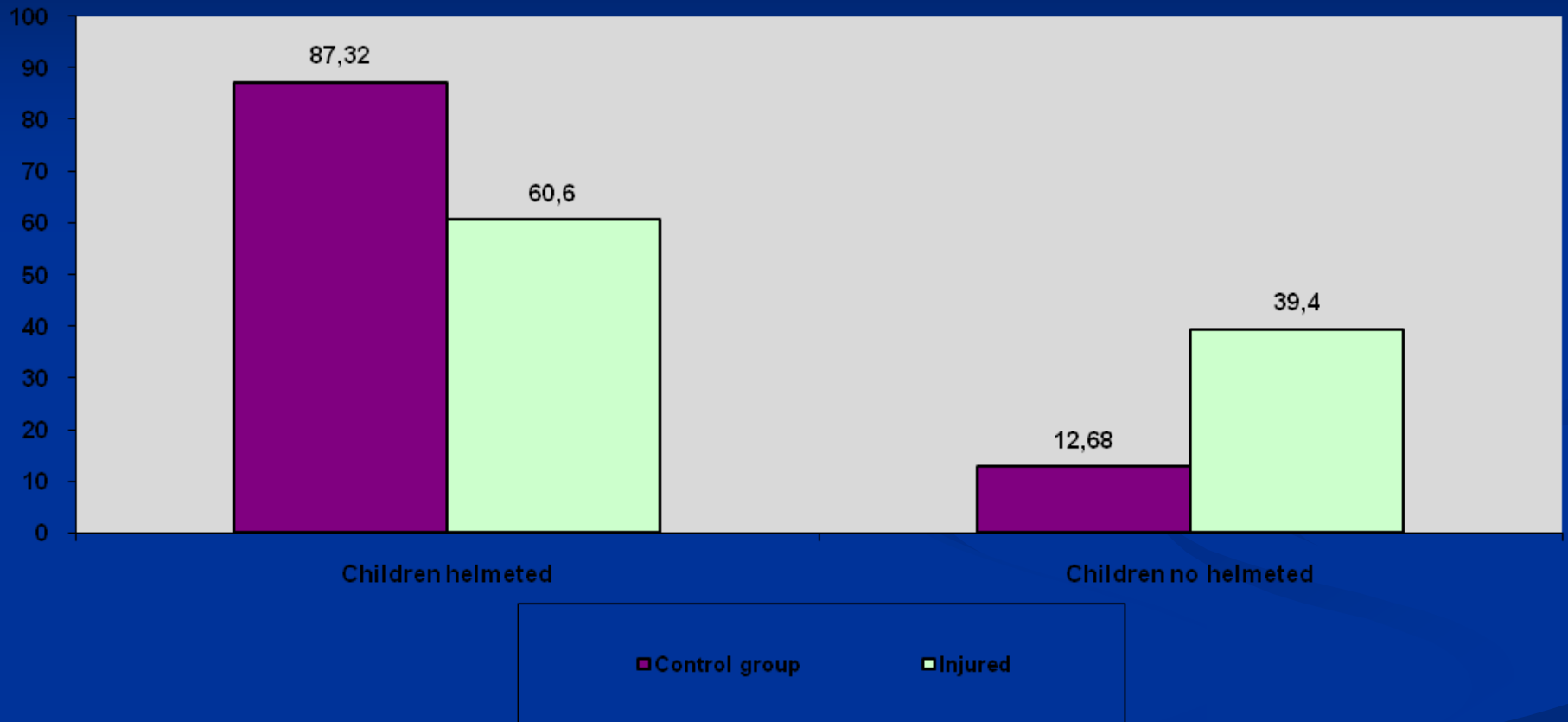
Children helmet in control groups



Helmets for young skiers

The objectives of the campaign ski helmet for kids initiated by Medecin de Montagne in the 90s are fully met: helmets are adopted by more than 95% of the children on the slopes in France.

Head injuries for kids and helmets (study 2005)



% of children helmeted is significantly lower in case of head injuries, $P < 0.001$

Cases report



We have observed some severe injuries after a collision with a skier with a camera fixed on the helmet



Médecins de montagne
Association créée depuis 1953

Discussion

- Using a helmet with a camera fixed on the top could be a danger:
 - either for other skiers in case of collision, because the camera is a projectile.
 - either for the skier himself because the camera is rigid (fi Schumacher?) and can damage the shell of the helmet.

Cases report



Facial traumas with helmets

Helmets with rigid chin or amovable chin bar



Technical characteristics of ski helmets



- Shell: polycarbonate, fiberglass, ABS
- Protective absorption: EPS
- Lining: foam
- Comfort:
 - Ventilation
 - Google retention
 - Chin fixation
 - Size ajustement



Soft or rigid ear pads



Designs, colours



Weight

- A modern helmet weight is around 400 g, some models less.
- A few years ago, ski helmets weight was around 800 g or more.



Helmet for speed skiers



Médecins de montagne
Association créée depuis 1953

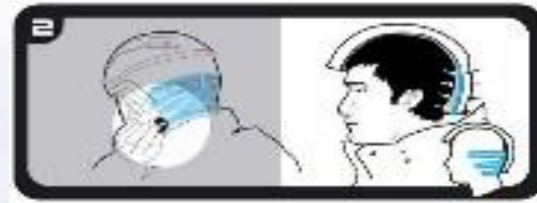
Helmets for bordercross



Comfort, size settings



Air system



Communication & sound



Helmets for ski patrols



Standards

- European standards for ski helmets : CE 1077
- Same for alpine skiing or snowboarding
- Standards are different for biking, mountaineering, climbing, paragliding
- Standards are not the same in other world areas (ASTM or Snell for USA)

Are actual standards adapted?

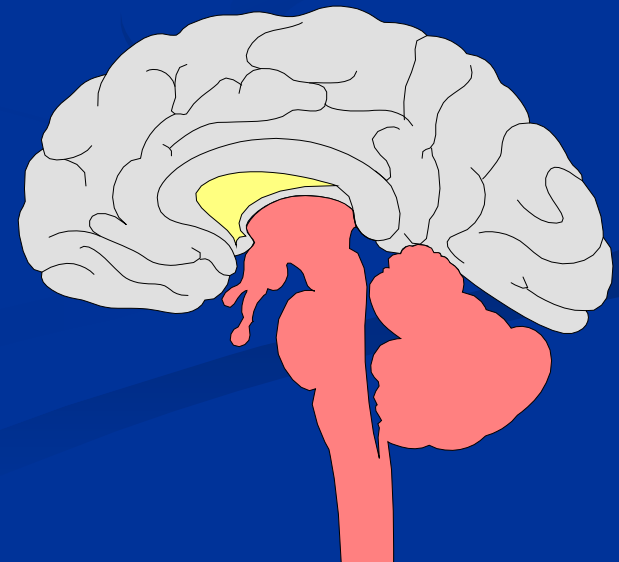
- Average speed on the slopes is increasing for all ski abilities
- Skiers often underestimate their speed
- Head concussion still occur often to helmeted skiers

check CE conformity



Effects of deceleration on the brain

- How much protection from a 300g limit?
- Based on cadaver research:
 - Minor brain damage likely at 148g
 - Serious brain damage at 268g
- Most authorities think that more than 100g is unsafe



New standard RH2013

- FIS has adopted a new standard for GS, SG and DH races
- RH2013 standard increase the speed of the fall test from 3,84 m to 6,8 m



New standard RH2013

- The shell of helmets reaching this standard are reinforced with carbon fibers or injection of composite resin.
- These new types of helmet are at higher cost, but able to decrease with mass production.
- The weight of this new type of helmet is higher than usual models.

Why different standards for ski helmets?

- The conditions are different for a kid in a ski garden, an intermediate skier on a groomed slope, or a downhill ski racer.

- These standards does exist:

EN 1077 B: is currently use. (close to ASTM 2040)

EN 1077 A: with a better percussion test and protects a larger surface. (percussion is about 2 x more demanding compared to B)

RH 2013: 3 times stronger in percussion than EN 1077 A.

Against

- Less freedom
- Helmet too heavy
- Disgreament for sight or/and hearing
- Afraid of risk for cervical injury
- Persistant risk of death or severe head injuries
- False safety, risk of dangerous behaviour

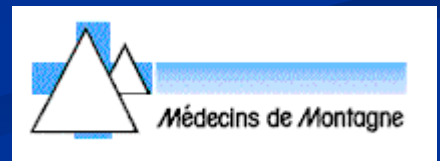
In favor

- Less severe head injuries
- Less hospitalization for helmeted injured children
- No more cervical spine injuries if the skier wear a helmet
- Better comfort
- More safety in case of trauma after collision or off pist

Conclusion

- Severe trauma is no longer the exclusive of road accidents.

The number of serious trauma or vital medical emergency each winter season in the Alps justifies the establishment of a medical facility by helicopter in the Portes du Soleil.



Conclusion

- Helmets are not used in France by all categories of skiers, specially adults and professionnels (ski instructors, ski patrols)
- Wearing a camera on the helmet is not safe
- For kids helmets with chin protectors are recommended
- Skiing with anticoagulation treatment is not a good idea.

Thank you for your attention.



Médecins de montagne
Association créée depuis 1953