Road Traffic Accidents and Brain Injury

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Aims

RTA Figures

Mechanics of RTA

Brain injuries
- Types
- Assessment
- Treatment
- Development

Mood disorders / Secondary complications

Whiplash

RTA figures

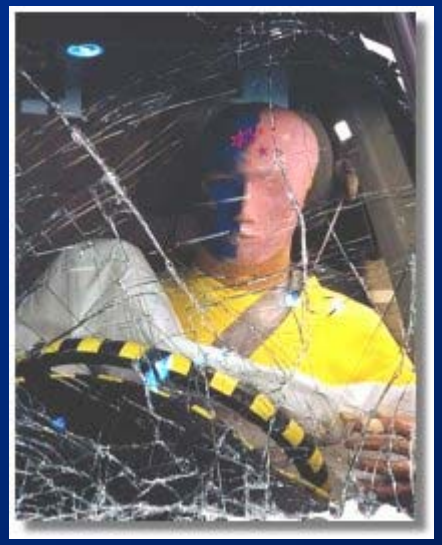
In 1990, road traffic crashes caused

5,563,000

Intra-cranial injuries worldwide

Murray CJL, *et al.* 1996

HI major cause of death and injury in RTAs
(80% of serious RTA injury is to head)

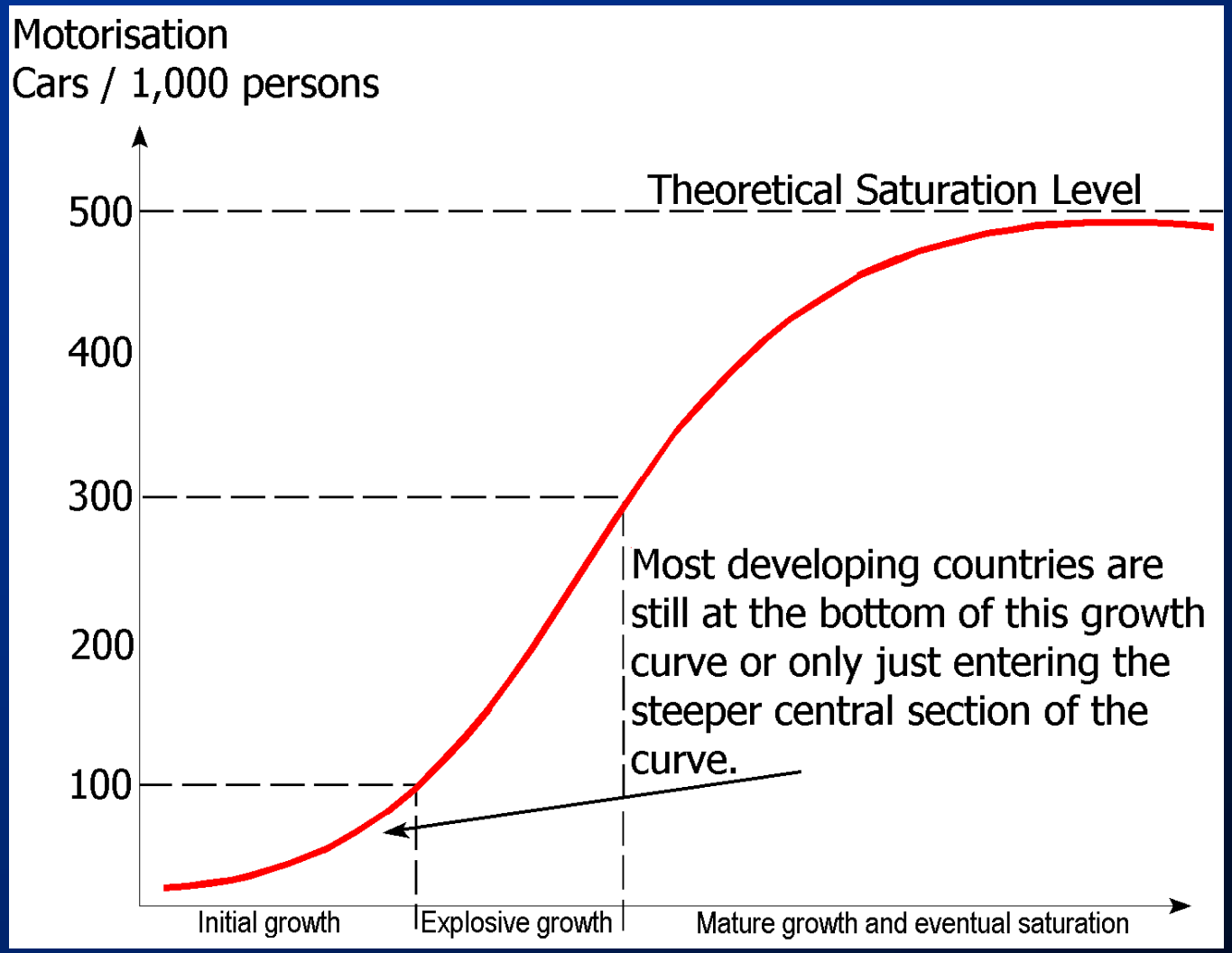


1 concussion every 15 seconds in USA

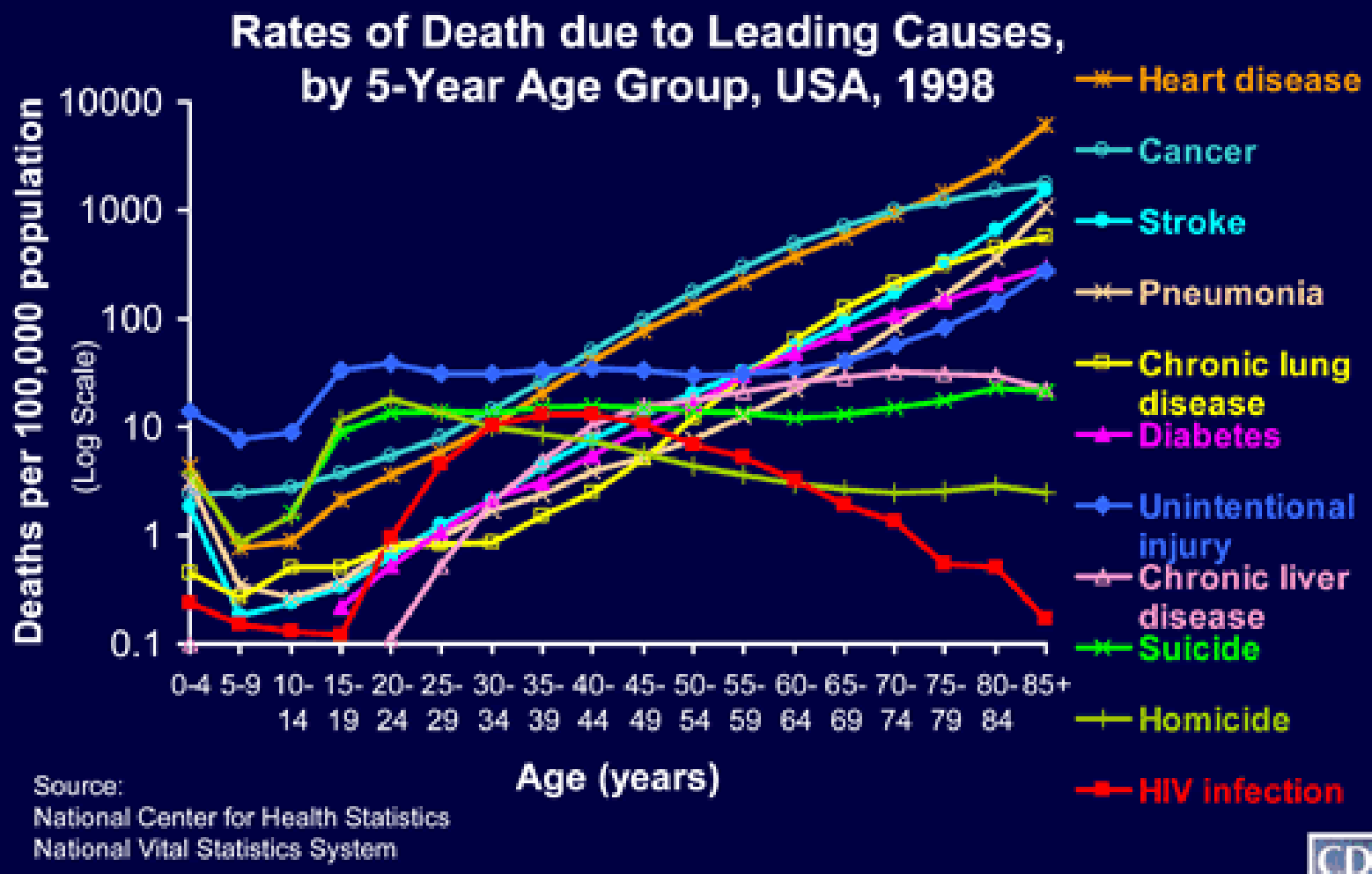
15,000,000 Brain Injuries per year in USA

Car injuries Playgrounds Sports

RTA figures


Motorisation
Cars / 1,000 persons
500
400
300
200
100
Theoretical Saturation Level
Most developing countries are still at the bottom of this growth curve or only just entering the steeper central section of the curve.
Initial growth
Explosive growth
Mature growth and eventual saturation

RTA figures


Rates of Death due to Leading Causes, by 5-Year Age Group, USA, 1998
Deaths per 100,000 population
(Log Scale)
10000
1000
100
10
1
0.1
0-4 5-9 10-14 15-19 20-24 25-29 30-34 35-39 40-44 45-49 50-54 55-59 60-64 65-69 70-74 75-79 80-84 85+
Age (years)
Heart disease
Cancer
Stroke
Pneumonia
Chronic lung disease
Diabetes
Unintentional injury
Chronic liver disease
Suicide
Homicide
HIV infection
Source:
National Center for Health Statistics
National Vital Statistics System
CDC

RTA figures

1,200,000 killed per year in RTAs
10,000,000 injured per year in RTAs

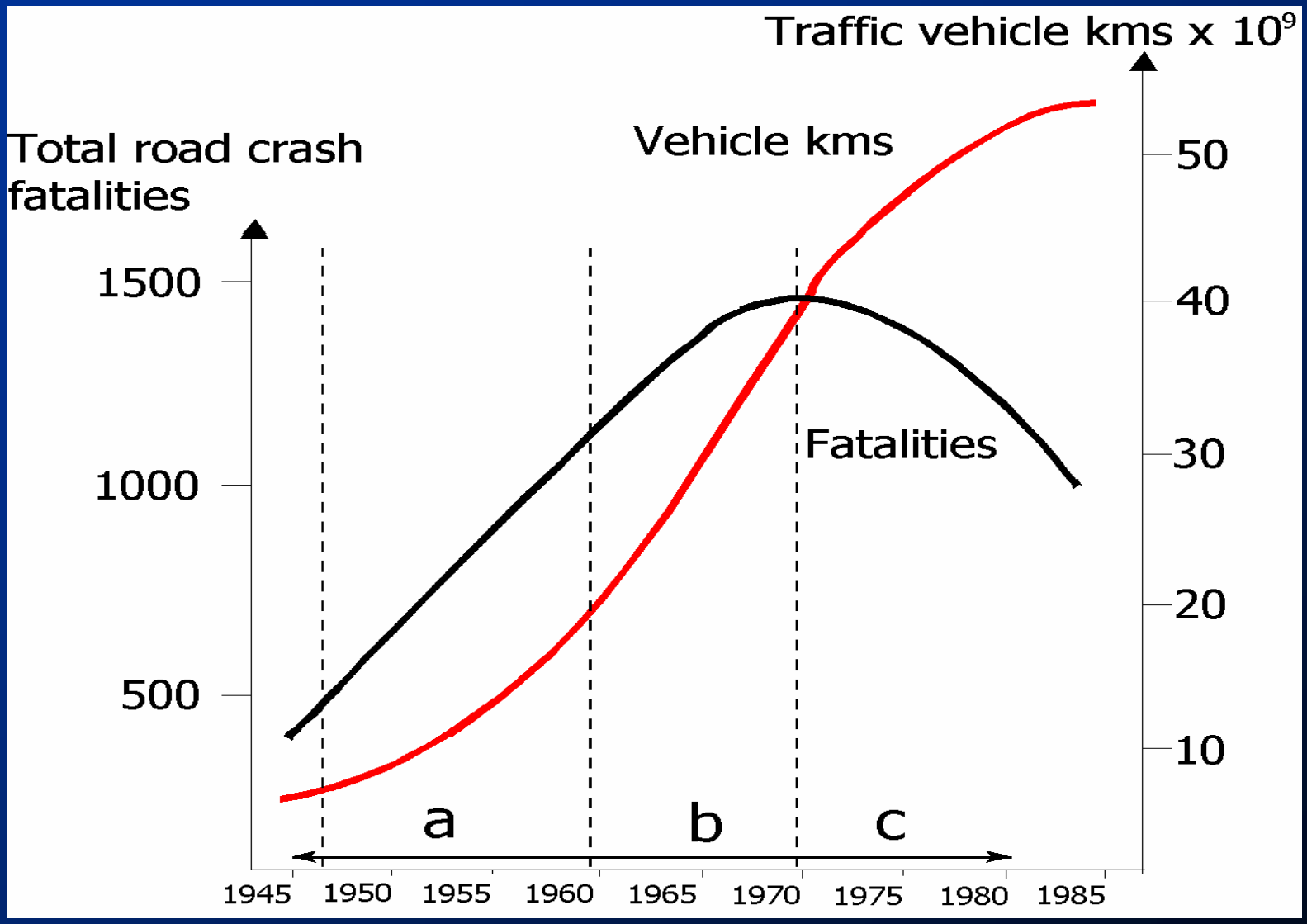
Most Head Injuries are mild, but any lefy with long-lasting problems

RTA most common cause of HI

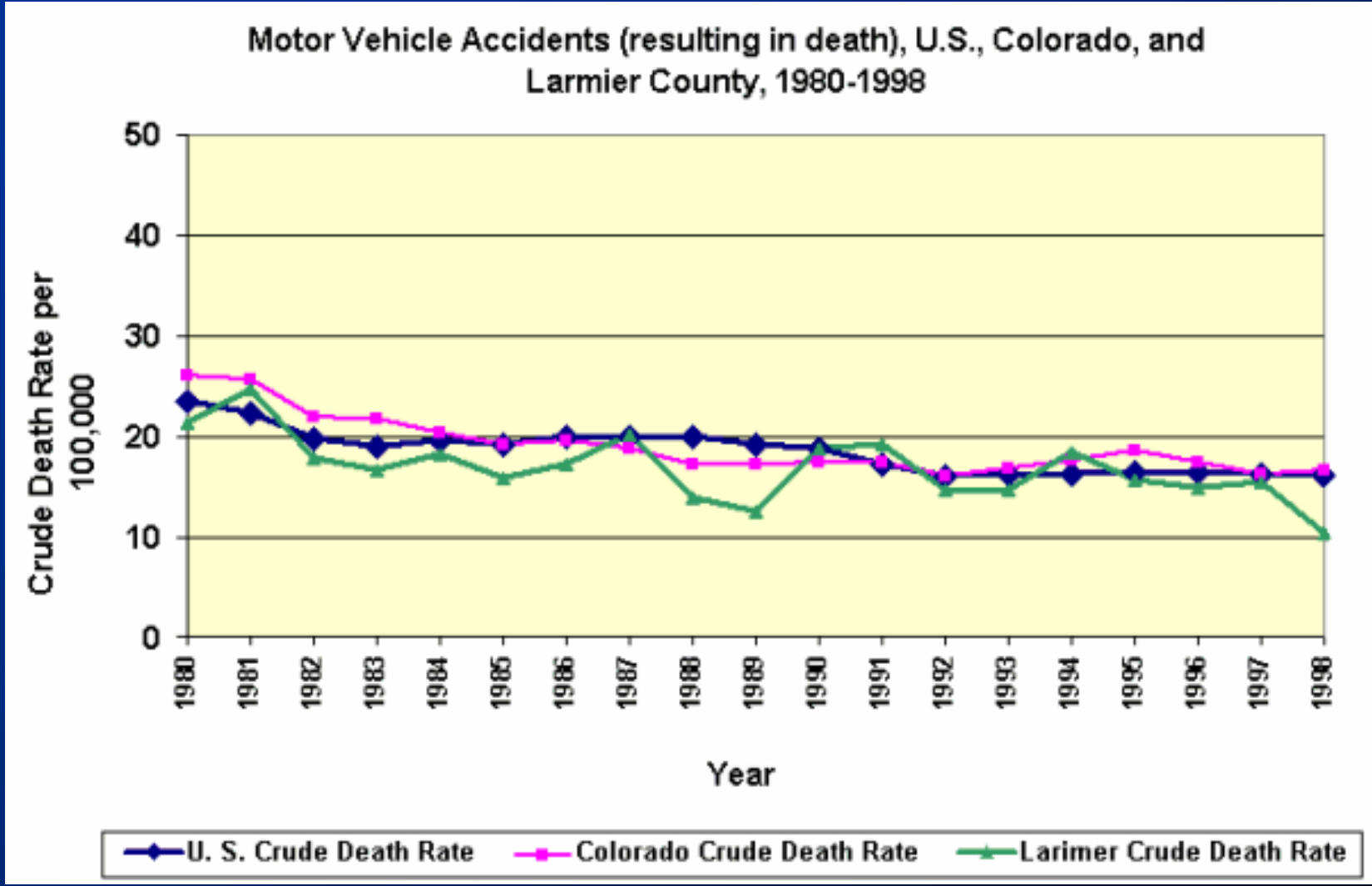
Young males at biggest risk

Alcohol implied
Data suggests female drinking catching up with male
Implications for Female RTAs?

RTA figures


Traffic vehicle kms x 10⁹
Total road crash fatalities
Vehicle kms
Fatalities
1500
1000
500
50
40
30
20
10
a
b
c
1945
1950
1955
1960
1965
1970
1975
1980
1985

RTA figures

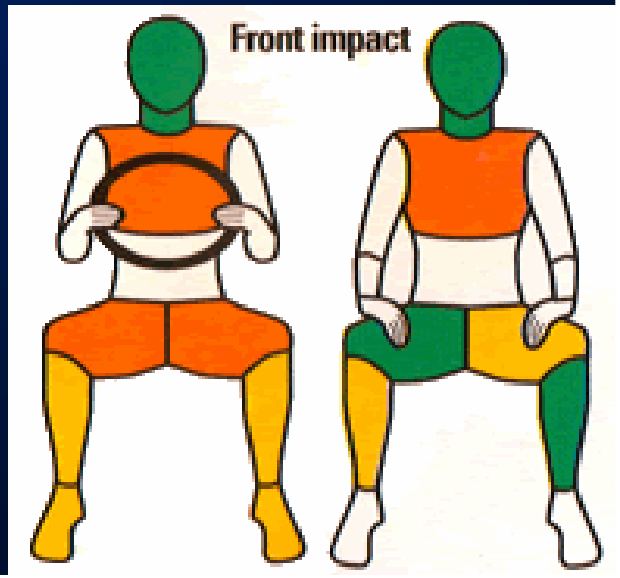

Motor Vehicle Accidents (resulting in death), U.S., Colorado, and Larmier County, 1980-1998
Crude Death Rate per 100,000
50
40
30
20
10
0
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
Year
U. S. Crude Death Rate
Colorado Crude Death Rate
Larimer Crude Death Rate

Mechanics of RTAs

Occupant RTAs

Driver Hazards

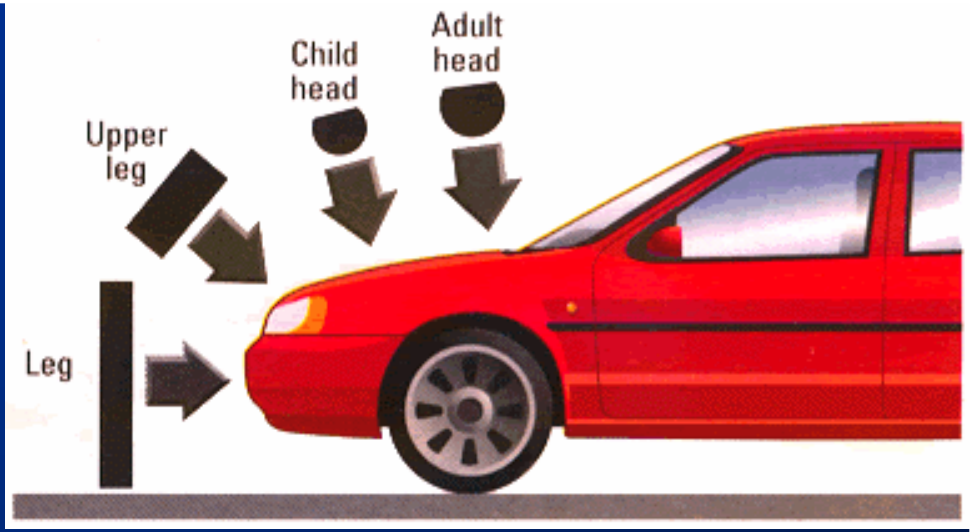
- Steering wheel / column
- Instrument panel
- Seatbelt
- Windscreens

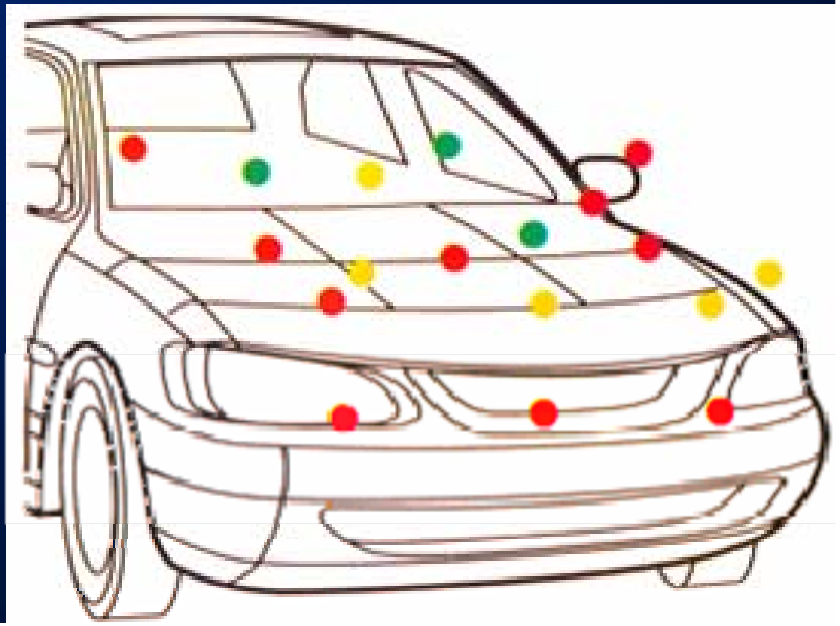


Passenger Hazards

Mechanics of RTAs

Pedestrian RTAs





RTA Brain injuries

Skull Fractures

Open Head Injury

OPEN HEAD WOUND — SKULL FRACTURE

Closed Head Injury

BLEEDING FROM EAR (Possible Skull Fracture)

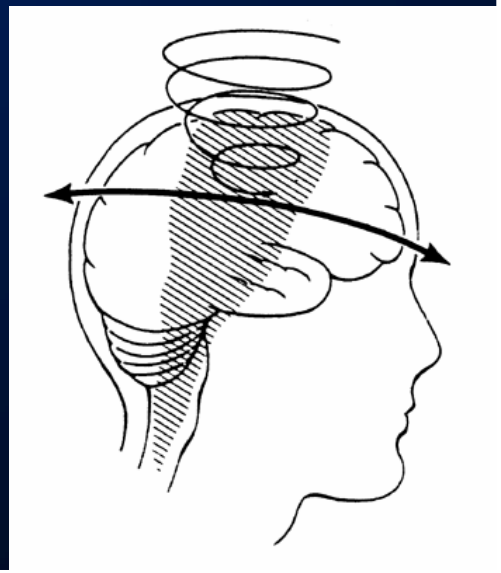
RTA Brain injuries

Contusion / Concussion

Contre-Coup

Epidural haematoma

Diffuse axonal injury

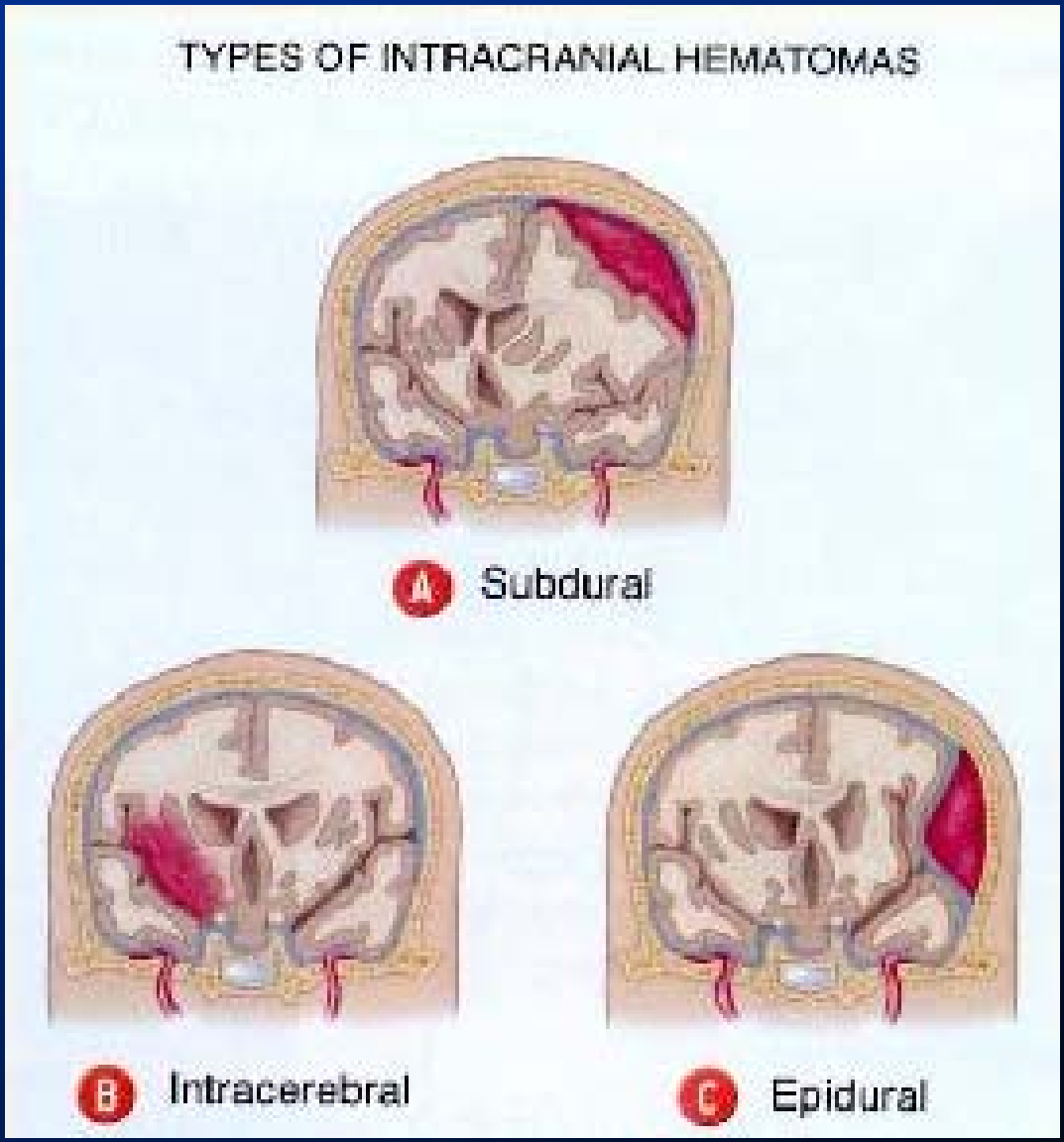


RTA Brain injuries

Subdural haematoma

Intracerebral haemorrhage

Epidural haematoma



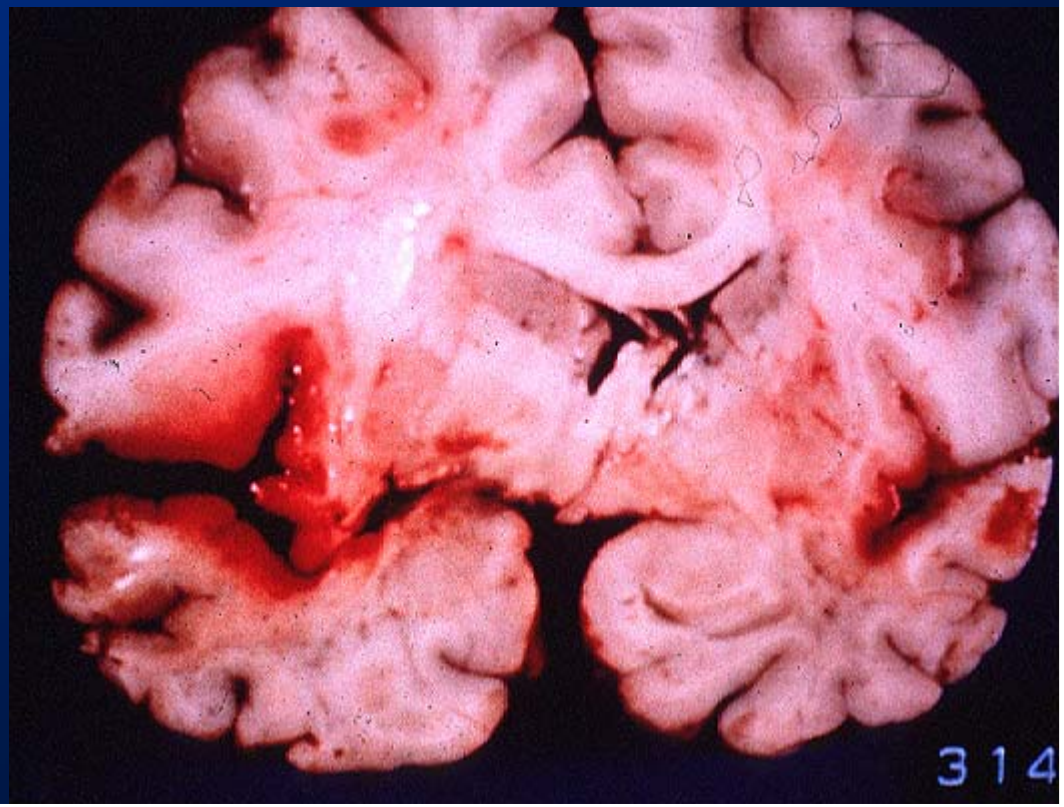
Swelling

Brain matter pushed and swollen

Painful

Exacerbates affects

Accelerates symptoms



How are brain injuries assessed?

PTA

Post Accident Amnesia – memory problems when regaining consciousness

- Minor Brain Injury
  Unconscious for < 15 mins

- Moderate Brain Injury
  Unconscious > 15 mins but < 6 hrs + PTA < 24 hrs

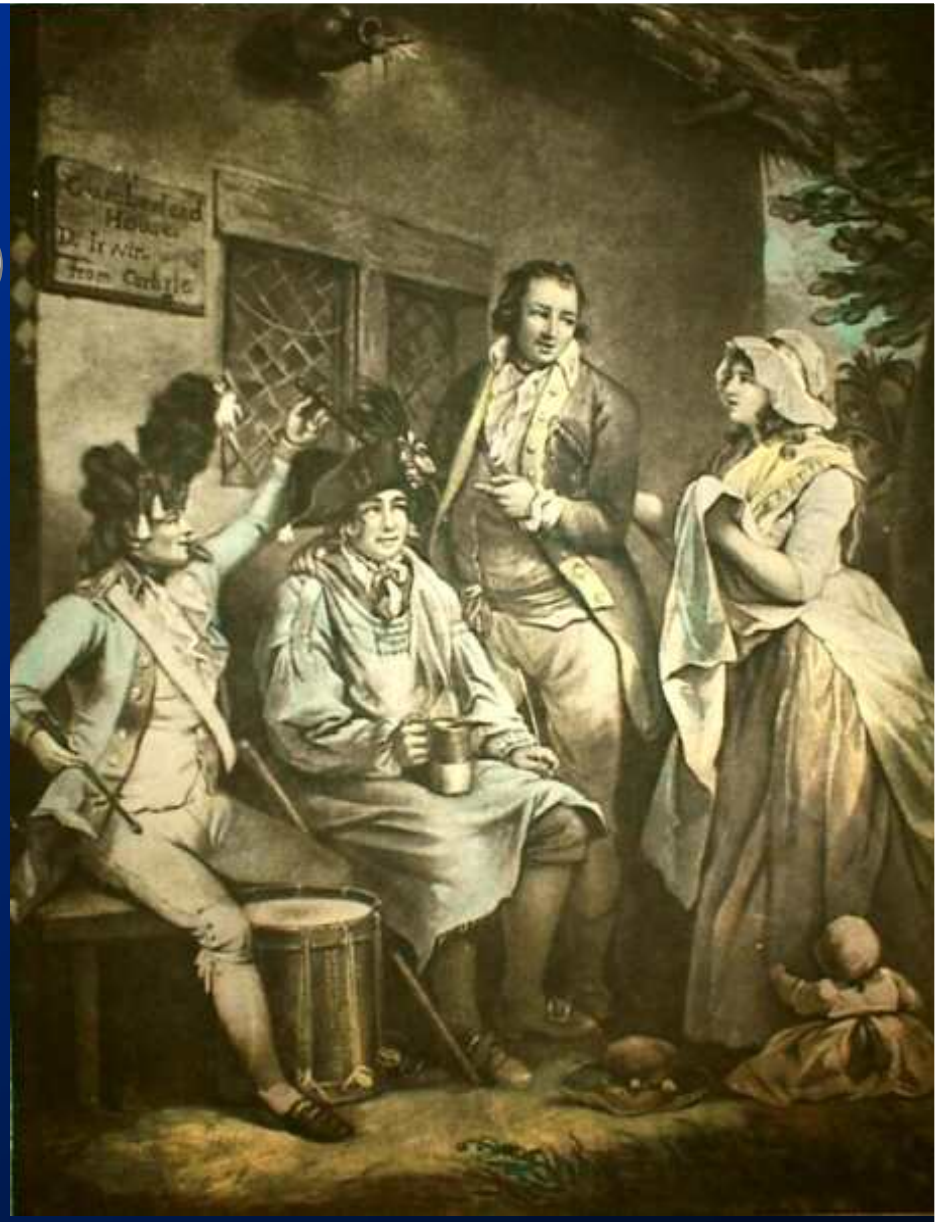
- Severe Brain Injury
  Unconscious > 6 hrs OR PTA > 24 hrs

- Very Severe Brain Injury
  Unconscious > 48 hrs OR PTA > 7 days

How are brain injuries treated?

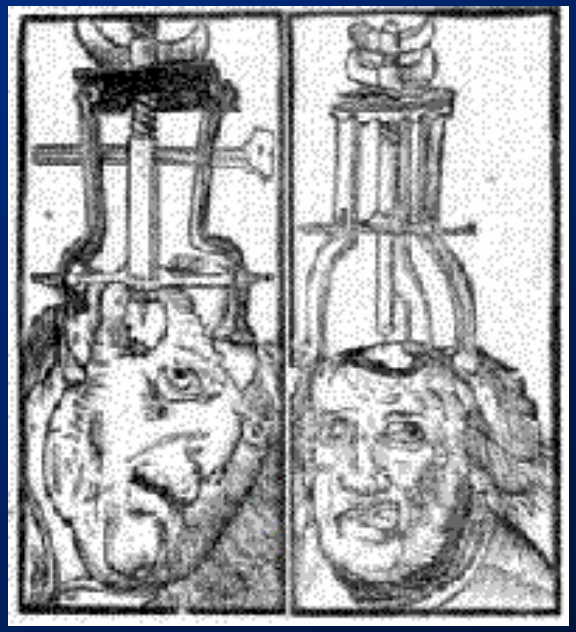
Trepanning (Gk – trupanon – borer)

Popular Japanese treatment



George Morland. Trepanning a Recruit. c.1790 Oil on canvas

How are brain injuries treated?



How are brain injuries treated?

Stop bleeding
Prevent ICP
Control pressure
Maintain blood flow
Remove any blood clots

Positioning (head up)

Fluid restriction (of patient)

Medication
- barbiturate (coma)
- anticonvulsants
- diuretics

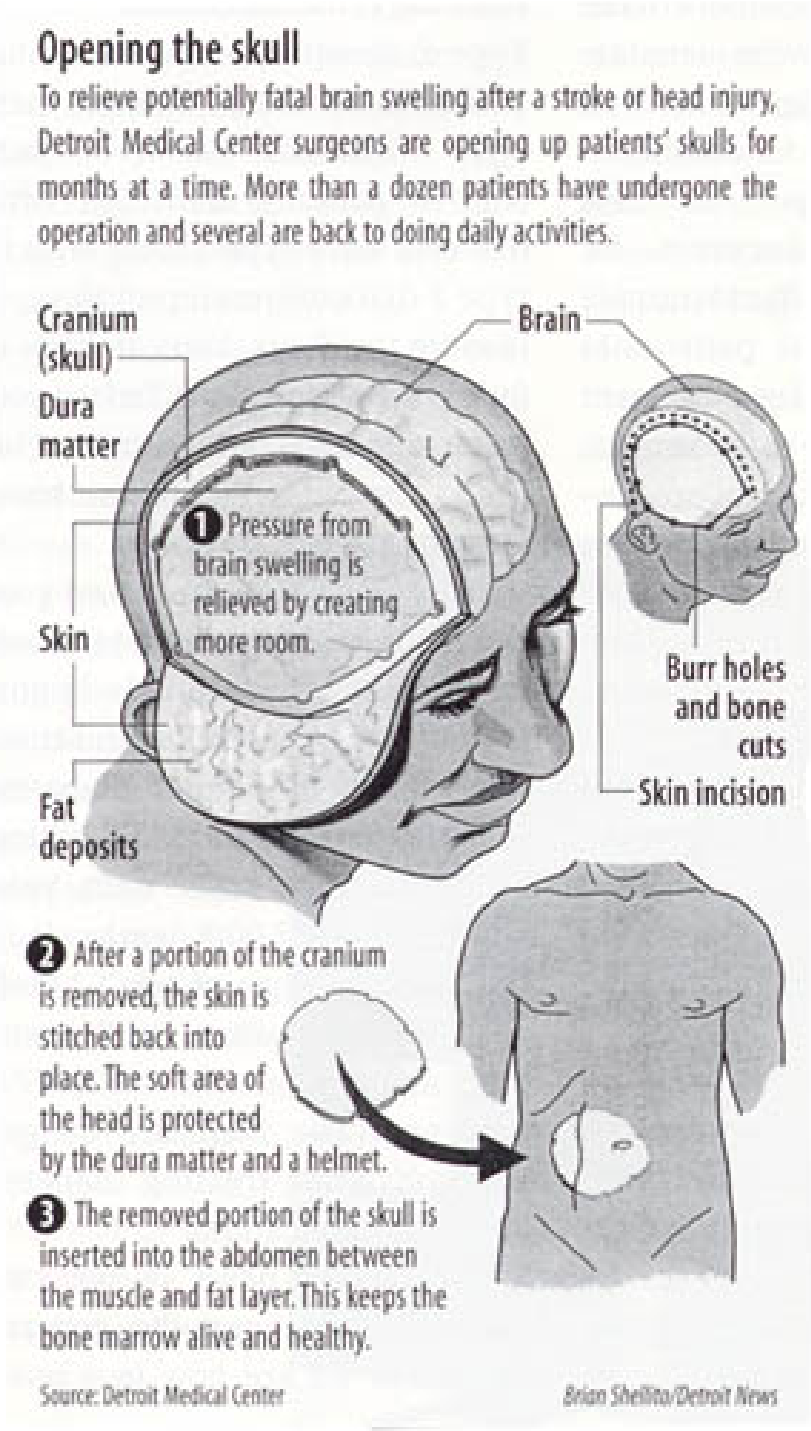
How are brain injuries treated?

Ventricular drain (Ventriculostomy)

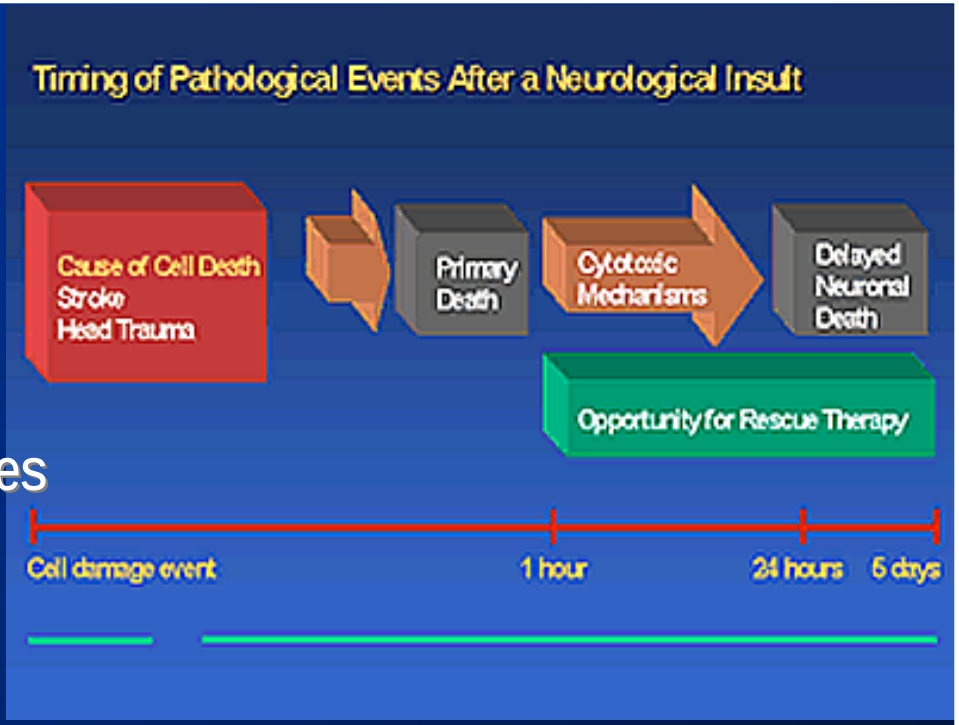
Ventilator

Surgery

- Craniotomy
- Burr holes
- Bone flap removal



Injury Development



Recovery from Brain Injury is possible

Less likely as severity of injury increases

Permanent brain problems from minor head injury are rare

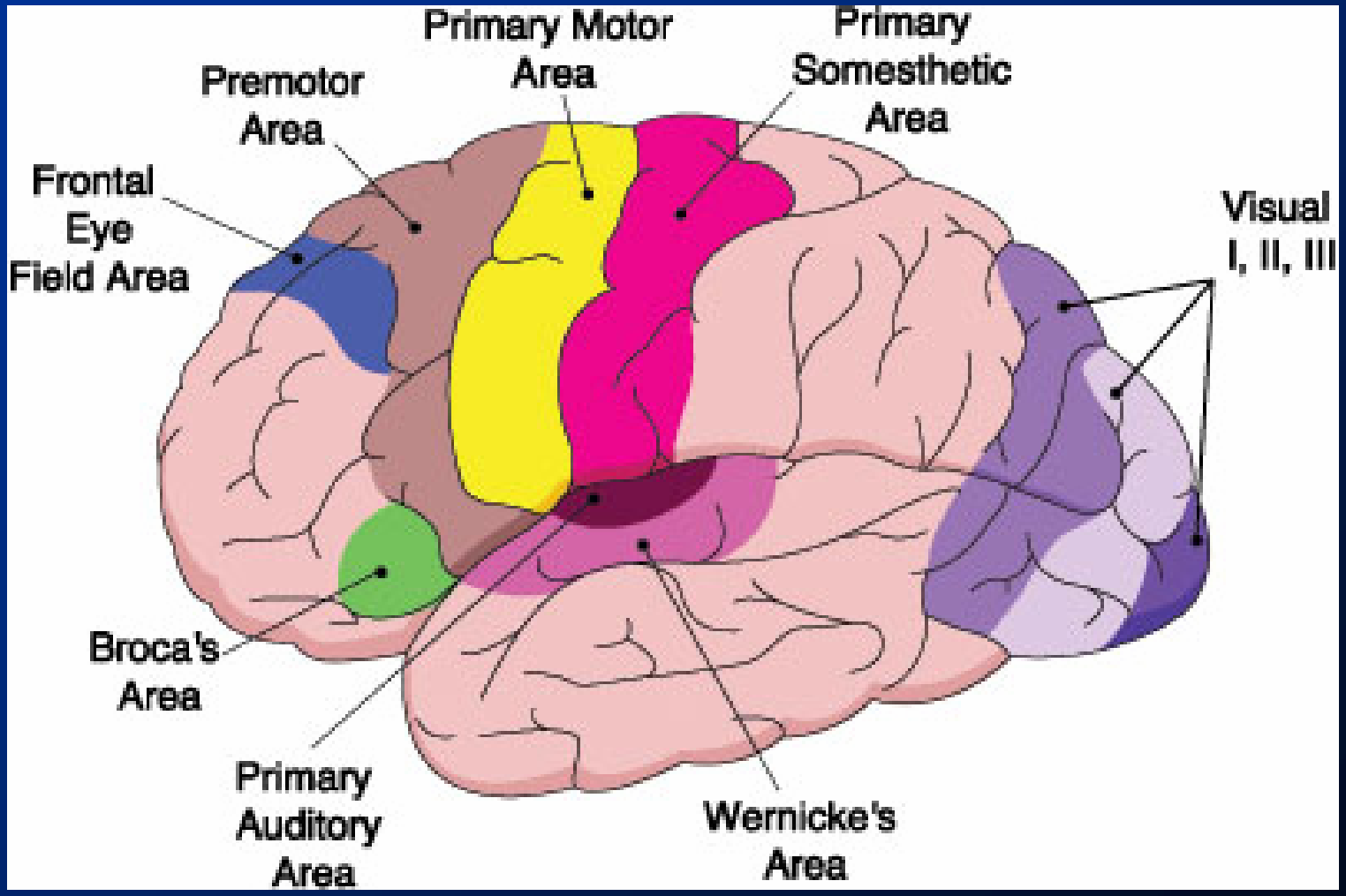
Post-concussional symptoms / Post-concussion syndrome

Headache	Dizziness	Sensitive to loud noise or bright light
Insomnia	Slow thinking	Tinnitus
Blurred vision	Tiredness	Irritation

PCS usually pass within 3 months

Injury Development

"Focal Brain Injury"



Development of mood problems

Memory
Headache
Overload
Sleep disorders
Fatigue
Anger
Depression
Cognitive loss and muddle

- 33% of head injury patients develop depression within < 1 year
- Only 20% for non-head injury patients
- Neuro-Rehab services need to plan ahead

Development of mood problems

PTSD in kids after accident
34% of children in RTAs suffer PTSD
Within 6 weeks of RTA

Stallard, P *et al*. 1998

20% suffer acute stress reaction afterwards
25% suffer psychiatric problems within 1 year

Mayou *et al*.

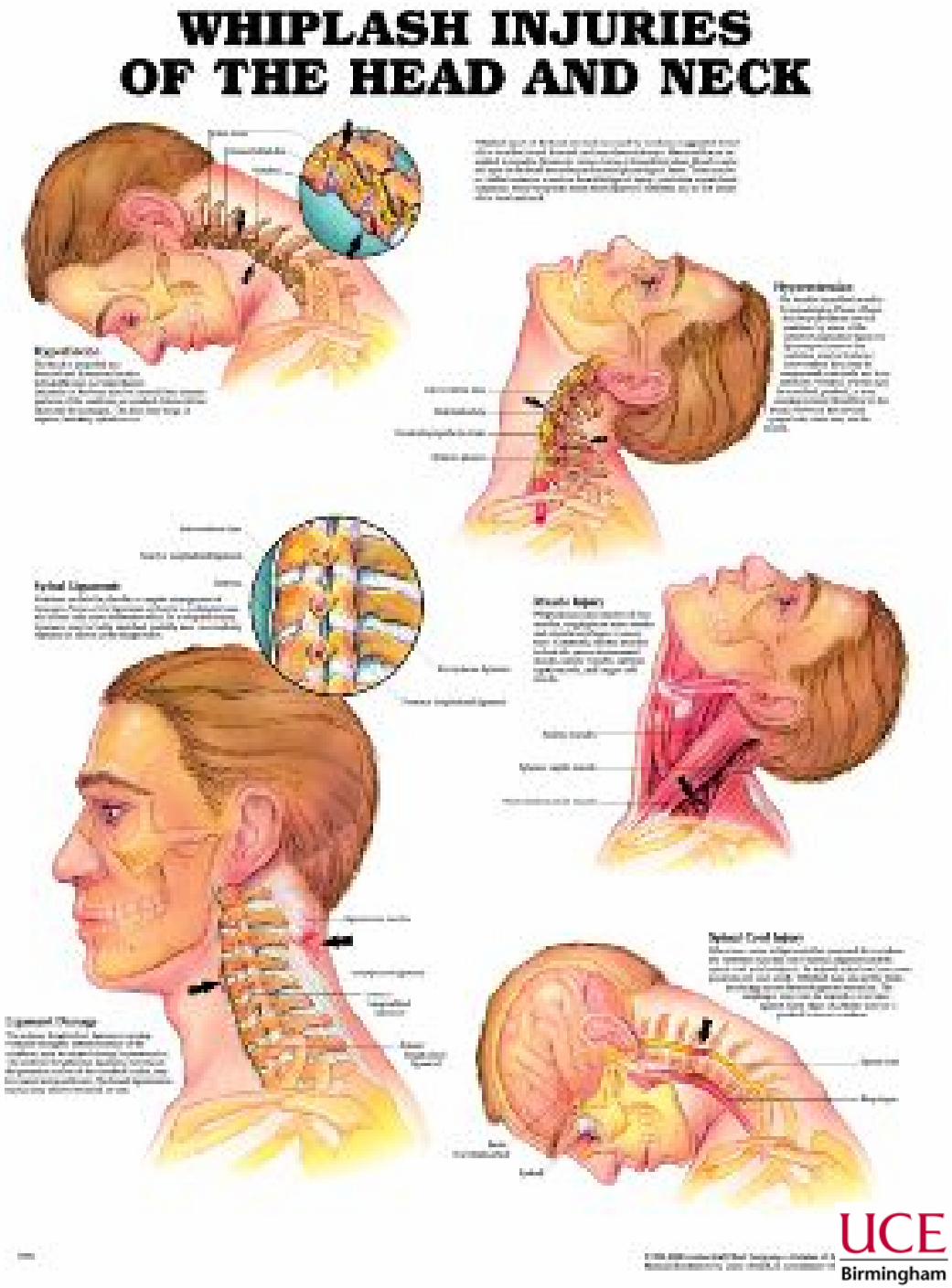
Mood disorder
Phobic travel anxiety
PTSD

} all common

Psychological de-briefing after RTAs may help

Hobbs *et al*. 1996

Development of Whiplash



UCE Birmingham

Development of Whiplash

Case 1.

A woman driver was stopped at a red light when she was struck from behind by another vehicle causing $950 damage to the front car but no visible damage to the rear vehicle. The front driver sustained neck and jaw (TMJ) injuries from the impact. Based on Consumer Reports bumper tests, we showed that the damage was consistent with a 10-14 mph impact, which generated a peak head acceleration of up to 24 g's, consistent with the driver's injuries.

Case 2.

An SUV Driver was stopped at a red light when he was rear-ended by another SUV causing $800 damage to his vehicle but no damage to the rear vehicle. The struck driver claimed to have suffered a lasting shoulder injury as a result of the impact. Based on bumper basher test data and other evidence, we demonstrated that the closing speed must have been 4-6 mph, resulting in peak chest accelerations of only 3-4 g's for the front driver, which was inconsistent with the injuries claimed.

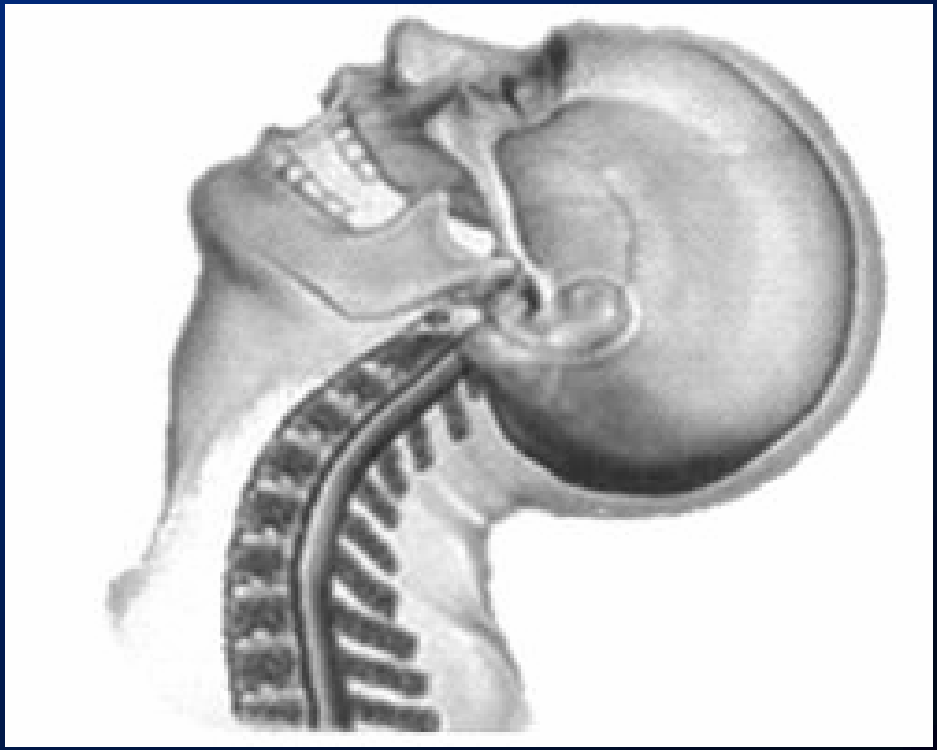
Development of Whiplash

Injuries to the neck following a car accident are referred to as "whiplash“

Symptoms may not fully appear for several weeks after accident

Symptoms suggestive of whiplash may include some or all of the following:

Headaches
Double vision or blurred vision
Vomiting
Dizziness
Jaw pain or clicking
Ear pain
Stiffness in the neck
Difficulty turning the head
Pins and needles
Numbness or tingling in arm(s)
Weakness in the hands



Development of Whiplash

These injuries often result after a traumatic car accident most commonly involving a rear-end collision.

Even in collisions as low as five miles per hour

There may be very little damage to the car yet the individual in the car can still sustain neck injury

When the head is suddenly thrown in any direction beyond its normal limits, the muscles and ligaments supporting the spine and head can be overstretched, twisted and torn.

The soft, jelly-like discs that act as shock absorbers between the spinal vertebrae can also be damaged - bulges, hernia or ruptures depending on the severity.

Development of Whiplash

Despite seat belts and air bags, whiplash injuries continue to result in significant lost work time and disability

Early treatment is most important in order for proper healing to occur in the delicate structures of the neck

The longer treatment is delayed, the higher the probability for adhesions (similar to grizzle on a steak) and bony arthritis (spinal decay) to develop

Spinal adjustments on a regular basis allow the soft tissue structures, such as discs, ligaments and muscles to heal up in their proper position

Proper alignment ensures that the spine and supporting structures maintain proper structure and function allowing for maximum function and longevity

Whiplash as a pseudo “psychiatric” condition?

APA recognises three types “dissimulating” disorders

1. Malingering
2. Somatoform disorders
3. Factitious disorders

Doctors, alternative practitioners, scientists, lawyers, and patients have colluded in promoting a disorder that now afflicts millions and costs billions

While patients who sustain serious neck injuries have a good prognosis minor collisions producing no demonstrable tissue damage now result in lifelong disability in around 10% of cases

Whiplash as a pseudo “psychiatric” condition?

One of a family of fashionable conditions, including:
Fibromyalgia
Repetitive strain injury
Chronic fatigue syndrome
Occupational back pain
Chronic pain syndrome

These diagnoses are offered to patients who are either consciously or unconsciously seeking an escape from the pressures of modern life into the roles of sickness and victim-hood

These conditions risk degrading medicine and bankrupting health services; they elevate junk science and corrupt the law; worst of all, they condemn patients to disorders from which there is little hope of recovery.

Whiplash as a pseudo “psychiatric” condition?

Most common injury following RTA (Spitzer *et al*. 1995)

Make up 85% of UK RTA injury insurance claims

Sufferers no more likely to be “worriers” or have psych. probs than non-suffers who had RTAs

Sufferers more likely to find accident “frightening” and be the innocent party than non-suffers who had RTAs

33% of sufferers have psych complications at 1 year after accident

No “psychology of whiplash” – many physical and psychological interactions

(Mayou & Bryant 2002)

Summary

RTA is a simple area – clear-cut effects on health

Well-recognised patterns affecting injury and prognosis

Treatment advances and prognosis gets better

Care of RTA sufferers needs to plan or wider psychological (consequences)

Whiplash IS a complicated clinical problem