

Trauma ICU – a safe place?

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Death

ARDS

ARF

Airway problems

Pain

Infections

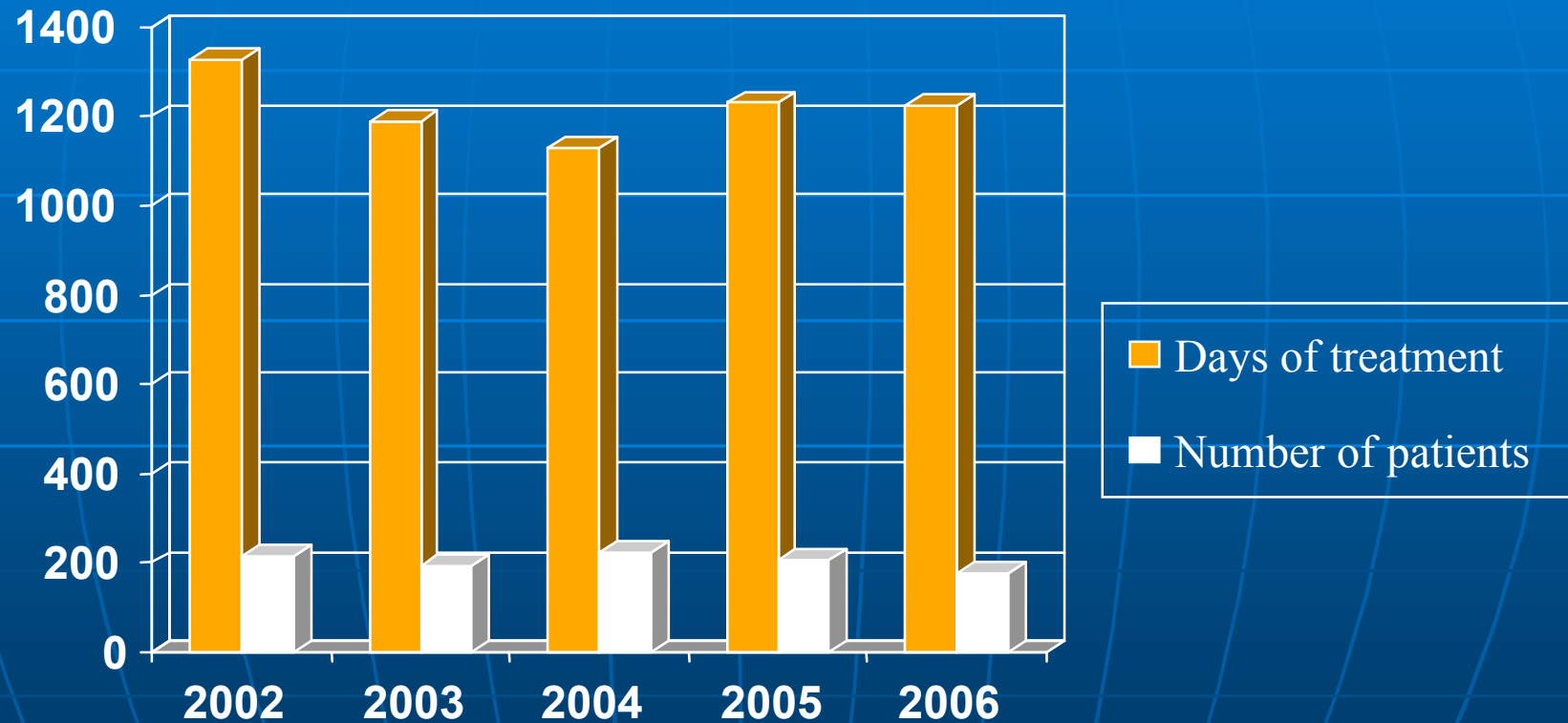
GI-problems

Coagulation disorders

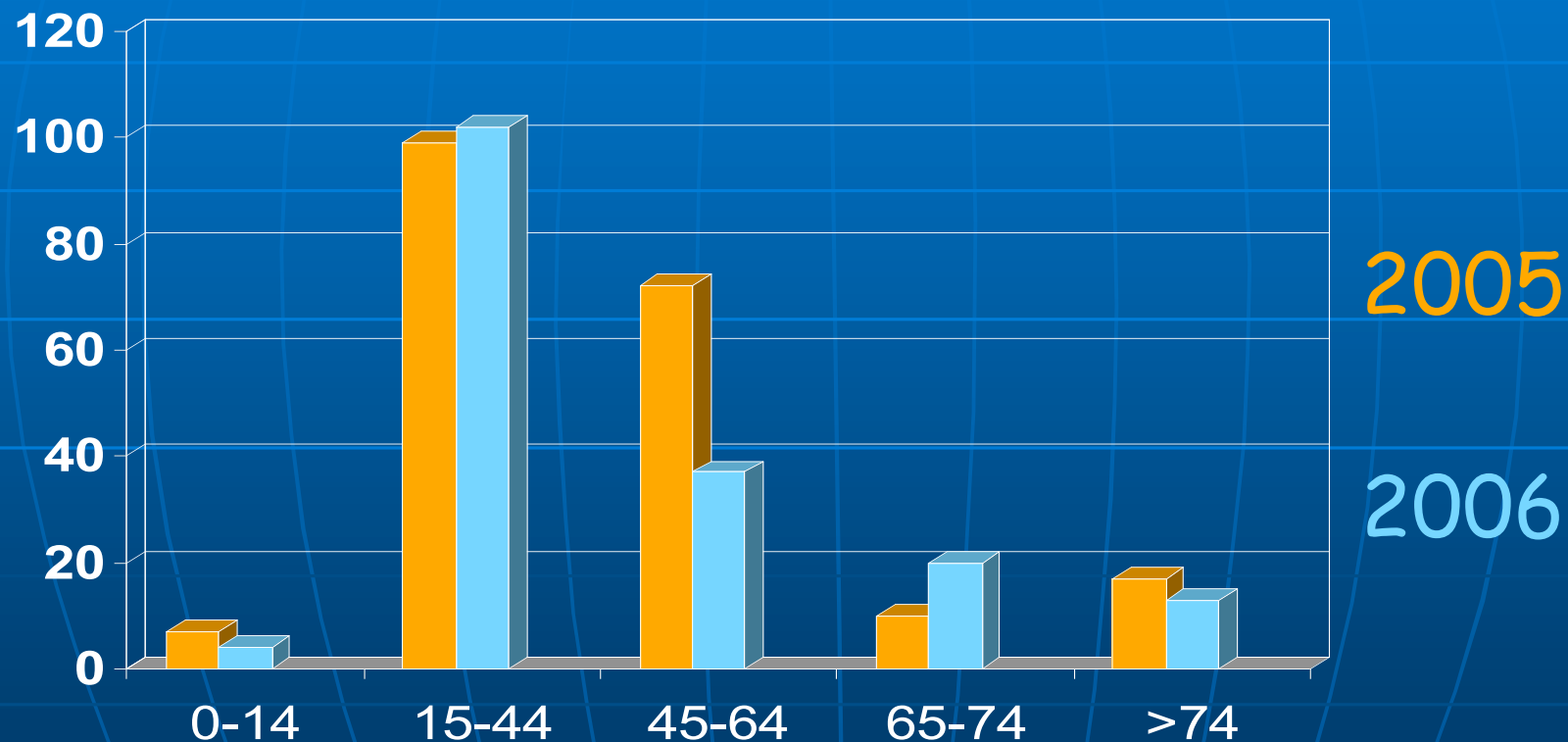
Skin problems

Mental disorders
Loss of autonomy
Separation
Sleep disturbances
Wasting
Medication errors
Electrolyte balance

Helsinki, Töölö hospital Trauma ICU

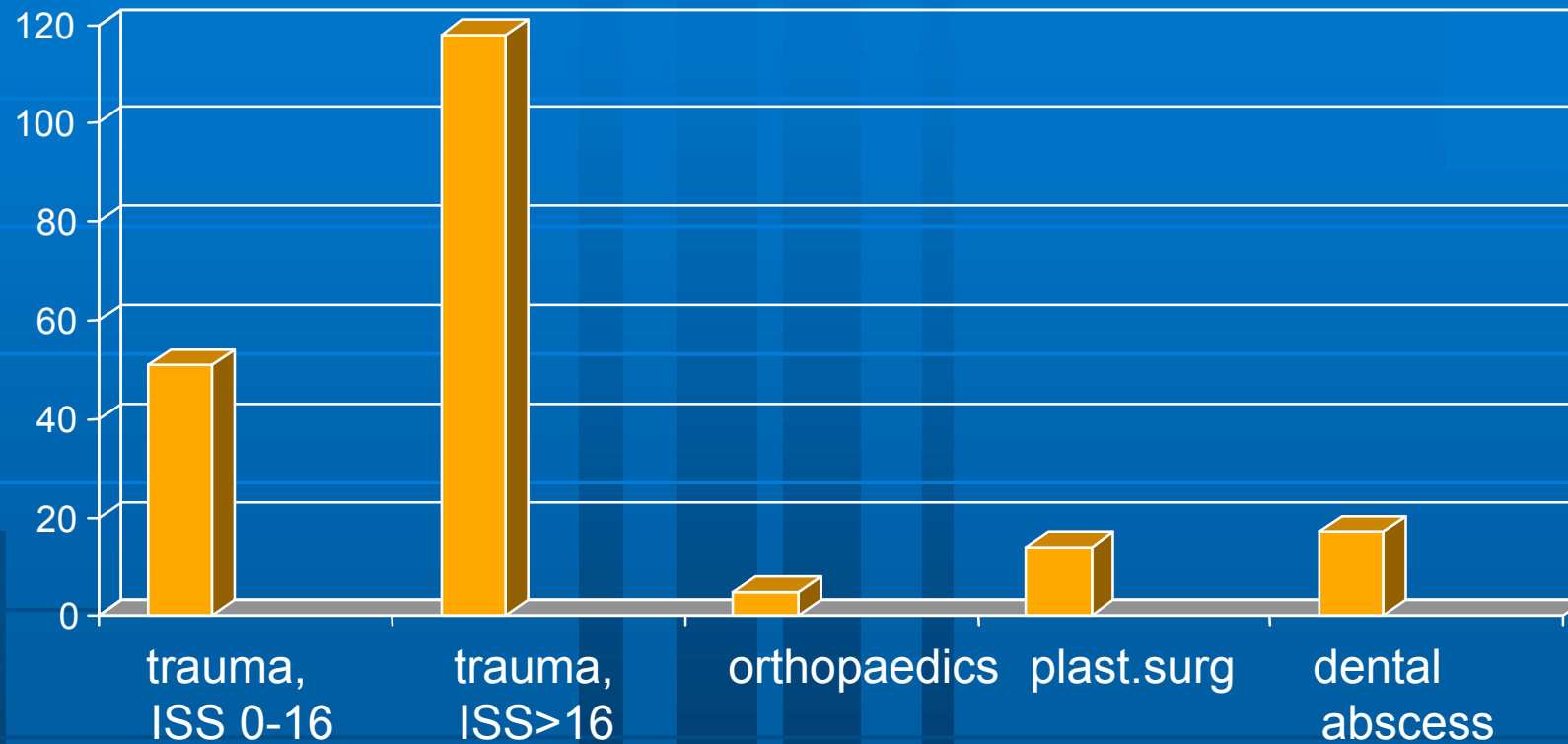


Helsinki, Töölö Hospital, Trauma ICU



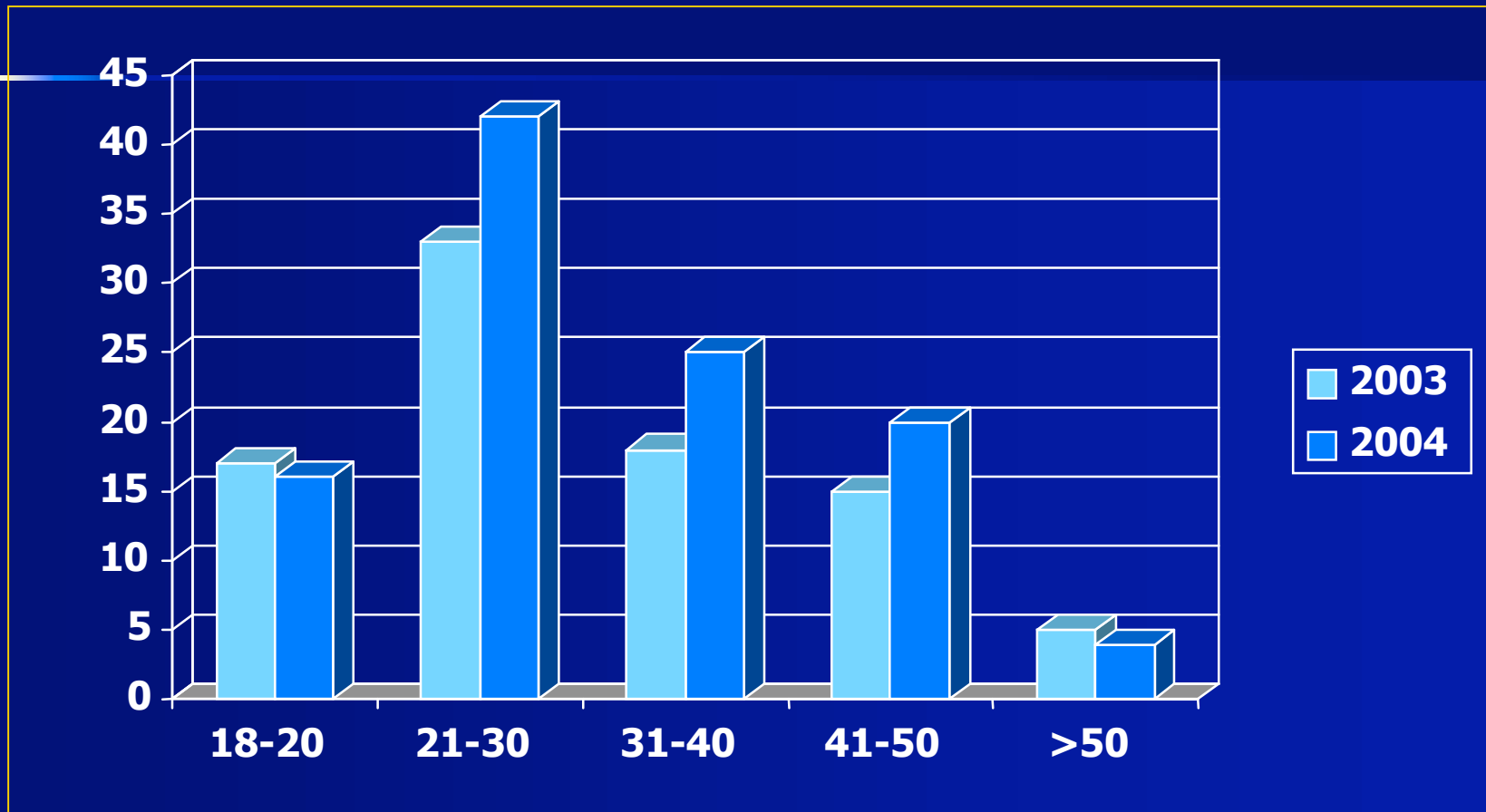
Age of patients in 2005-2006

Helsinki, Töölö Hospital Trauma ICU



Group of patients 2005

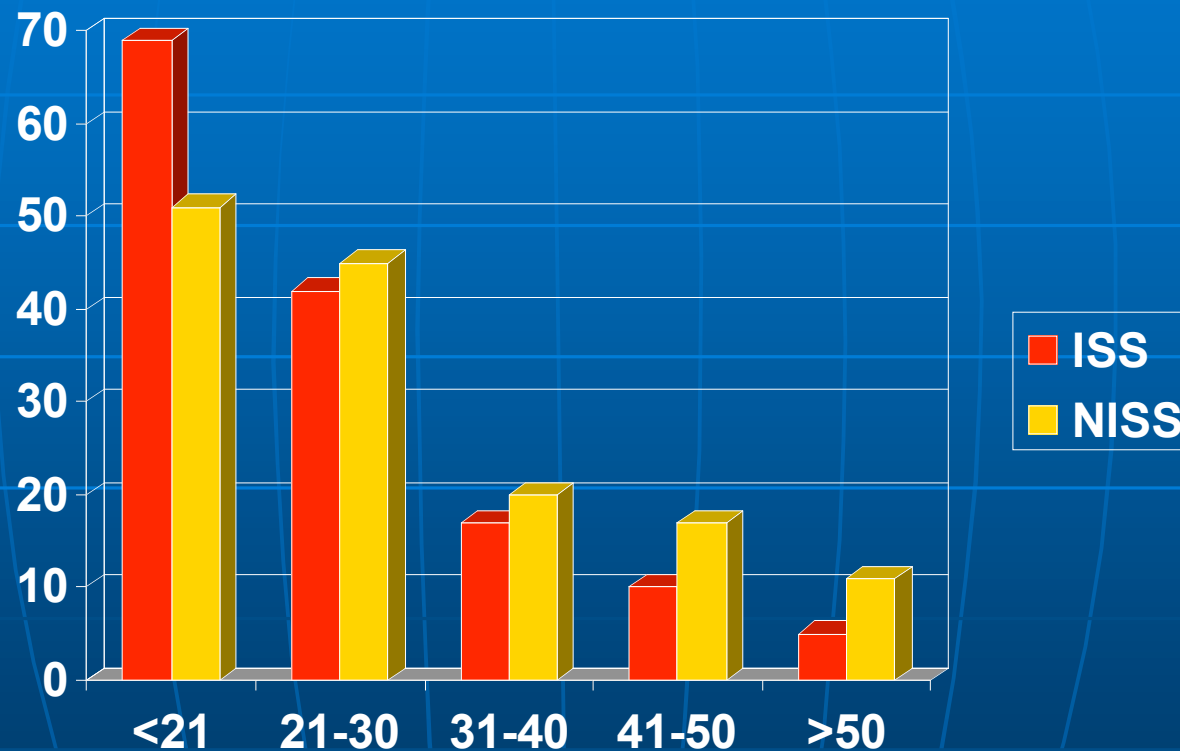
Helsinki, Töölö Hospital 2003-2004 Trauma ICU



Injury Severity Score (ISS) 2003 (n 88) – 2004 (n 107)

Injury Severity Score (ISS*)

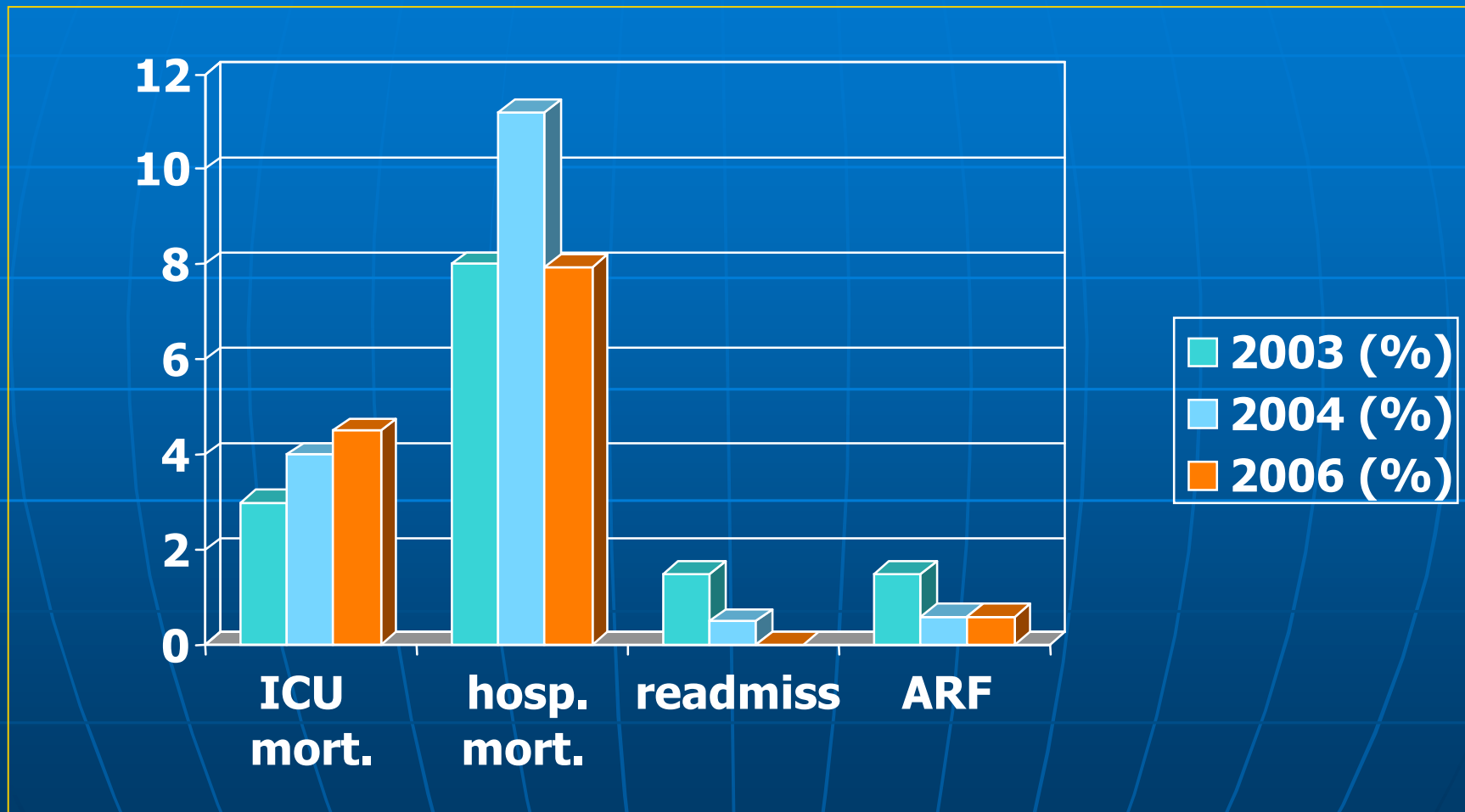
New ISS (ISS) 2006



* AIS 2005

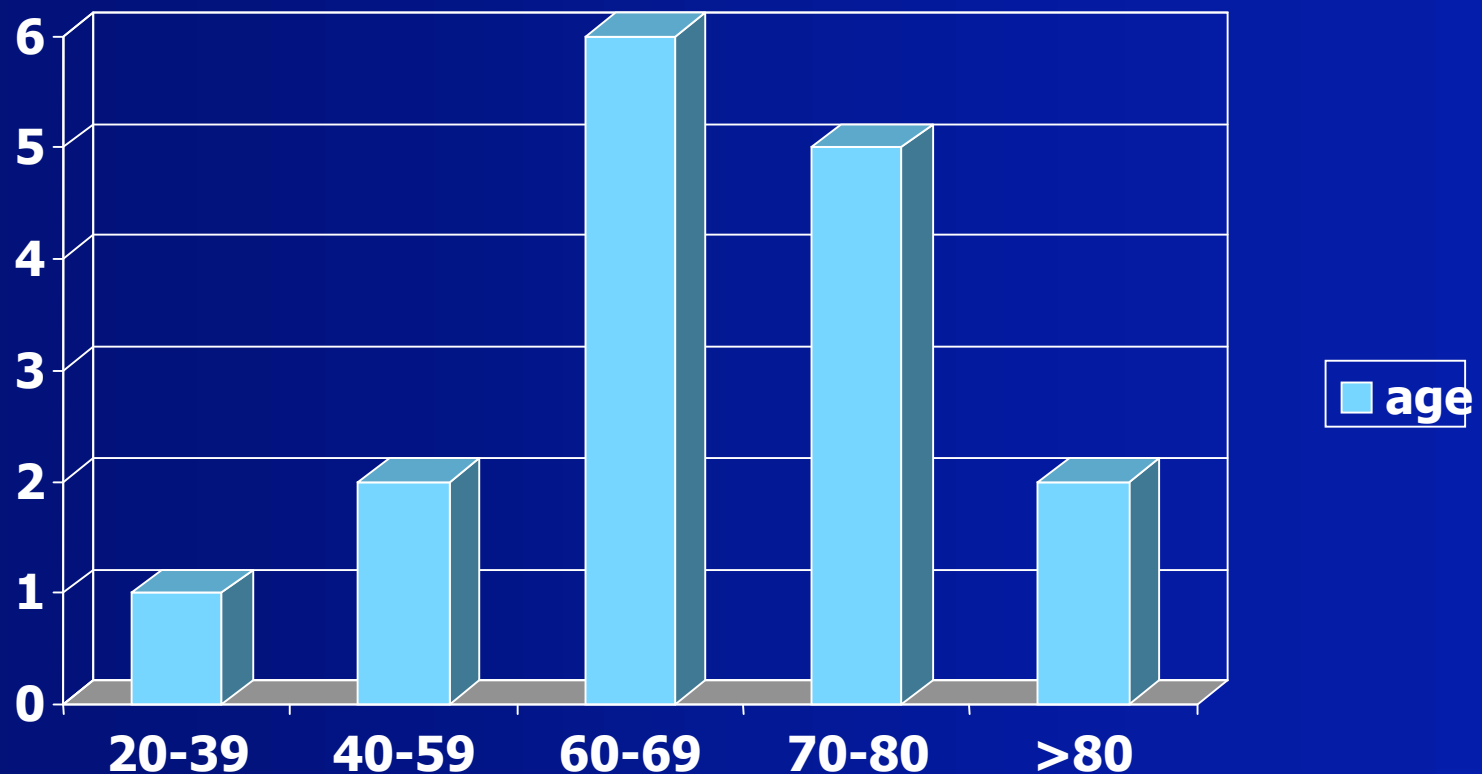
Helsinki, Töölö Hospital 2003-2006

Trauma ICU



Mortality and readmissions 2003-2006 (%)

Helsinki, Töölö
Trauma ICU
Hospital mortality 11% (n 25)

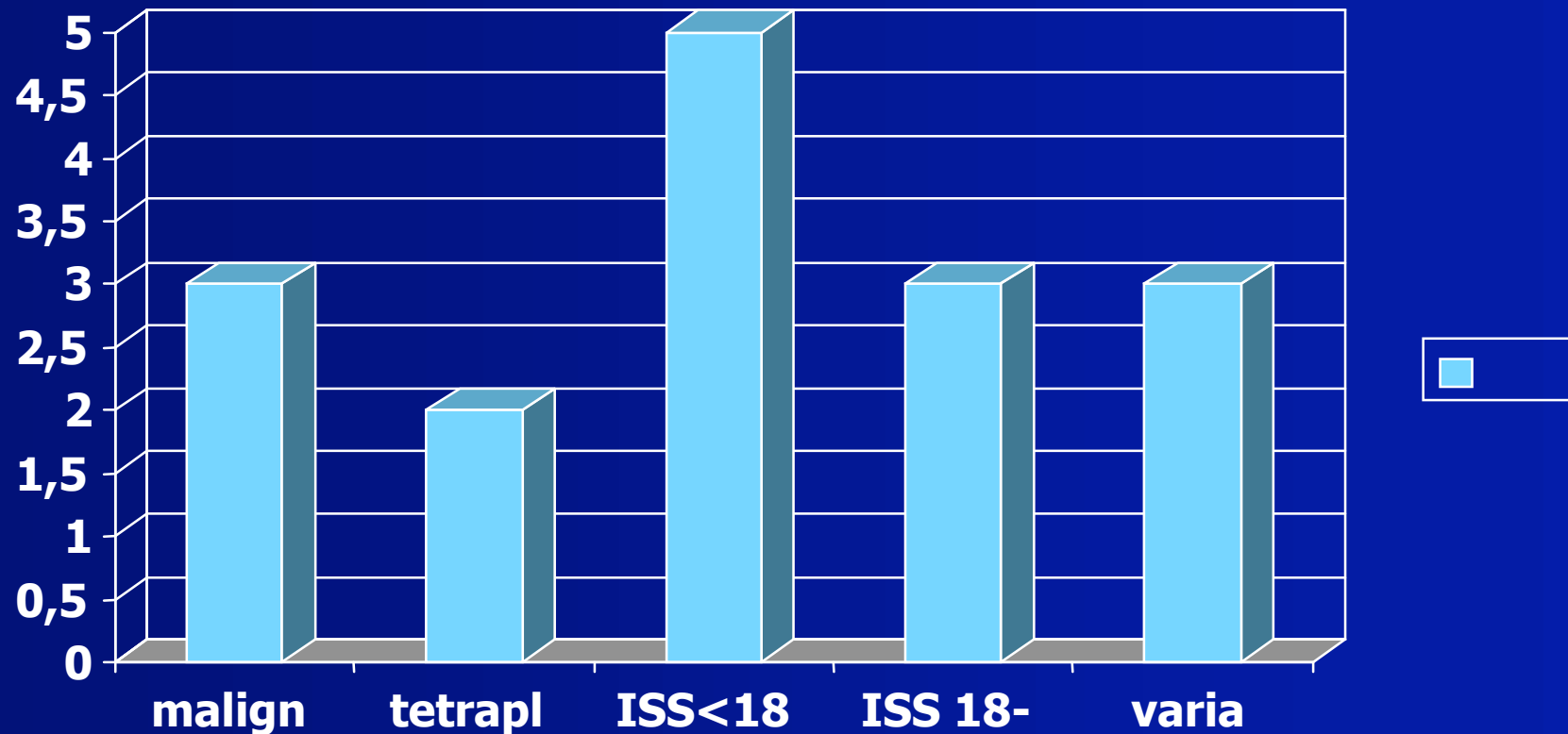


Patients died in other hospital (n 16)

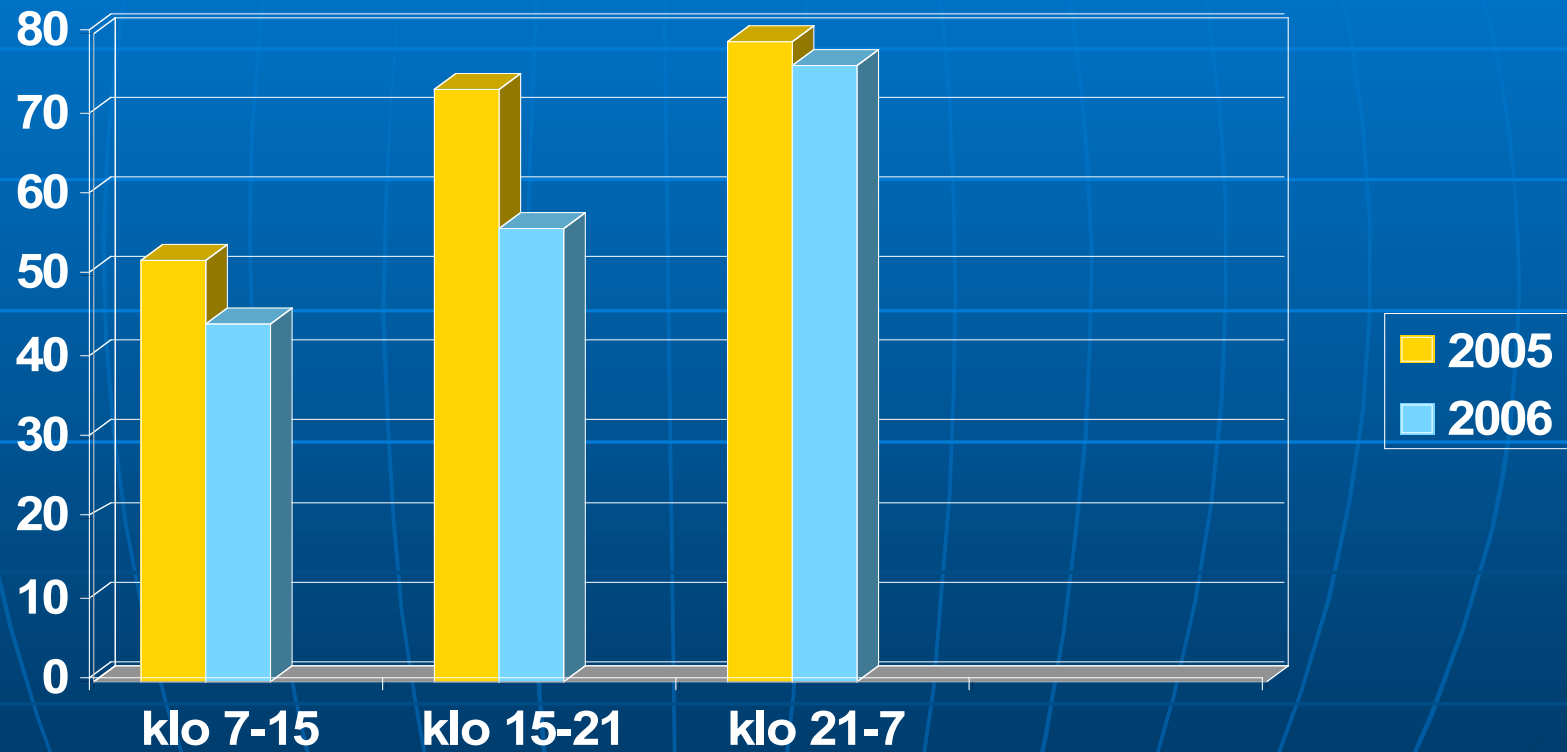
Helsinki, Töölö Hospital

Trauma ICU

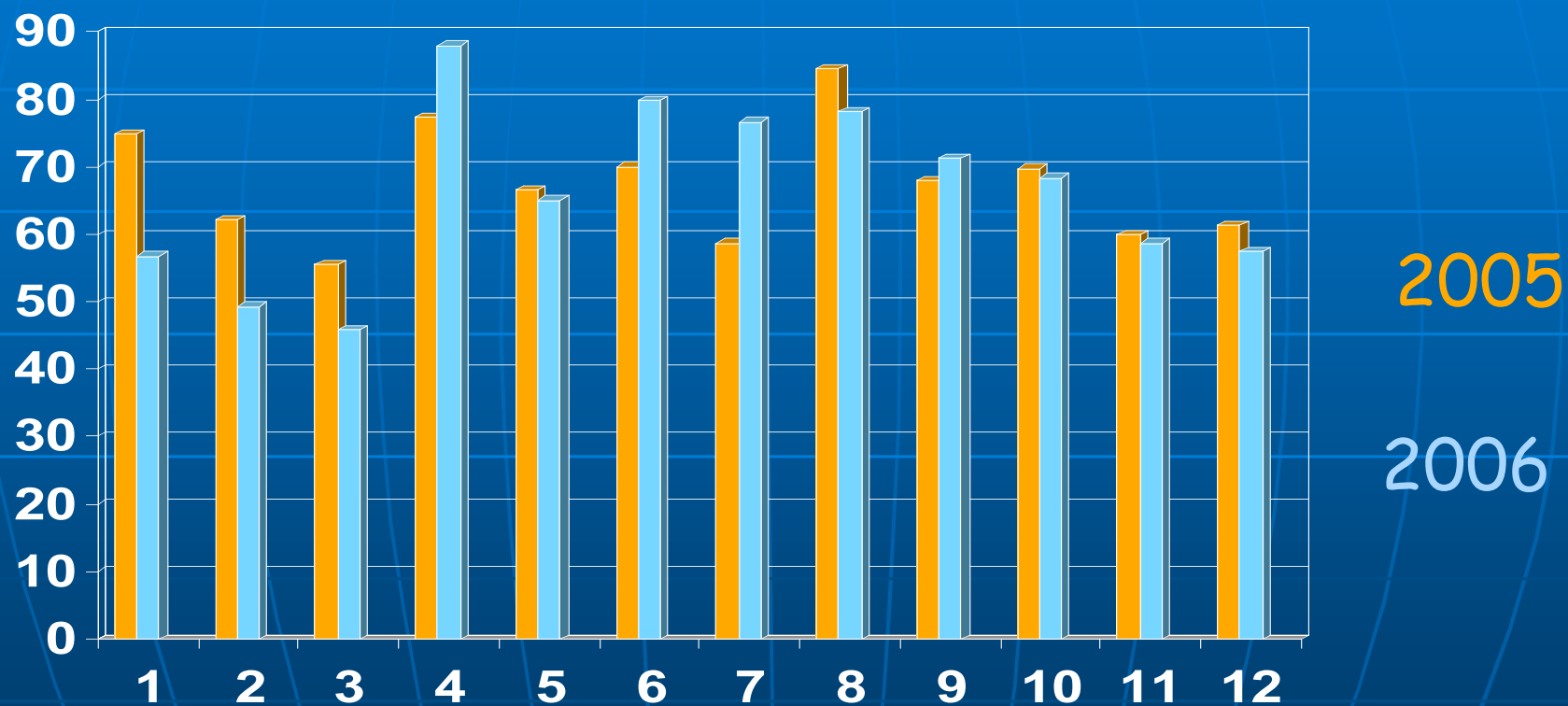
Patients died in other hospital (16)



Time of admission (klo)



Helsinki, Töölö Hospital Trauma ICU



Osaston kuormitus (%) kuukausittain 2005-2006

Severe brain injury

Trauma patients in the intensive care unit: short- and long-time survival and predictors of 30-day mortality

Ulvik A *et al.*

Acta Anaesthesiol Scand 2006

- **Seven years**
- **325 patients**
- **ICU mortality 13.8%**
- **Hospital mortality 17.8%**
- **30-day mortality 16.9%**
 - **severe head injury**
 - **age above 50 years**
 - **SAPS II**

Neurosurgical intensive care treatment goals (EBIC, BTF)

- ICP ≤ 20 mm Hg
- CPP 60 mmHg
- SAP 100 mm Hg
- PaO₂ ≥ 12 kPa
- SaO₂ $\geq 96\%$
- Temperature
- B-glucose

Evidence?

- **Retrospective**
- **Longitudinal observational studies**

Fluid thresholds and outcome from severe brain injury

Clifton GL *et al.*

CCM 2002; 30:739-745

- **Glasgow outcome score at 6 m**
- **Poor neurological results:**
 - **ICP > 25 mm Hg**
 - **CPP < 60 mm Hg**
 - **MAP < 70 mm Hg**
 - **negative fluid balance during first days**

Specialist neurocritical care and outcome from head injury

**Patel HC *et al.*
Intensive Care Med
2002; 28:547-553**

- **Injury severity, outcome, GOS at 6 months...**
- **No statistically significant decrease in mortality**
- **More made a good recovery**

- **“Specialist neurocritical care with protocol-driven therapy is associated with a significant improvement in outcome for all patients with severe head injury”**

**Reduction in mortality from
severe head injury following
introduction of a protocol for
intensive care management**

**Clayton TJ *et al.*
BJA 2004;93:761-67**

- **843 patients**
- **ICU mortality**
 - **19.95% to 13.5%**
- **Hospital mortality**
 - **24.55% to 20.8%**
- **No change: median ICU and hospital length of stay**

Management of brain-injured patients by an evidence-based medicine protocol improves outcomes and decreases hospital charges

**Fakhry SM *et al.*
J Trauma 2004;56:492-9**

- **Mortality, GOS etc.**
- **Decrease in:**
 - **mortality**
 - **days in hospital**
 - **hospital charges**

Outcome after traumatic brain injury improved by an organized secondary insult program and standardized neurointensive care

Elf K *et al.*

Crit Care Med 2002;30:2129-2134

- **Mortality, GOS \geq 6 months**
- **Higher survival**
 - 60 – 97.2%
- **More with favourable outcome**
 - 40 – 84%

Other aspects

Development of renal failure during initial 24 h of intensive care unit stay correlates with hospital mortality in trauma patients

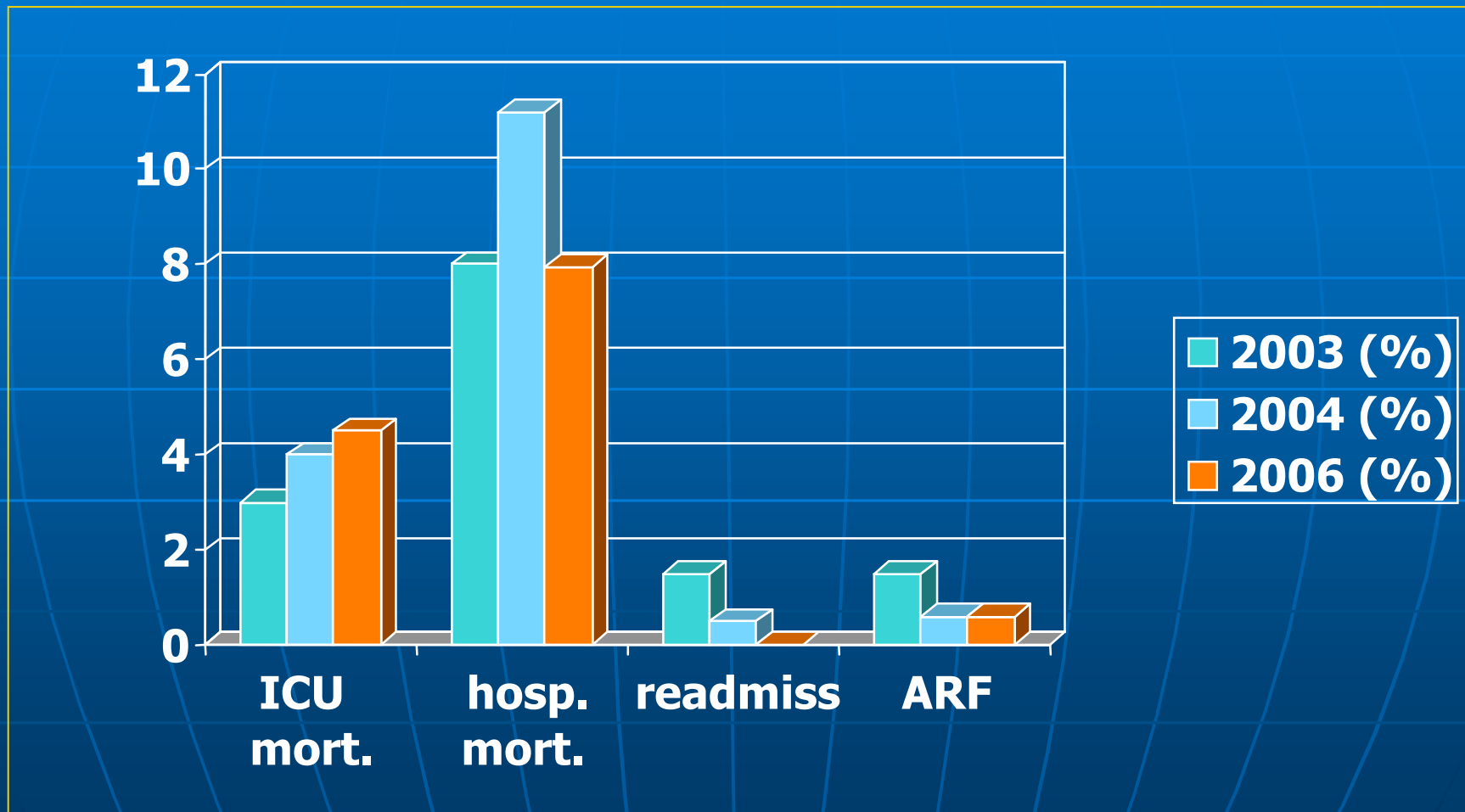
**Ala-Kokko T *et al.*
Acta Anaesthesiol Scand
2006; 50: 828-832**

- **Finnish ICU database**
- **22 hospitals**
- **Helsinki Trauma Center data not in the database**
- **3.5 years**
- **1993 pts – 1044 pts**
 - **isolated head traumas and burns excluded**
 - **missing data**

- **ICU mortality 5.6% (58 pts)**
- **ARF (krea > 300micromol/l) in 3.5% (37 pts) of patients during the first 24 hours**
 - **the ICU mortality 46%**

Helsinki, Töölö Hospital 2003-2006

Trauma ICU



Mortality and readmissions 2003-2006 (%)

- **"Tyranny of distance"**
- **"There is no substitute for experience"**

An Analysis of Errors Causing Morbidity and Mortality in a Trauma System: A Guide for Quality Improvement

Davis JW *et al.*

J Trauma 1992; 32: 660-667

- **Failure to evaluate abdomen**

Analysis of preventable trauma deaths and inappropriate trauma care in a rural state

Esposito TJ *et al.*

J Trauma 1995; 39: 955-962

Post-emergency department

- **Delay or inappropriate operation**
- **Fluid management**
- **Head injury management**
- **Management of infection**
- **Management of rebleeding**
- **Ventilator management**
- **Other**

Crystalloids and colloids in trauma resuscitation: a brief overview of current debate

Rizoli J Trauma 2003;54:S82-S88

**“In trauma, the use of colloids is
associated with a trend toward
increased mortality”**

Crystalloids vs. colloids in fluid resuscitation: a systematic review

Choi PT *et al.* CCM 1999;27:200-210

“Crystalloid resuscitation is associated with a lower mortality in trauma patients.

Methodological limitations preclude any evidence based clinical recommendations”

Hemoglobin- trigger

**Anemia management program
reduces transfusion volumes,
incidence of ventilator-
associated pneumonia, and cost
in trauma patients**

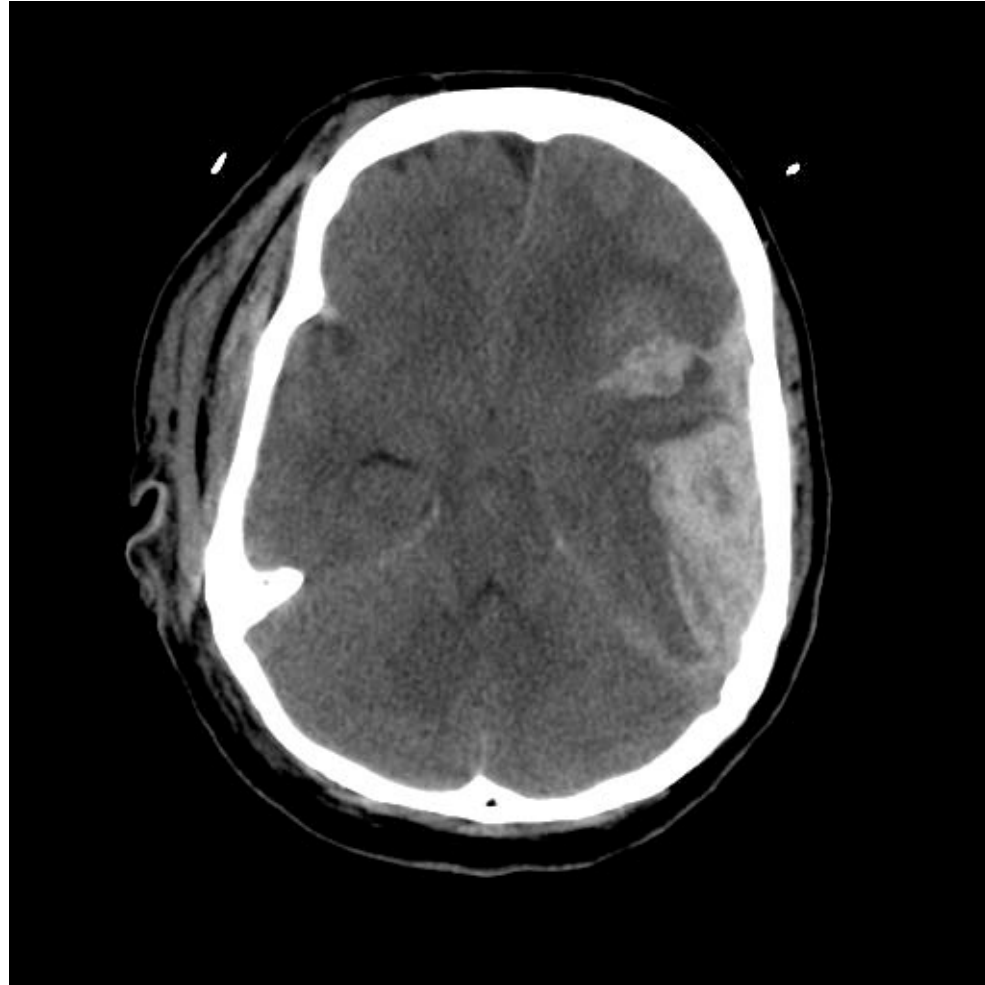
**Early A *et al.* J Trauma 2006;
61:1-7**

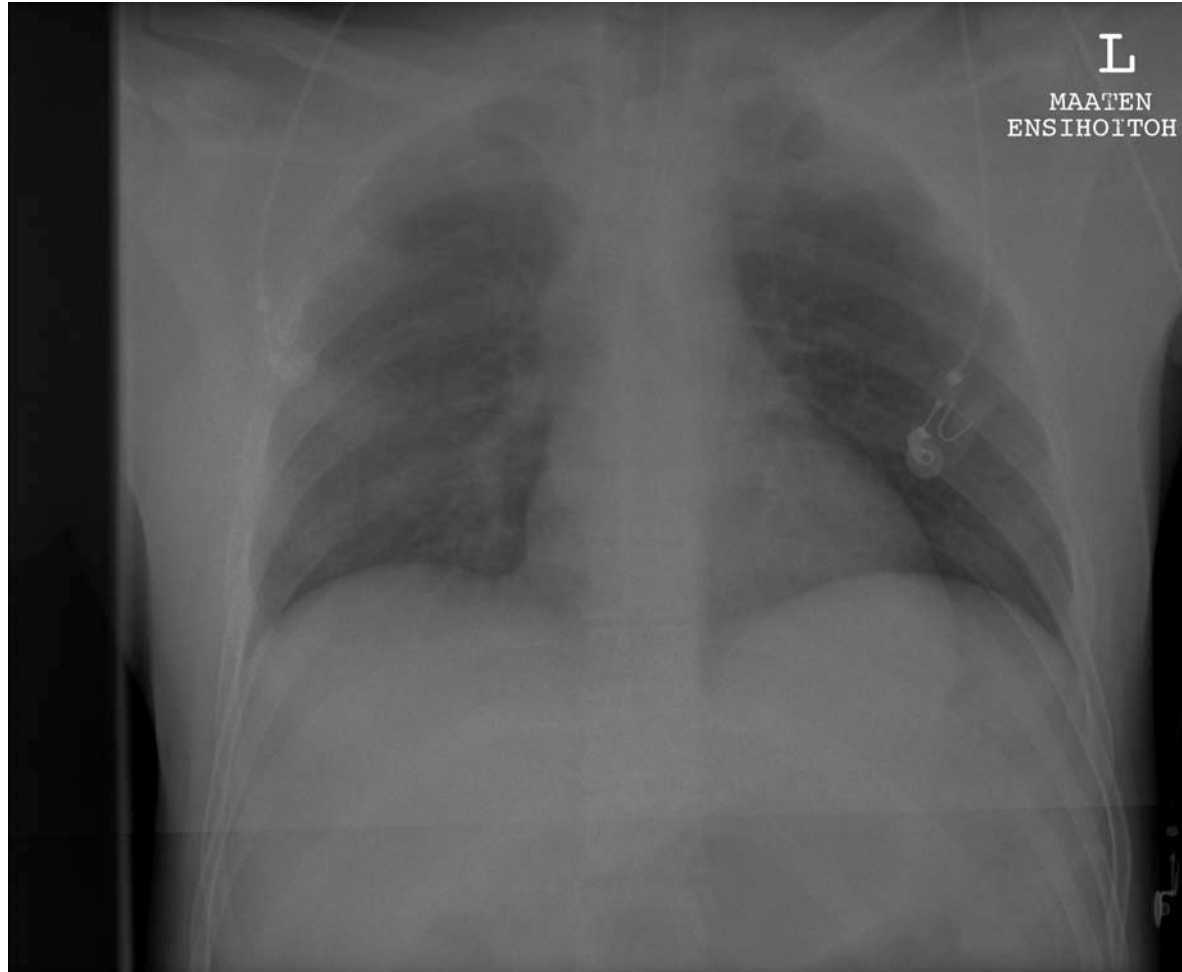
Missed injuries

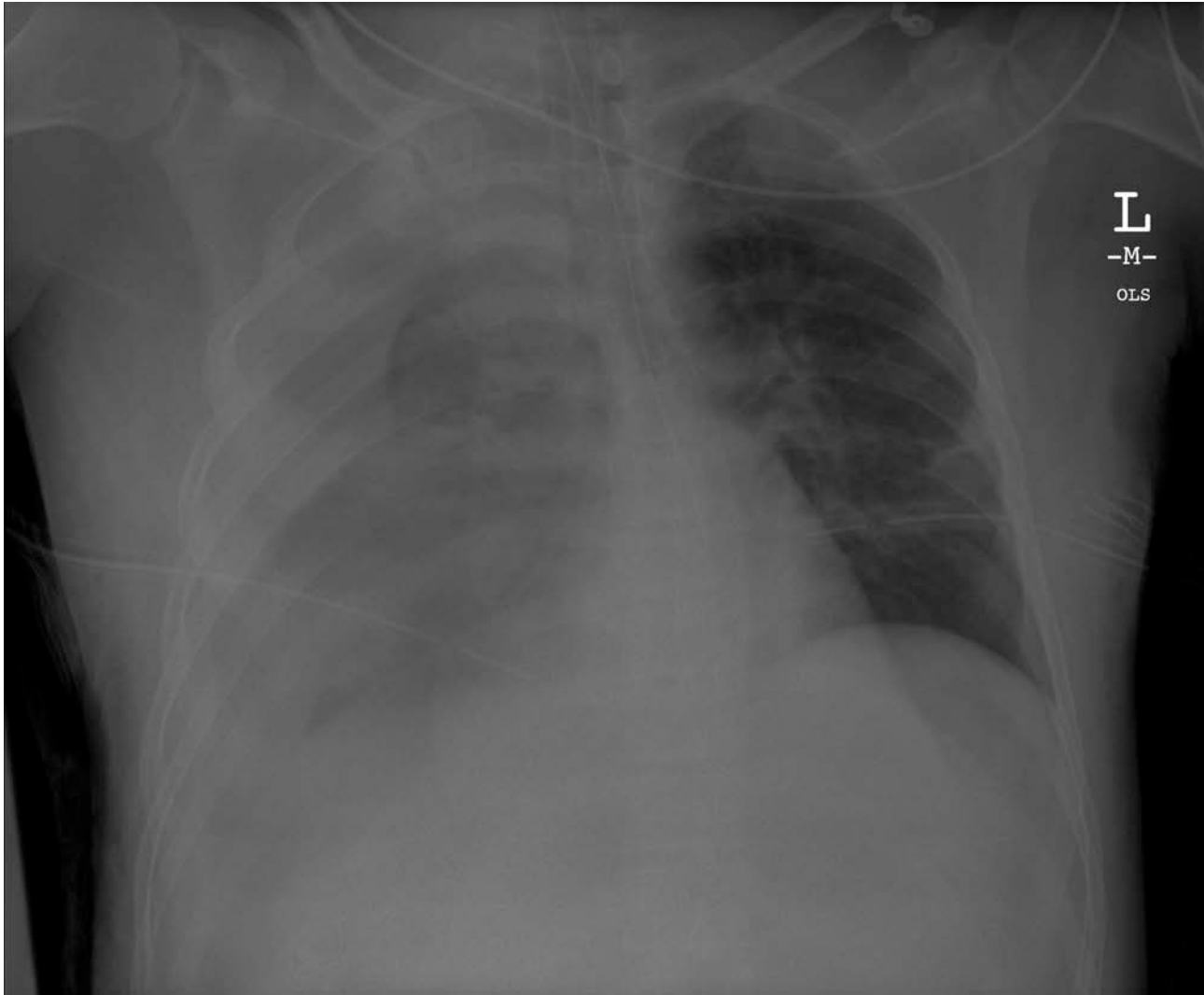
**Delayed intracranial
haemorrhage in patient with
multiple trauma and shock-
related hypotension**

**Lee ST, Lui TN
Acta Neurochir 1991; 113: 121-
124**



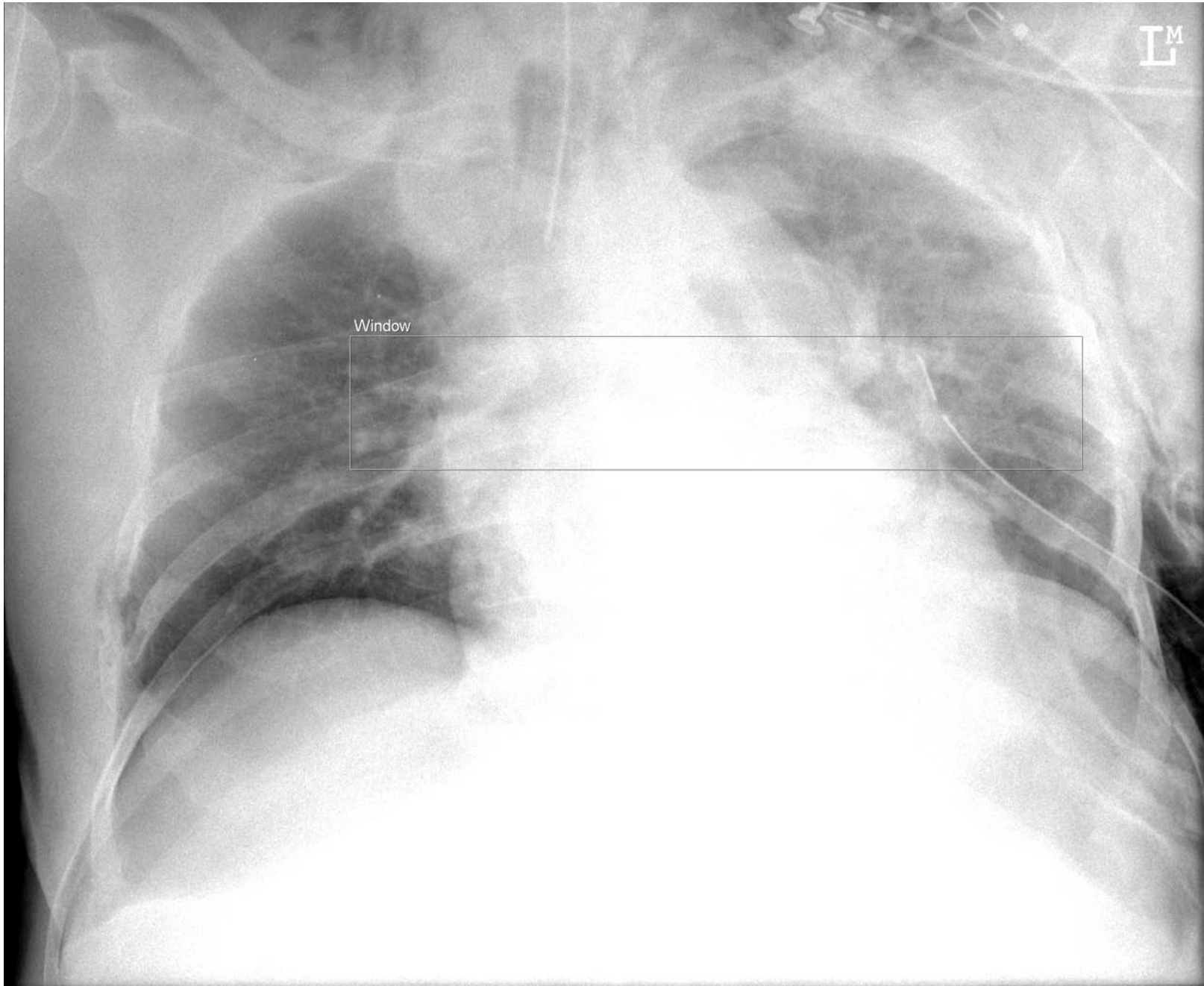


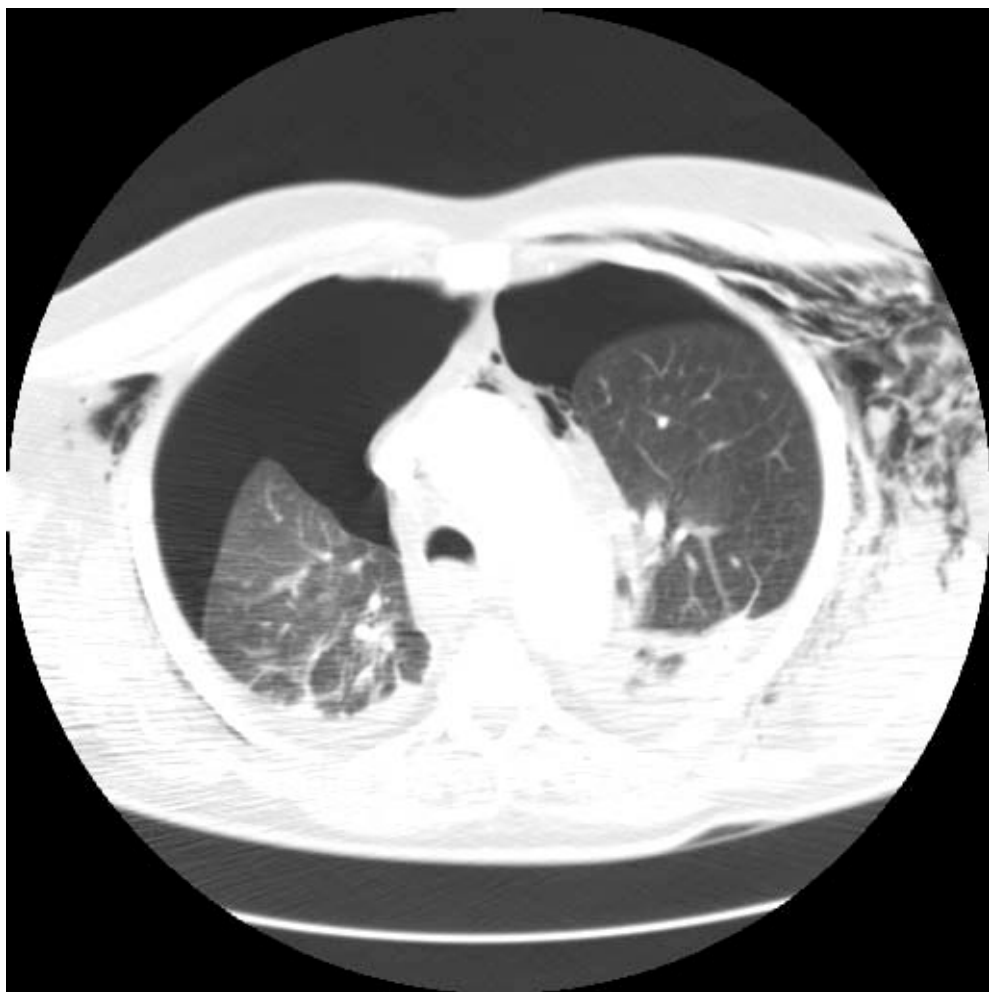


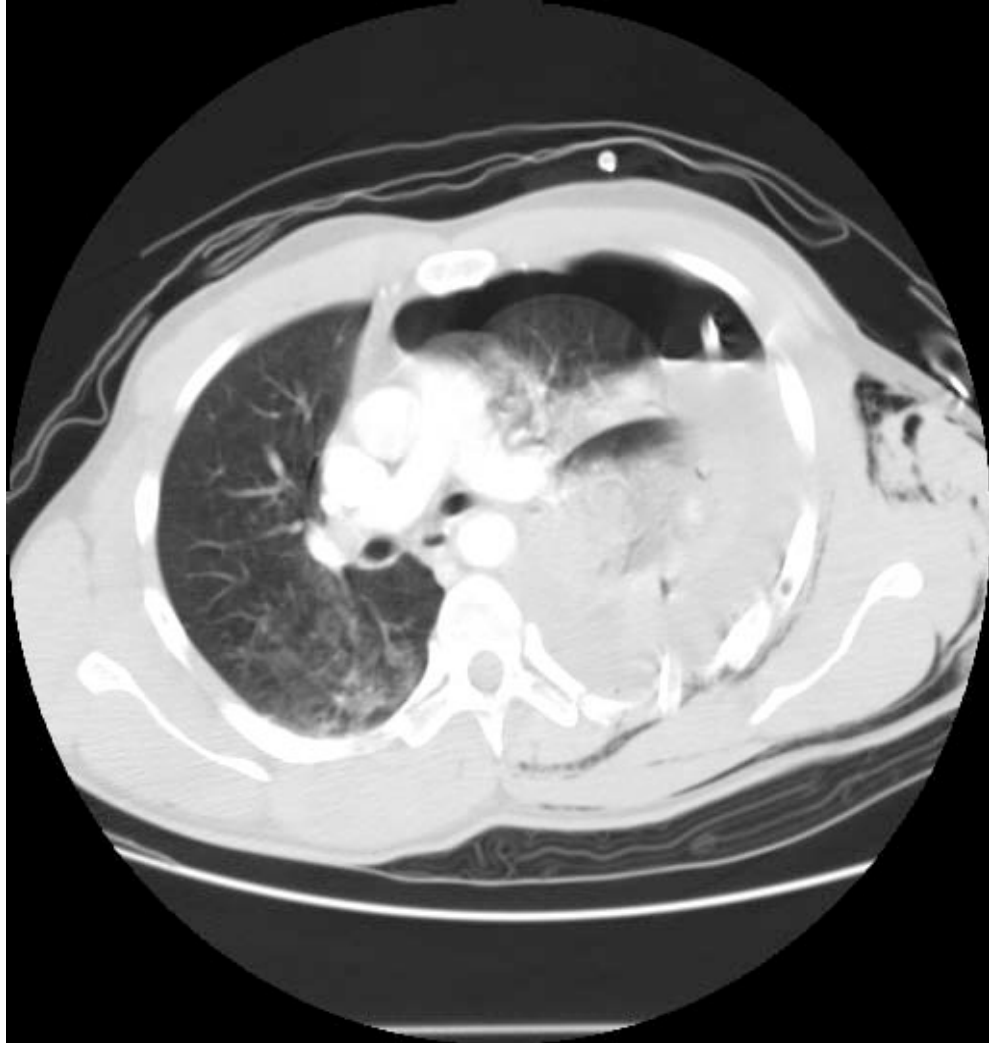


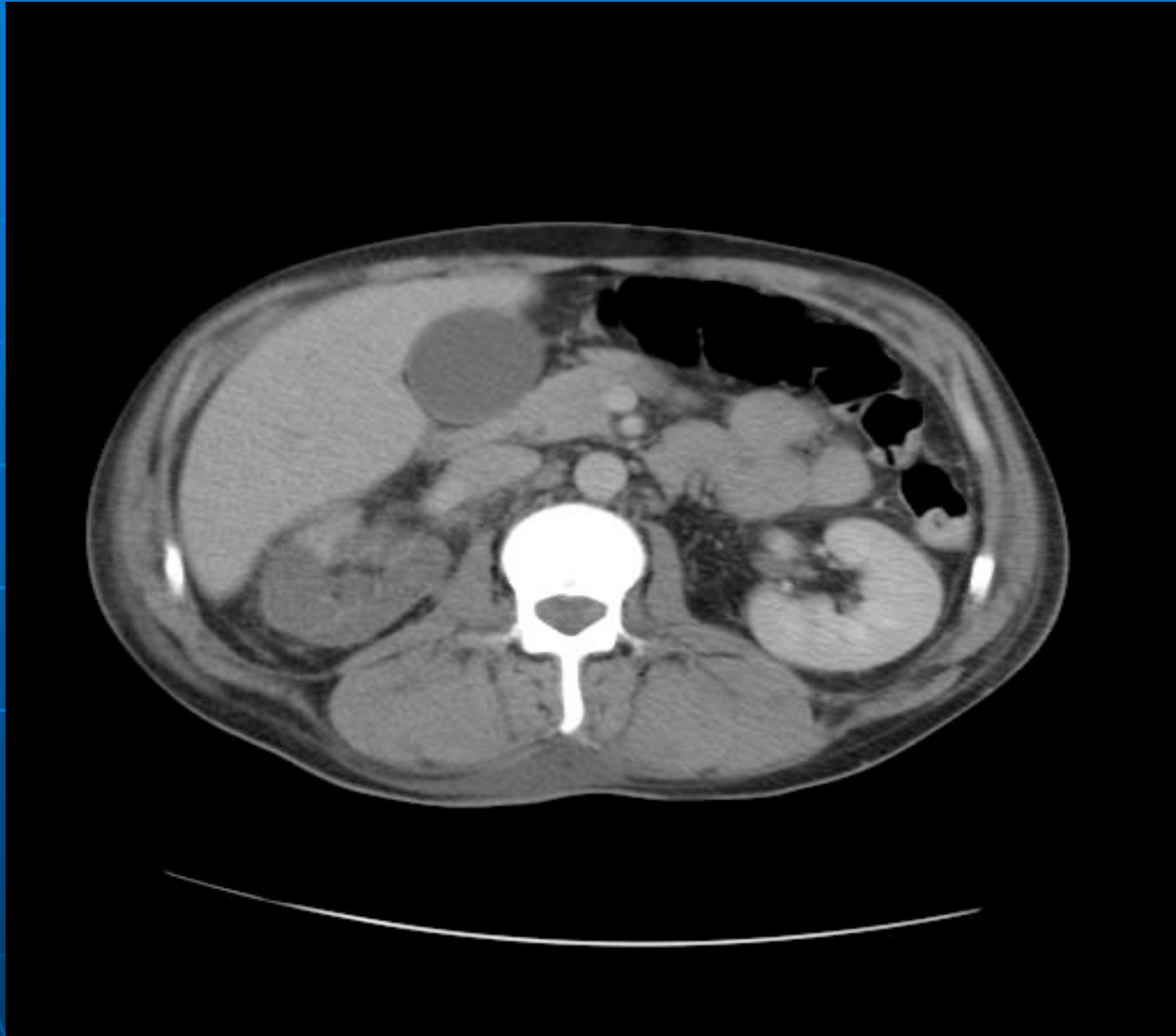
**CT detection of occult
pneumothorax in multiple
trauma patients**

**Bridges KG *et al.*
The Journal of Emergency
Medicine 1993; 11: 179-186**









Conclusions

- **TBI 1. threat**
- **Specialist neurocritical care with protocol-driven therapy**
- **Age correlates with death**
- **General ICU-therapy**
 - **diagnosis**
 - **prevention of ARF**
 - **transfusion policy**



Yleinen tehohoito

- **“Yleiset” periaatteet**
 - muuttuvat ajan funktiona
- **Keuhkoja suojaava ventilaatio**
 - inspiriumin tasannevaiheen paine (< 30-35 mmHg)
 - kertatilavuus (6-8 ml/kg) Ei jos aivovamma
 - myös vatsamakuu
- **Critical illness hyperglykemia**
 - normoglykemia
- **Kortikosteroidit**
 - pitkittynyt ARDS, vasoaktiivituokea vaativa sepsis
- **Hb - stabiili tila / aktiivi vuoto / PS hajoaminen**