



Polytrauma in elderly

Vilmos Vécsei, Vienna, Austria - Europe

Early stabilization Femurfx.

Medical University Vienna, Dept. for Trauma Surgery

- « Polytrauma »



- prospective database 9/92 - 6/00
- 352 patients
- 148 patients with combined chest and head injury, AIS >2 (42%)

- retrospective analysis to study effect of femoral fracture and fixation
- exclusion: age < 18 years, previous head injury, neurologic disease

Methods

Study Group

- femoral shaft fracture
- n = 28
- Ø age = 39.0a
- Ø ISS = 39.1
- AIS extr. = 3 (3-6)

Control Group

- without femoral fracture
- n = 120
- Ø age = 40.9a
- Ø ISS = 38.2
- AIS extr. = 0 (0-4),
p<0.0001

Fracture Fixation < 24h

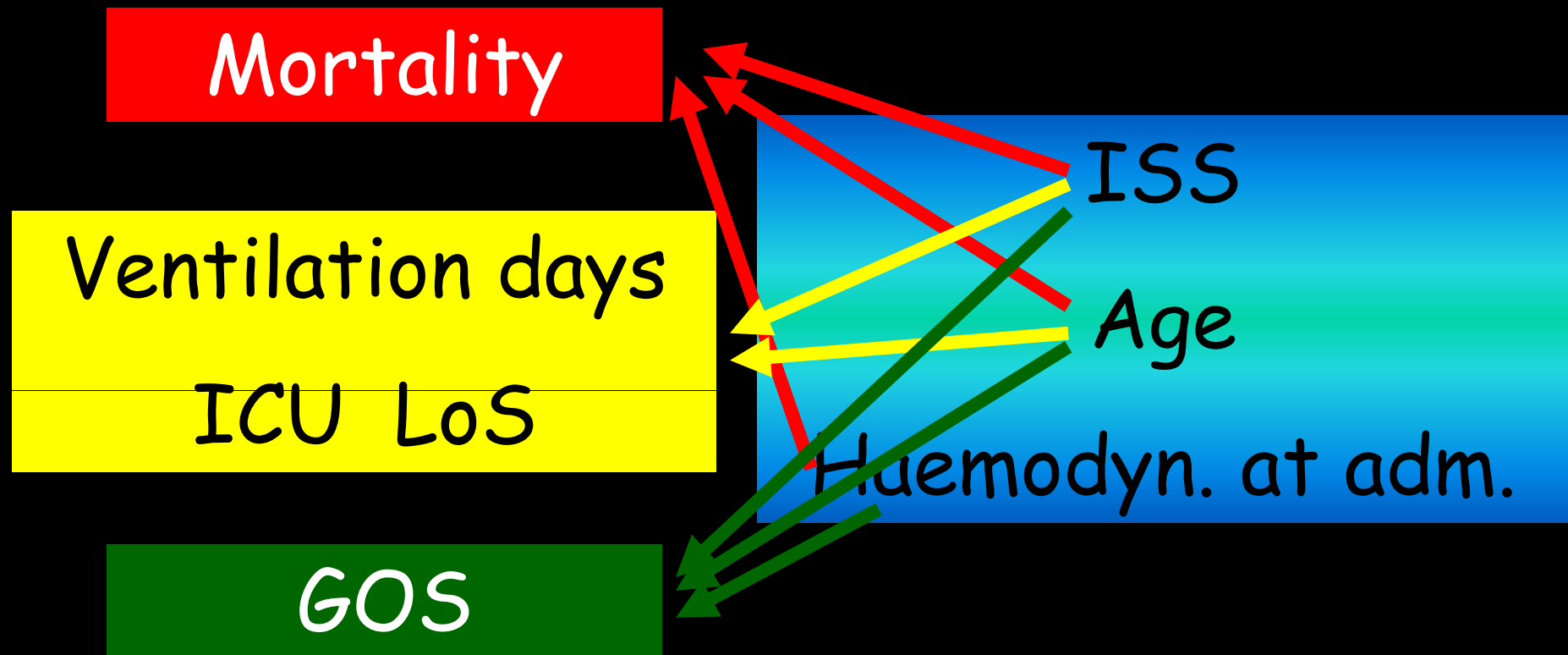
- n = 16, intramedullary nailing: stable hemodynamics < 1h, for 3h
- n = 6, external fixation
- n = 6, died before fixation



Results

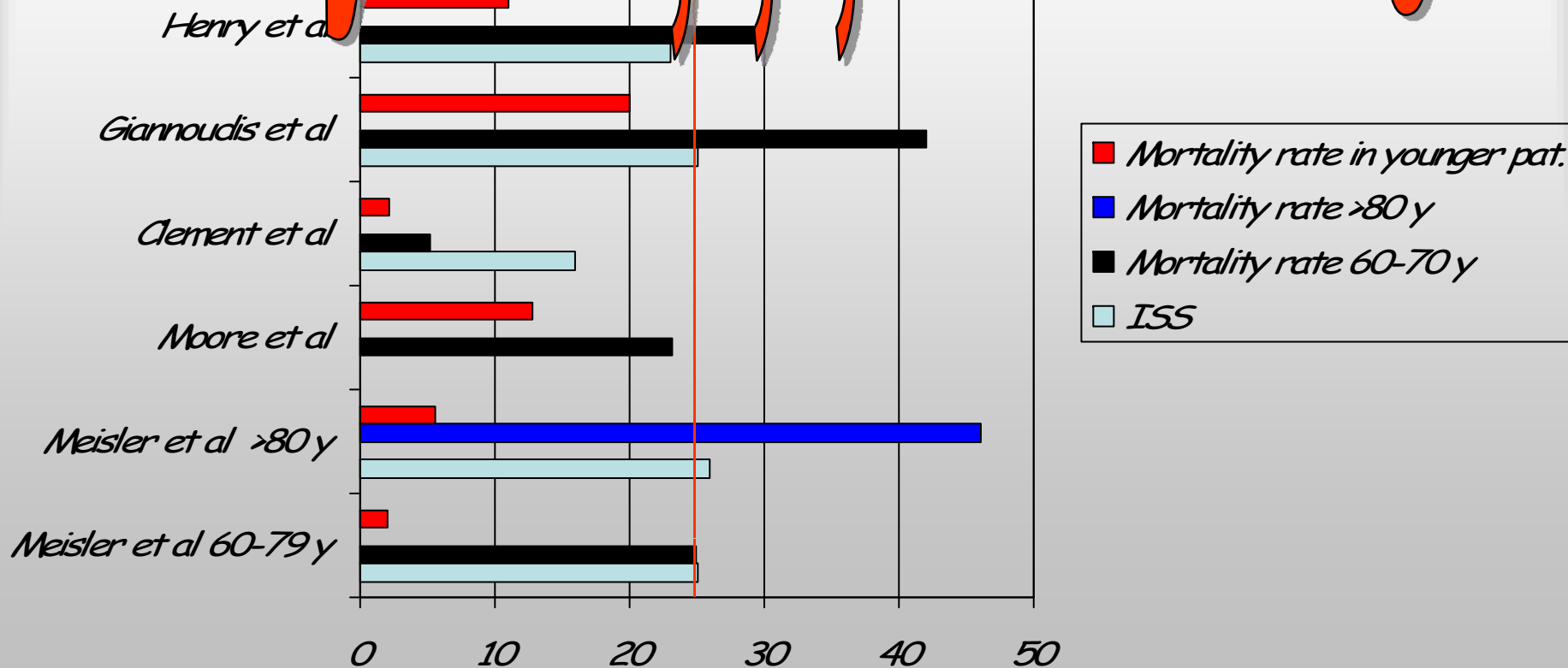
	Study group n=28		Control group n=120
mortality	9/28 (32,1%)	n.s.	42/120 (35,0%)
early + <24 h	8/9		24/42
delayed + >24 h	1/9		18/42
Vent. days	9,3 (0-56 d)	n.s.	12,2 (0-56d)
ICU days	12,4 (0-60d)	n.s.	16,1 (0-97d)
GOS good, or moderate	11/28	n.s.	58/120
GOS pvs.	0/28	n.s.	4/120

Stepwise logistic regression analysis



Mortality rates in the elderly - polytrauma >65y / >80y

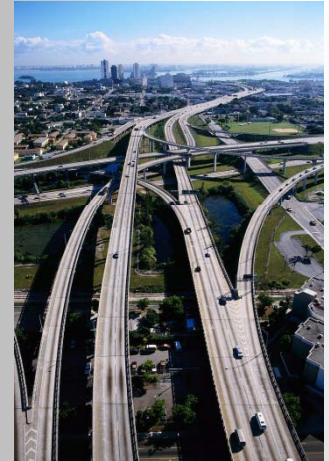
Mortality rate 2, 3, 4, 10 times higher



OUTCOME AFTER TRAUMA



Fall
30%



MVA
50%



Pedestrian
10%



Suicide
5%



‡ 9-11% >65 y 50%; (30% fall/year)
Baker SP et al 1985, Hogue CC 1982

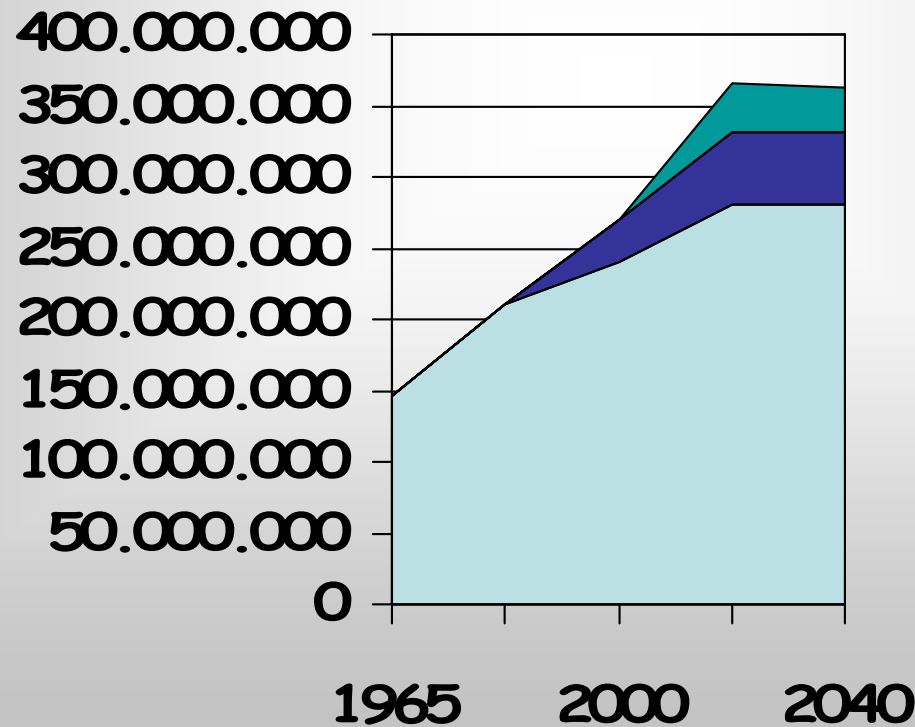
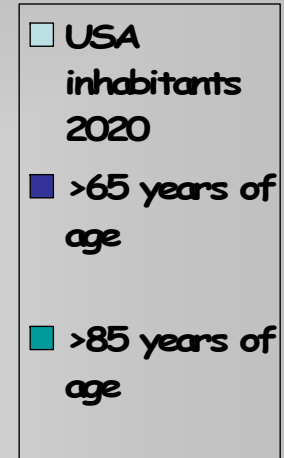
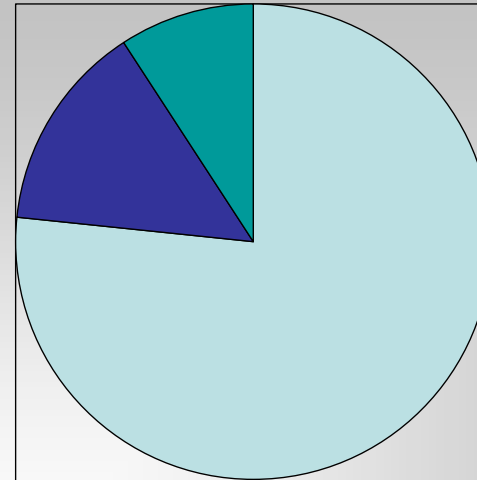
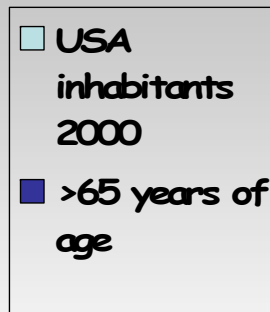
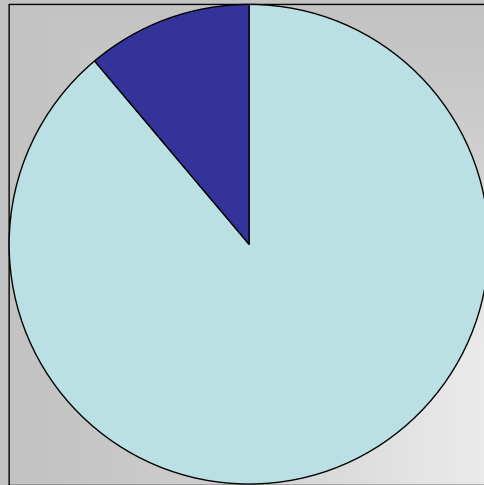


Risk of accident increases with advancing age, despite travelling a decreased number of miles



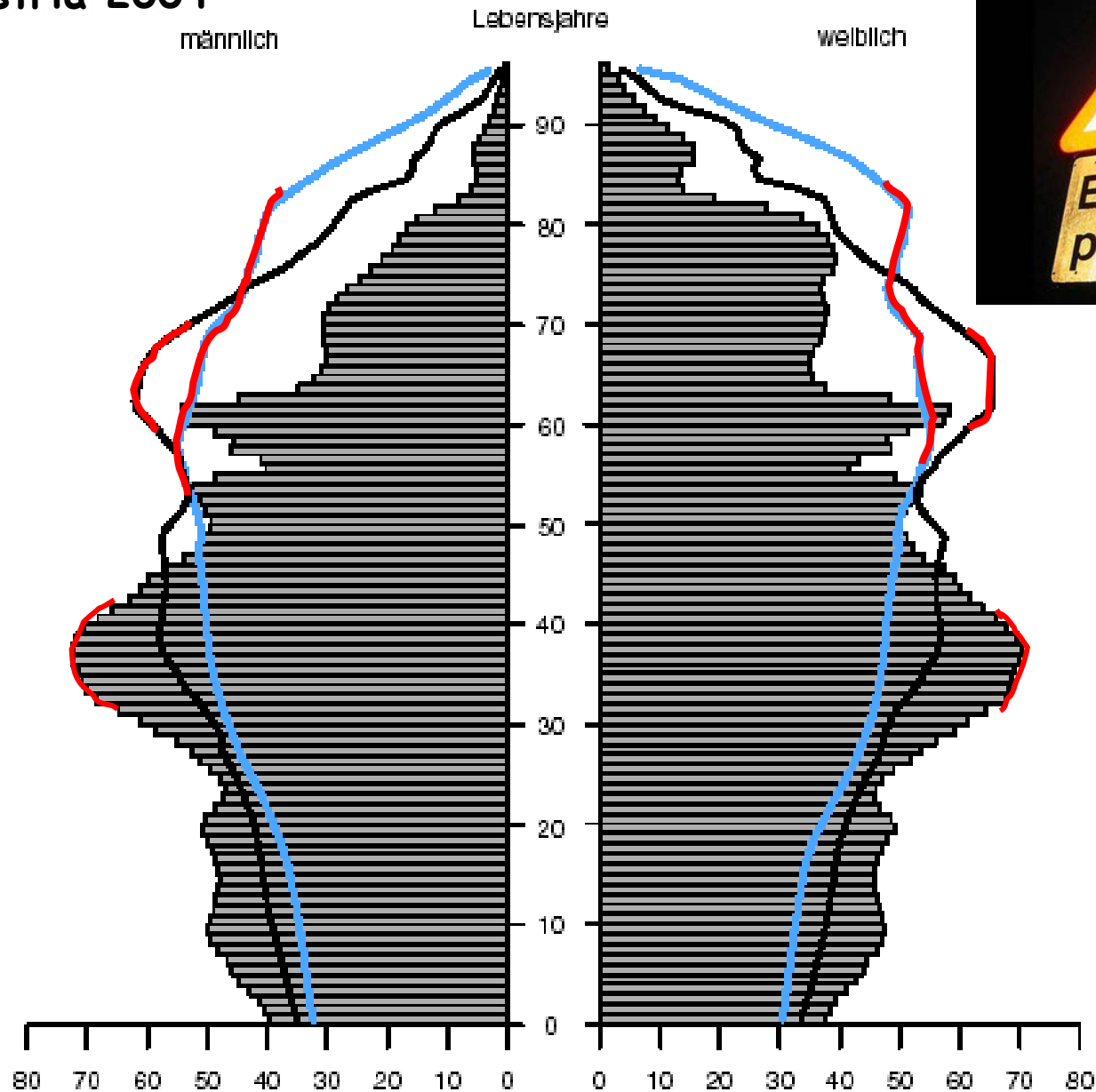
Fall and hit by car are the leading mechanism of injury in the elderly.
Naumann et al 2011





Pyramid of population

Statistik Austria 2004





Children are not
"small adults"!



Adults are the threshold
of our considerations in
medicine?

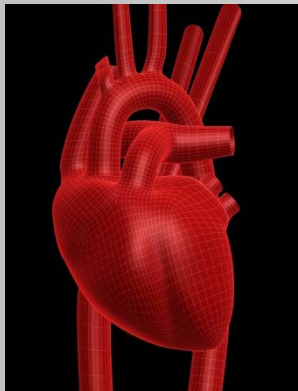


Elderly are not
"older adults"!

PHYSIOLOGIC CHANGES OF AGING



- ✓ Restricted ability to respond to injury
- ✓ Brain atrophy, increased intracranial space
- ✓ Deterioration in cognitive ability, memory and sensory in senescence



o The myocardial capacity may be inadequate

o Cardiac work exceed the ability of arterosclerotic vessels to deliver oxigen → myocardial ischemia

o Degeneration of myocardial cells → fatty infiltration → decreased stroke volume↓, rate of systolic contraction↓ and diastolic relaxation↓.



Pump
function
↓ ↓ ↓
0,5%/year

β -adrenergic
receptor
sensitivity
↓ ↓ ↓

PHYSIOLOGIC CHANGES OF AGING



- Chronic loss of functional reserve,
- Thoracic cage more brittle
- Chest wall more stiff
- Elastin is lost from the parenchyma, alveolar volume and surface area decrease
- Increasing ventilation/perfusion mismatching
- Increase the work of breathing, *demands on the heart*
- Increased risk of pulmonary infection

PHYSIOLOGIC CHANGES OF AGING



- Up to 90% loss of the nephron mass
- Progressive glomerular loss
- Reduction of glomerular filtration rate

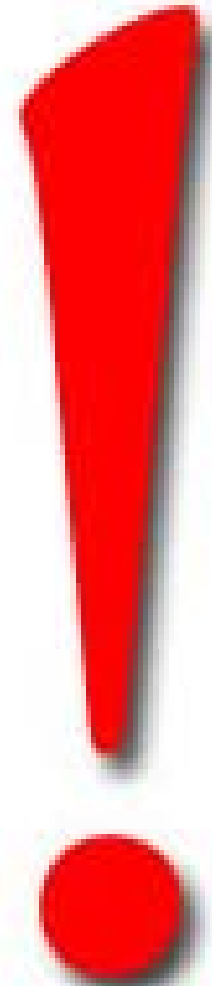
- Decline of muscle mass
 - Source of creatinine, serum creatinin tend not to rise
 - Creatinin clearence!

- Osteoporosis
- Loss of strenght
- Greater susceptibility to fracture

PHYSIOLOGIC CHANGES OF AGING



- Decreasing in caloric requirement + body mass
- Glucose intolerance
- Less nutritional reserve
- Immune senescence, changes in cellular and humeral immune response, progressive immunoincompetency
- T-cell dysfunction



COMORBIDITY in TRAUMA PATIENTS



- 8 - 20%
- 4. decade 17%, 6. decade 44%, ≤ 75 years 65%
(Milzmann et al)
- Poorer outcome, longer hospital stay by 2/3 = increased costs
- Medical prehistory, pace maker, systemic anticoagulation, diabetes, COPD, hypertonia, AS, etc.

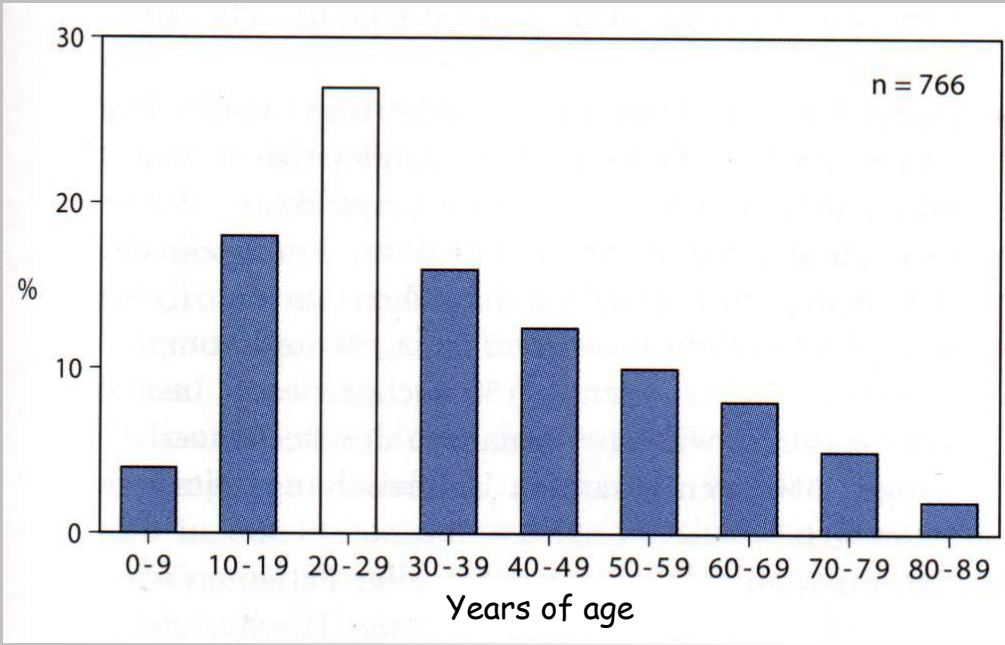
**The elderly are
and will develop
a complete
different
behavior**



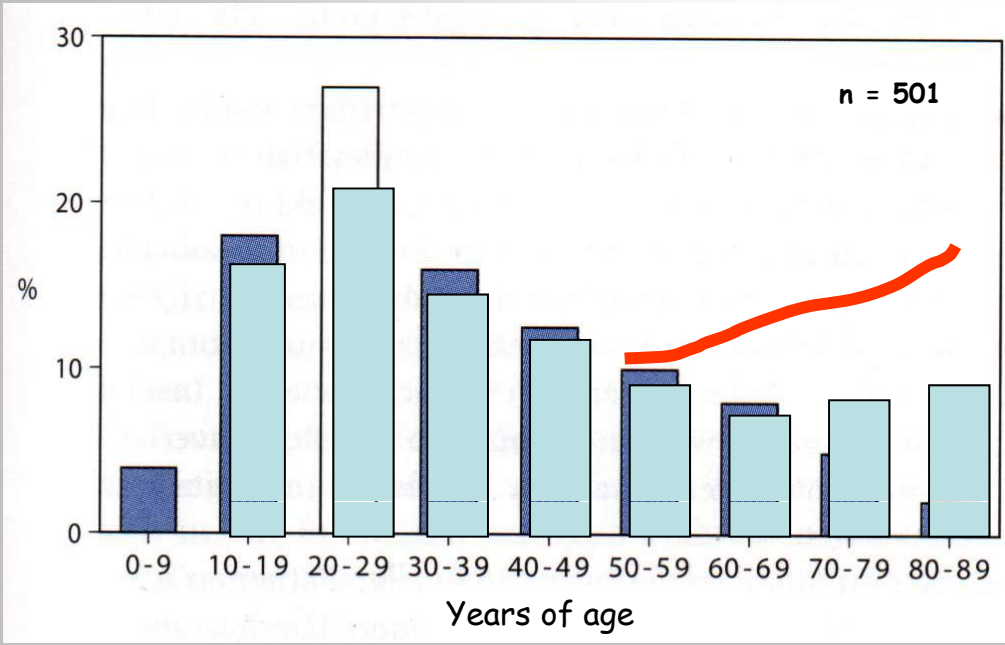
What is polytrauma per definitionem?

- Injury at least two organ systems, leading potentially to a life-threatening condition.
- The overall severity of the trauma load on the patient's anatomy and physiology is usually expressed as an Injury Severity Score (ISS) ≥ 16 or 18

American College of Surgeons, Committee on Trauma. National trauma data bank. Annual report 2005, dataset version 5.0. Chicago: American College of Surgeon; 2005.

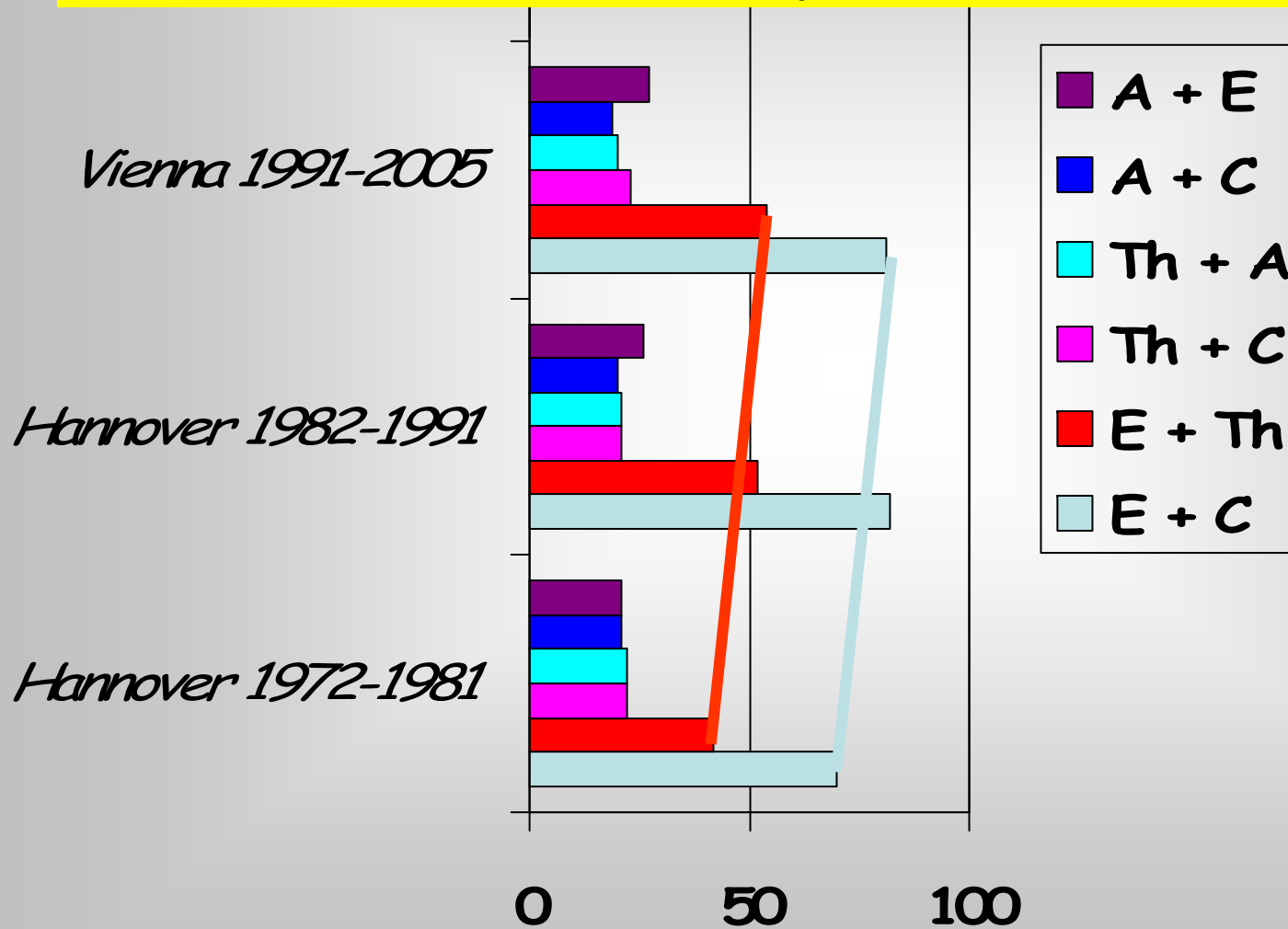


Tscherne H, Regel G:
**Unfallchirurgie,
 Trauma-Management
 1997**



**Department for
 Trauma Surgery,
 Vienna, MUV
 2002**

Aging of the society leads to changes in the injury pattern - seemingly more extremity injuries!



Tscherne H, Regel G, 1997 ; Aldrian et al 2005

Common Associated Injuries

*Rogers LF, Hendrix RW, Orthop
Clin North Am 21:437-447, 1990*

Obvious Fractures

Associated Injury

Bone and bone

Spine, especially thoracolumbar
Chest wall
Anterior pelvic arch
Femoral shaft
Calcaneus
Distal radius

*Remote fracture (5%)
Scapula fracture
Sacrum fracture or sacroiliac joint dislocation
Hip fracture or dislocation or both*

Bone and viscera

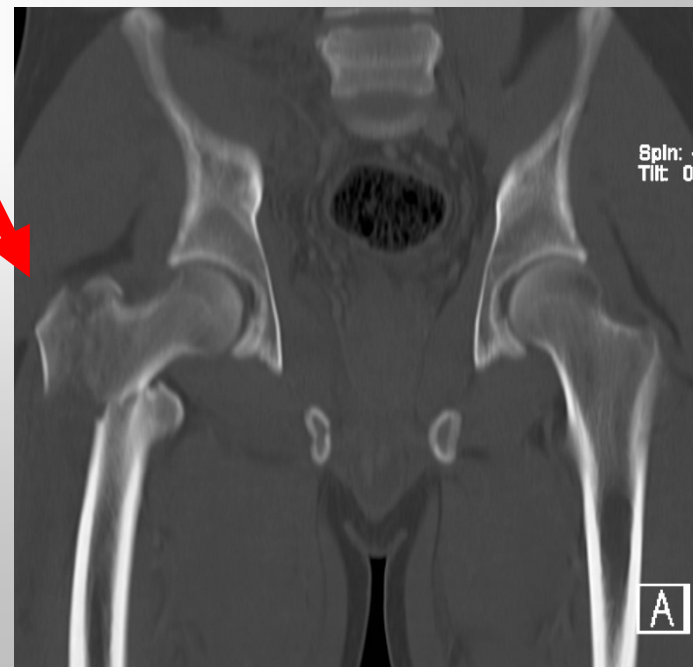
Transverse spine fracture
Lower ribs
Pelvis

*Ruptured mesentery or small bowel (15%)
Laceration of liver, spleen, kidney, diaphragm
Ruptured bladder or urethra, diaphragm*

Bone and vascular

Ribs 1,2, or 3
Sternum
Pelvis
Distal third femur
Knee dislocation

*Ruptured aorta
Myocardial contusion
Laceration of pelvic vasculature
Laceration of femoral/politeal arteries
Laceration popliteal artery*



B.H-P. male 2009-05 Diagnostics

MORE

Consequences

More severe injury pattern

More demanding treatment modalities

More days ICU

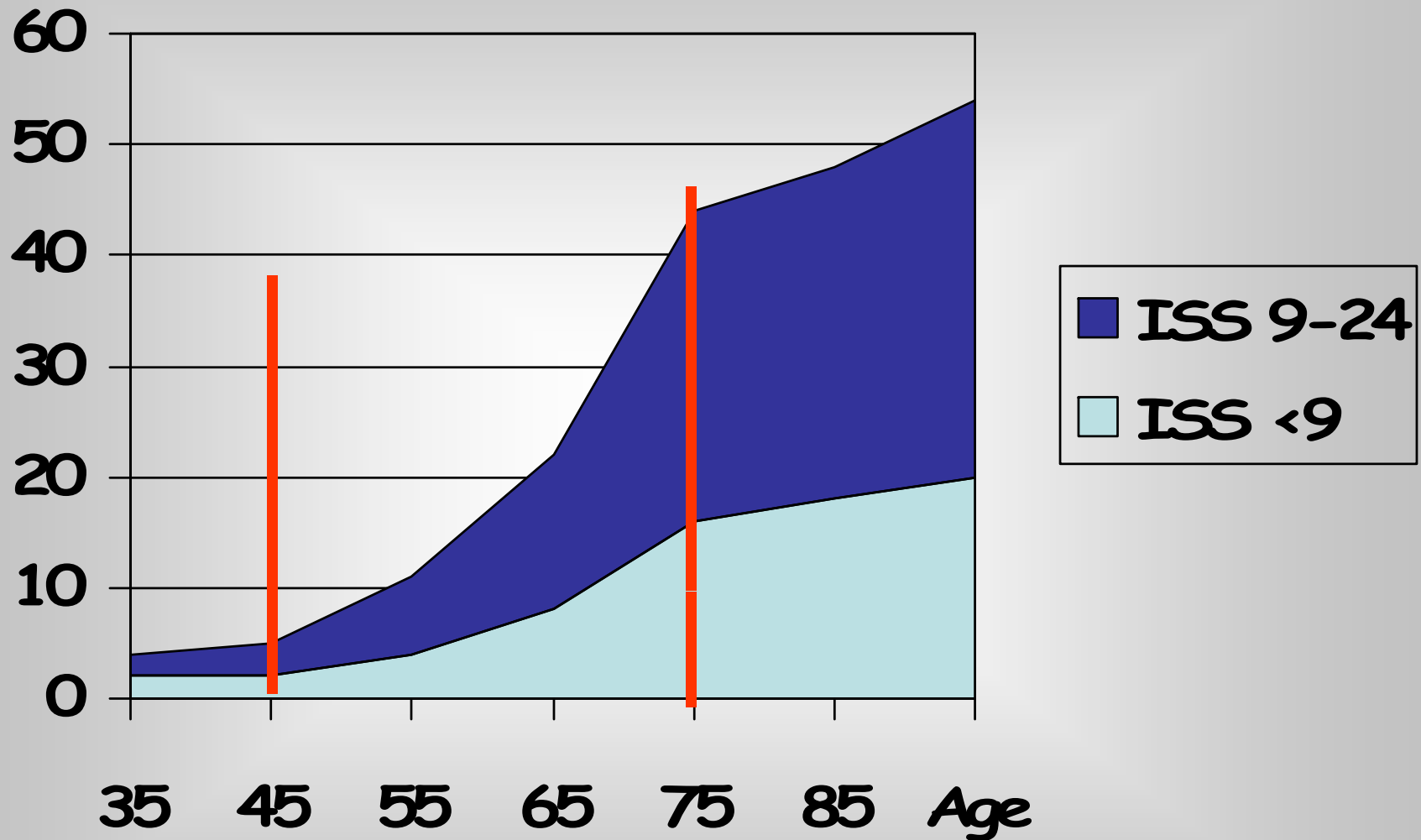
More days ventilation

More complications

More dead

More costs

AGE DEPENDENT MORTALITY (in-hospital death)



MORRIS et al J. Trauma 1990;30:1476-1482
n = 199,737 age < 15y Hospital in California

Elderly Polytrauma

ATLS

Consider invasive hemodynamic with a pulmonary artery catheter if:

- Physiologic compromise
- Significant injury (AIS>3)
- High risk mechanism of injury
- Uncertain cardiovascular status
- Chronic cardiovascular or renal disease

Advanced age:
Lower threshold for triage directly to a trauma center and aggressive management with early admission on ICU

Consider to limit aggressive management when:
Trauma Score < 7*
Admission respiratory rate < 10*; GCS < 8 and no substantial improvement GCS within the first 72 hours
(*100% mortality)

Consider injury patterns

Clinical Condition

Aim:

- Cardiac index > 4L/min/M²
- Oxygen consumption index of 170 cc/min/M²

Base deficit measurements to determine status of resuscitation and risk of mortality

MONITORING

MANAGEMENT

AGE, PEC's

Clinical Condition

INJURY
PATTERN

DIAGNOSTIC
MEASURES

Stable



Borderline



Unstable



In Extremis

OP

In RR: control of
hemorrhage! Decompression

OP

Fixateur-Distraktor-
Positioning

ETC

Reevaluation (RR) ABG, US,
Urinproduction, IL-6, GS

Stable OP

? / OP

DCOS

ICU
Staging of
procedures
when stable

Ongoing evaluation of physiology

ETC

DCOS

Pape et al. Am J Surg
(2002) 183:622-629

"Independent predictors of early death"

Mica

Albrecht

Katja

Keel M.

Trentz O.:

698 Poly-traumatised;
2011

Total + 26,4%	Survival	Non -S.
ISS	32,4±11,8	37,8±13,4
NISS	41,4±13,5	50,2±14,1
APACHE II	15,2±7,5	25,3±7,7
Core temperature		
Syst.RR - mean art. pressure		
Hematocrit - shock	35,4±7,8	26,4±7,9
Platelets	192±75,5	152±79,6
Prothrombin time*	80,5±19,1	58,9±26,3
Lactate acidosis*	10±2,3	5,6±3,9
pH	7,31±0,1	7,2±0,2
Hypoxemia		
IL-6		↑ ↑ ↑ ↑

could be independent

risk factor

late death

Cause of death in the elderly

- Brain and neck
- Shock (pelvis, unstable femoral fx.)
- Pulmonary sepsis
- Prolonged ventilatory support
- MOF
- Cardiovascular failure

LONNER 1995; DEMARIA 1987; BROOS 1988;
ORESKOVICH 1984; FINELLI 1989; HORST 1986;
EAST/ JACOBS, SCALEA et al 2001.

Should age itself be a criterion for triage from the field directly to a trauma center, regardless of Glasgow Coma Scale (GCS), trauma score (TS), etc.? If so, what age should be used?



**If any doubt:
YES! (ACS-COT
1999)**

**GCS \leq 8 (bed
prognosis)
Resp. $<$ 10**

**TS, ISS
APACHE II**

$>$ 55 y.

Dimitriou et al EJTES 2012



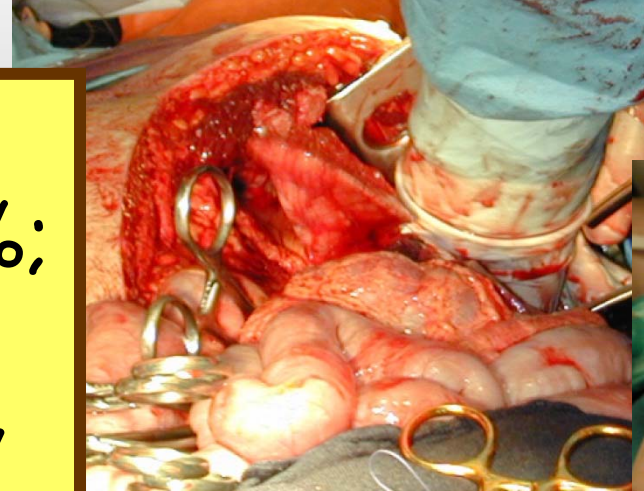
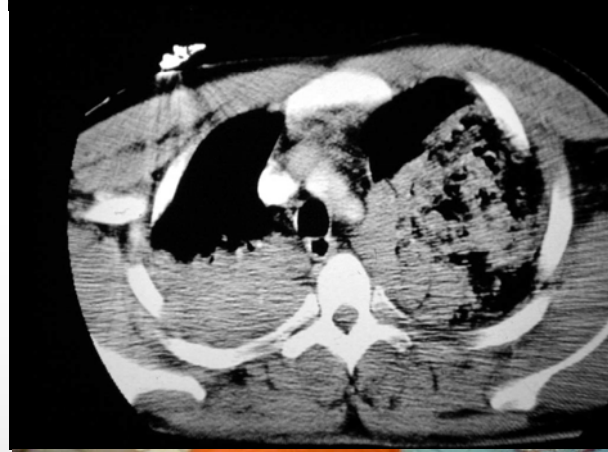
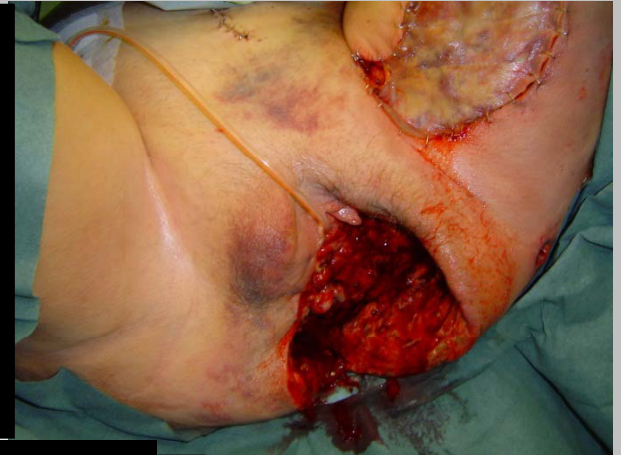
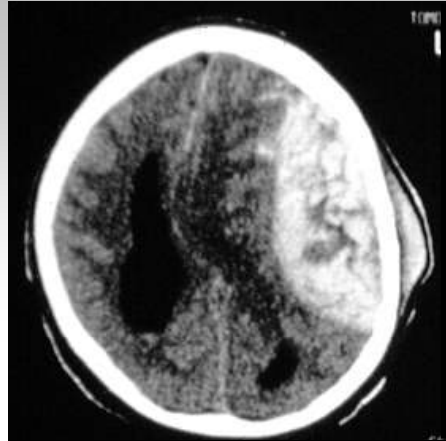
Do trauma centers have better outcomes with geriatric trauma patients than non-trauma centers?

YES!

Smith et al. Inj. 1990

- 1) Trauma team - triage
- 2) Multidisciplinary
- 3) Comprehensive diagnostics
- 4) Avoidance of compl!

Are there specific injuries, scores (Injury Severity Score(ISS), TS, GCS, etc), or PEC/age combinations in geriatric trauma patients that are so unlikely to be survivable that a non aggressive approach from the outset could be justified?



TS < 7 → +100%;
base deficit ≤ 6 +66%;
RR < 10 → +100%;
GCS ≤ 8 72 h; >65y

Conclusion / Hypothesis:

- Advanced age is a risk factor for adverse outcome following trauma
- Mortality in elderly polytraumatised is significant higher compared to the younger
- Age is an independent risk factor for mortality