Traumapatienten på intensivvårdsavdelningen

Anders Oldner

Professor/ Överläkare

CIVA

Karolinska Universitetssjukhuset/ Institutet

Behövs intensivvården?

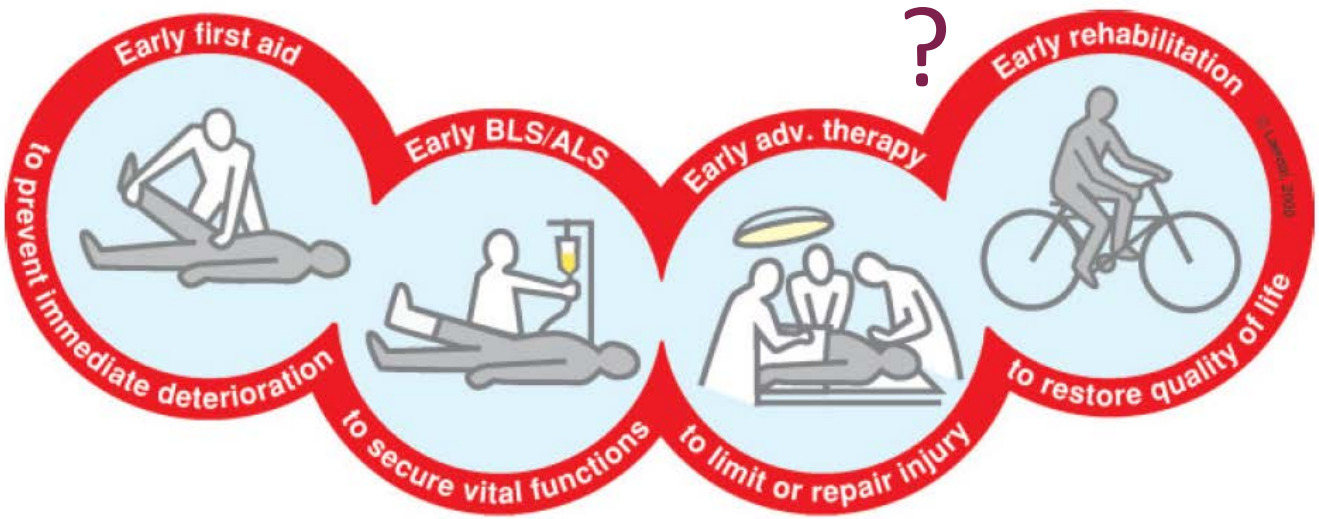
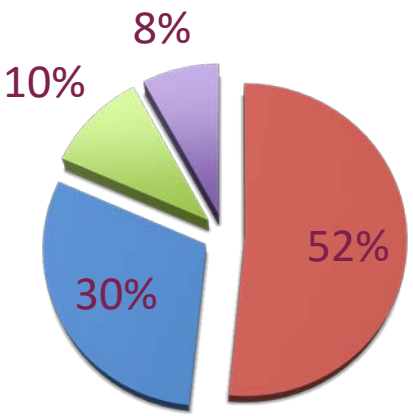


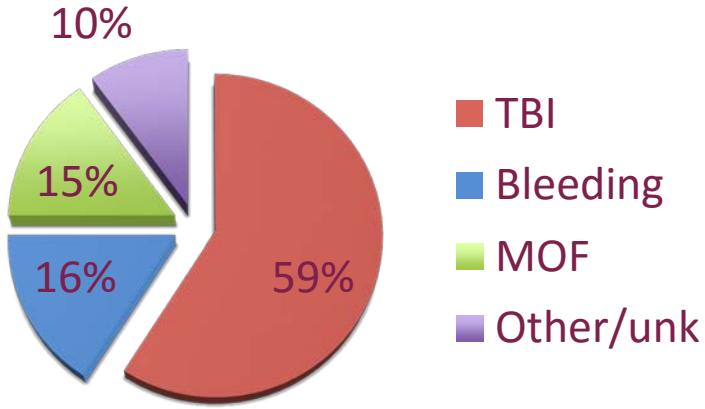
Fig. 1 The trauma chain of survival. First displayed at the *TraumaCare2002* conference in Stavanger, Norway, and reproduced with permission from Laerdal Medical, Stavanger, Norway. BLS, basic life support; ALS, advanced life support.

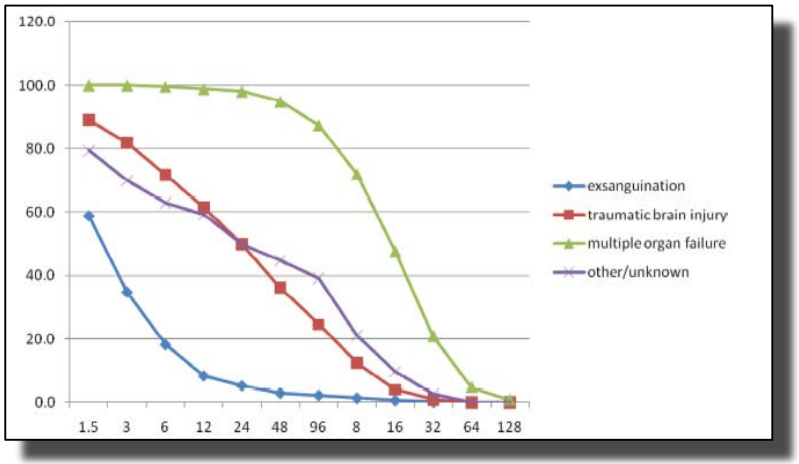
Av vad och när dör man efter trauma?

Maryland US

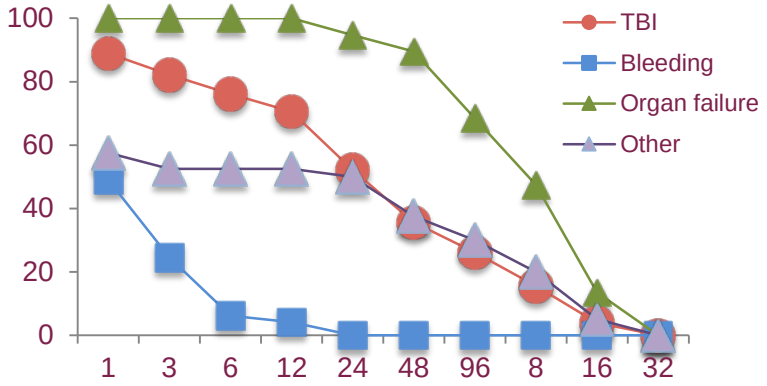


Karolinska





Dutton et al. J Trauma 2010.



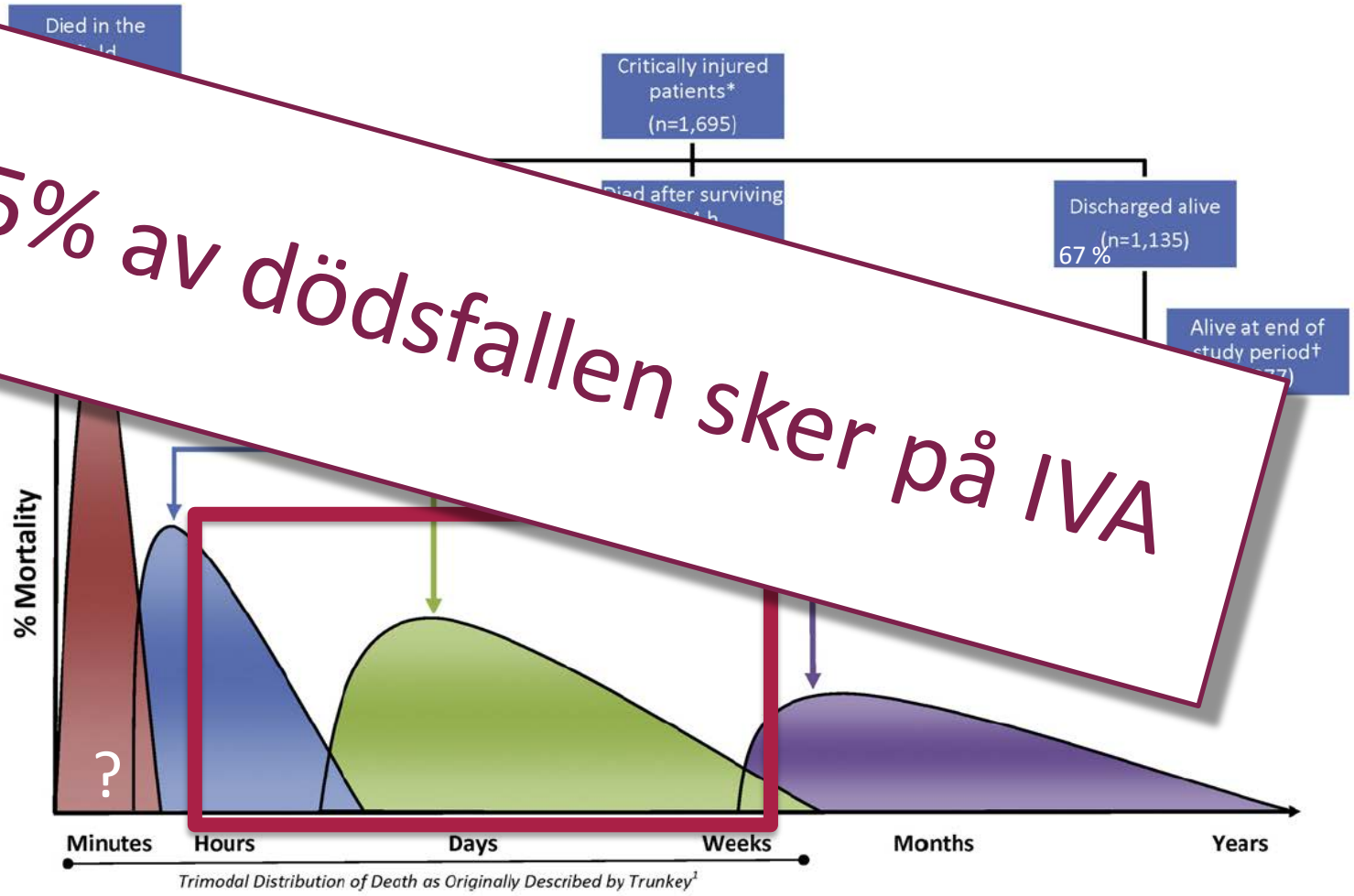
Ghorbani P *et al*. Scand J Trauma 2014

IVA-relaterad traumadöd

Quadrimodal distribution of death

H.P. Santry et al. / Journal of Critical Care 30 (2015) 656.e1–656.e7

> 65% av dödsfallen sker på IVA

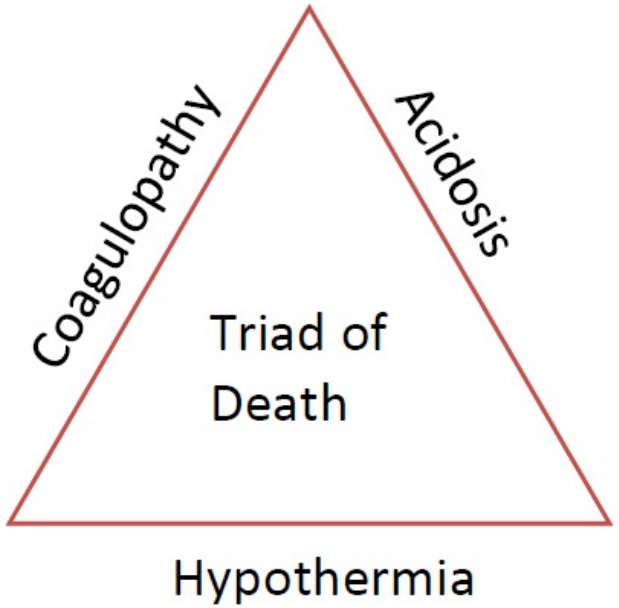


Santry *et al.* J Crit Care 2015.

Intensivvårdens roll i traumavårdkedjan förändras

Fokus på tidig homeostas – damage control

IVA tidig länk i traumavårdkedjan



Kraven på intensivvården ökar

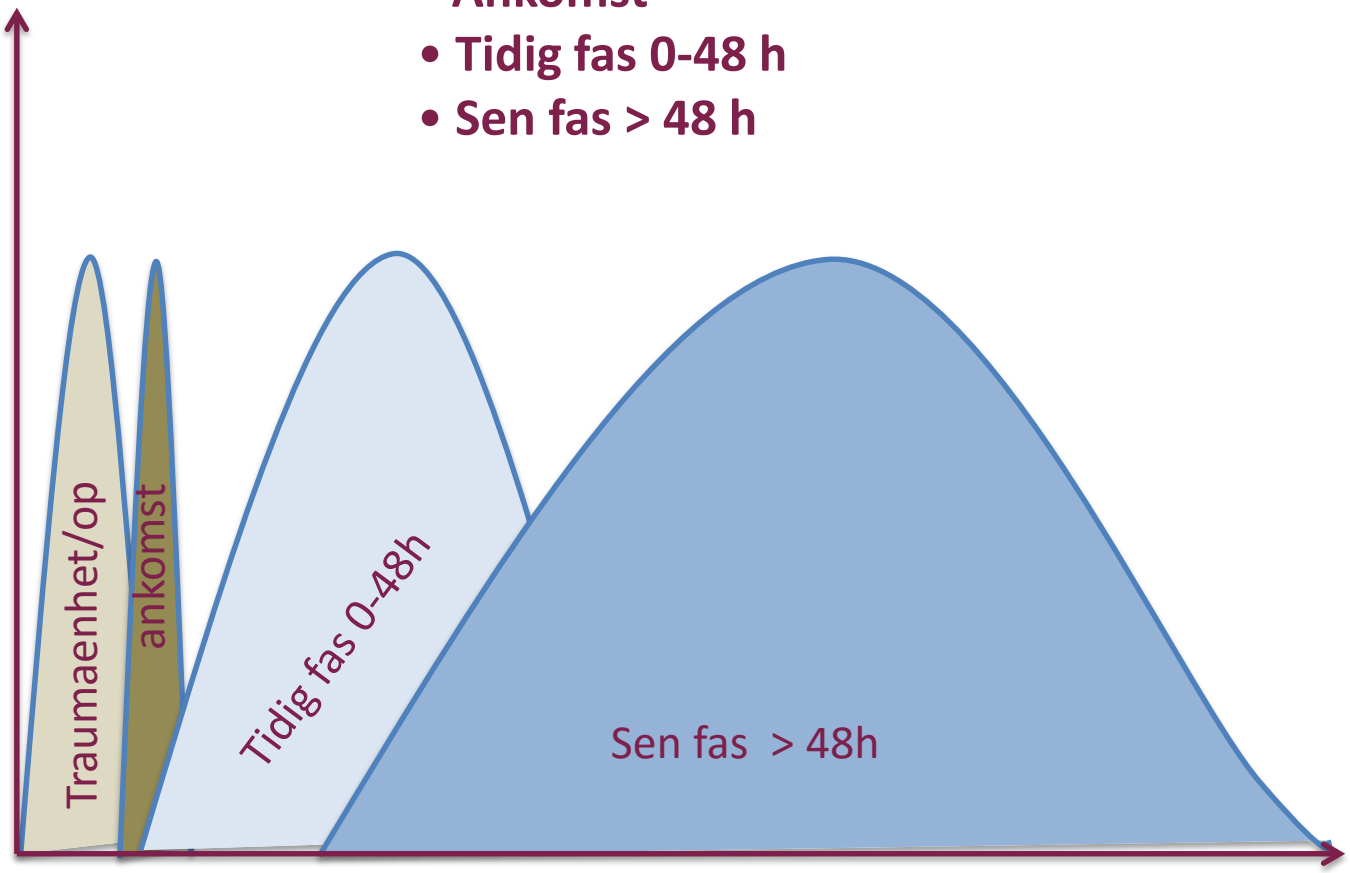
Svårare skador överlever till IVA

Damage control

Konservativ kirurgisk behandling

Traumapatienten på IVA faser

- Ankomst
- Tidig fas 0-48 h
- Sen fas > 48 h



Ankomst

- Upprätta en primär HANDLÄGGNINGSPLAN med kir/ort/neurokir
    - diskutera brytpunkter
- Bedöm patientens status
- Etablera adekvat MONITORERING
        - invasiv tryckmätning
        - överväg eko/PAC/annan CO mätning
    - Temp
    - Buktryck
    - ICP
    - Följ neurologi

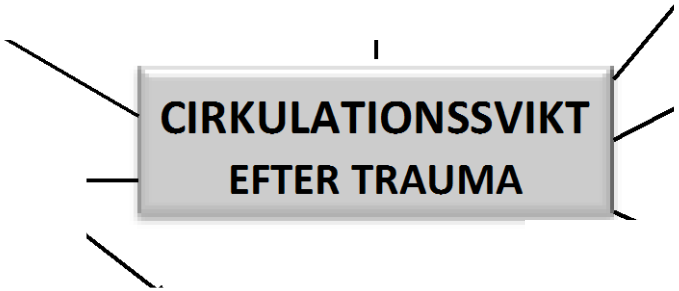
- TA ÖVER OCH DRIV VIDARE HANDLÄGGNING

Traumapatienten på IVA faser

Tidig fas 0-48 h

- Aggressiv behandling av störda vitalfunktioner
- Kompletterande diagnostik och behandling av kända skador
- Diagnostik och ev. behandling av dolda skador

Cirkulationssvikt på IVA i tidig fas



J Trauma Acute Care Surg. 2014

The conjoint effect of reduced crystalloid administration and decreased damage-control laparotomy use in the development of abdominal compartment syndrome

Bellal Joseph, MD, Bardiya Zangbar, MD, Viraj Pandit, MD, Gary Vercruysse, MD, Hassan Aziz, MD, Narong Kulvatunyou, MD, Julie Wynne, MD, Terence O'Keeffe, MB, ChB, Andrew Tang, MD, Randall S. Friese, MD, *and* Peter Rhee, MSD, *Tucson, Arizona*

TABLE 3. Multivariate and Univariate Analysis of Patients Who Developed ACS

	Univariate			Multivariate		
	OR	95% CI	*p*	OR	95% CI	*p*
Age	1.03	1.01–1.05	0.01	1.02	0.9–1.06	0.1
Sex, male	2.2	0.5–9.7	0.2	8.8	0.8–92	0.07
Systolic blood pressure	1.01	0.9–1.02	0.84	—	—	—
Heart rate	1.01	0.9–1.03	0.16	1.008	0.9–1.03	0.5
Temperature	1.2	0.8–1.7	0.2	1.11	0.7–1.7	0.6
Mechanism of injury, blunt	8.19	1.8–35	0.005	5.7	0.6–55	0.1
ISS	1.06	1.03–1.09	0.001	1.03	0.9–1.09	0.2
Base deficit	1.08	0.9–1.17	0.06	1.04	0.9–1.1	0.4
Crystalloids	1.09	1.04–1.1	0.001	1.07	1.01–1.1	0.02
Blood products	1.07	1.02–1.16	0.045	1.03	0.8–1.1	0.9
DCL	1.2	0.4–3.7	0.7	—	—	—

Kristalloider inte alltid rätt!!

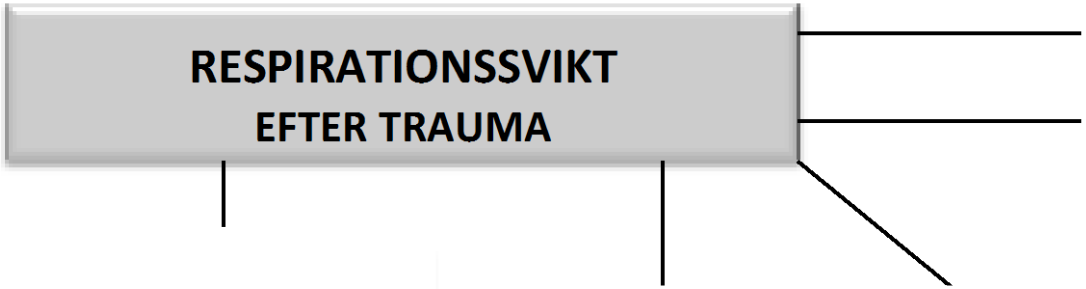
42. In hospital settings do not use crystalloids for patients with active bleeding (see NICE's guideline on intravenous fluid therapy in adults in hospital for advice on tetrastarches in adults).

manufacture essential ingredients for clot formation and replenishment of the circulating blood products and volume). The optimum management is fluid replacement with blood products.

The GDG discussed the situation when a pre-hospital practitioner is treating a patient in profound haemorrhagic shock but does not have access to blood products. In this case small boluses of crystalloids would be appropriate.

The GDG acknowledged that a recommendation to avoid using crystalloids and other clear fluids except in patients with profound haemorrhagic shock in the pre-hospital environment is a change in clinical practice. The GDG wanted to

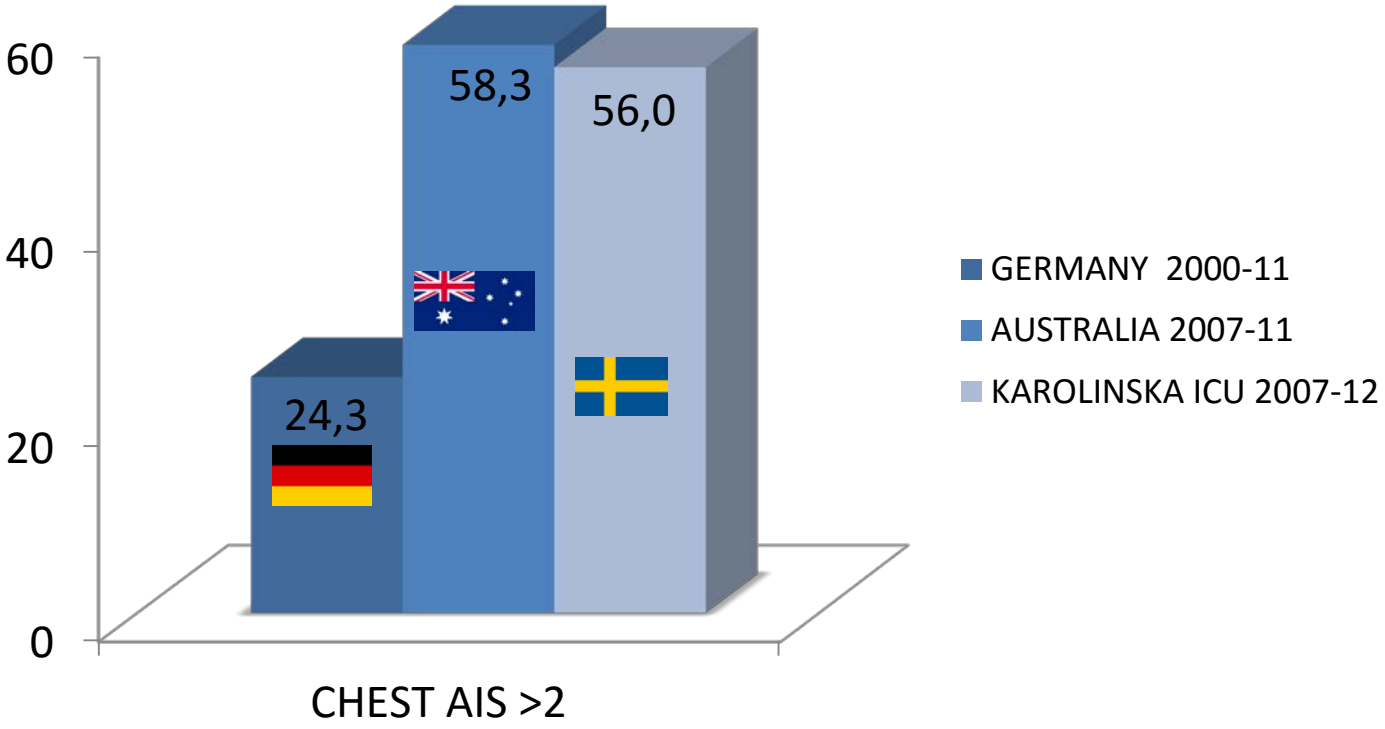
Lungsvikt i tidig fas efter trauma



NIV – non-invasive ventilation, IV – invasive ventilation, TRALI – transfusion-related acute lung injury, TACO – transfusion-associated cardiac overload


Sin

Thoraxskada – incidens vid multitrauma



Huber S. Scand J Trauma Resusc Emerg Med. 2014;22(1):52.
Marasco SF. J Am Coll Surg. 2013;216(5):924-32.

Fixera vid flail eller inte?

META-ANALYSIS

Annals of Surgery • Volume 258, Number 6, December 2013

Operative Management of Rib Fractures in the Setting of Flail Chest

A Systematic Review and Meta-Analysis

Jennifer A. Leinicke, MD, MPHS, Leisha Elmore, MPHS,* Bradley D. Freeman, MD,* and Graham A. Colditz, MD, DrPH†*

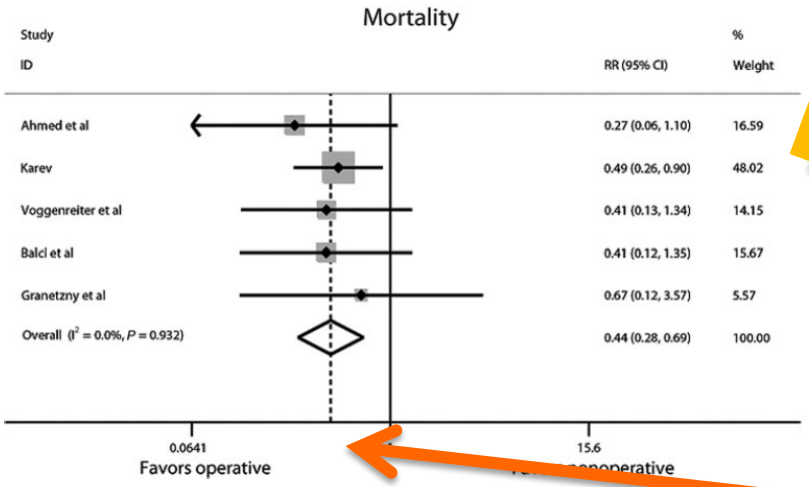
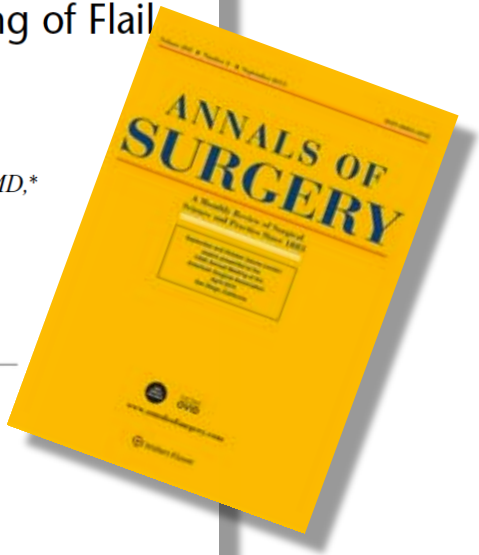
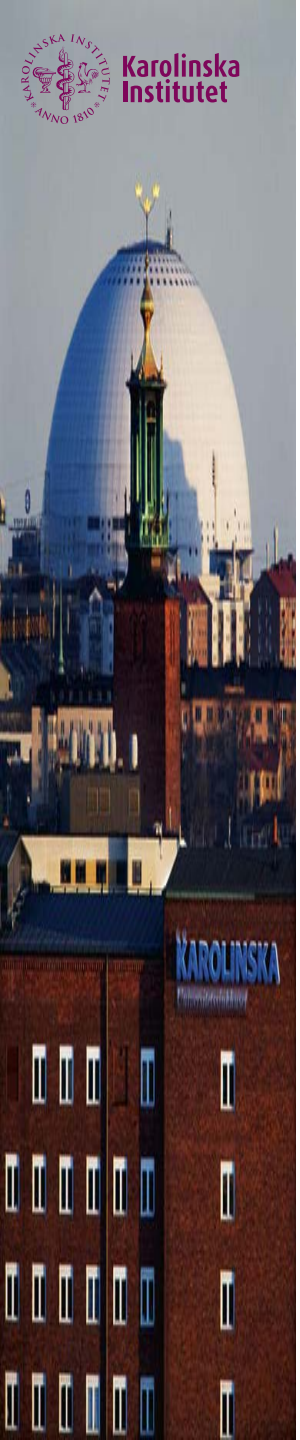


FIGURE 6. Forest plot of the pooled RR for the outcome of mortality. Pooled RR is 0.43, 95% CI: 0.28–0.69. χ for heterogeneity = 0.85, $P = 0.932$; $I^2 = 0$.



- Effect **is not seen** in patients with significant associated pathology.



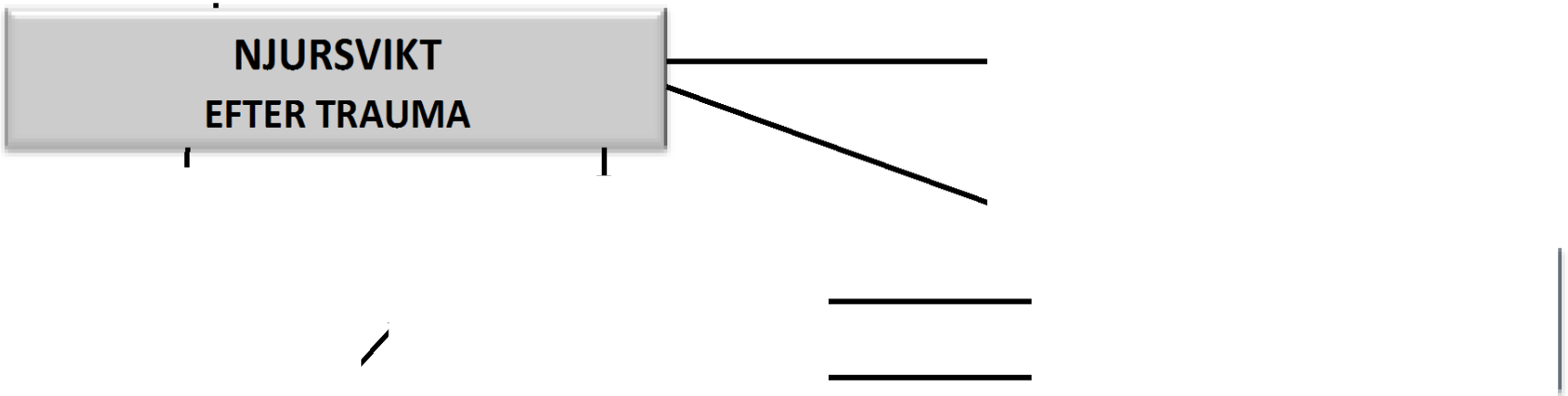
“It seems not to be a question

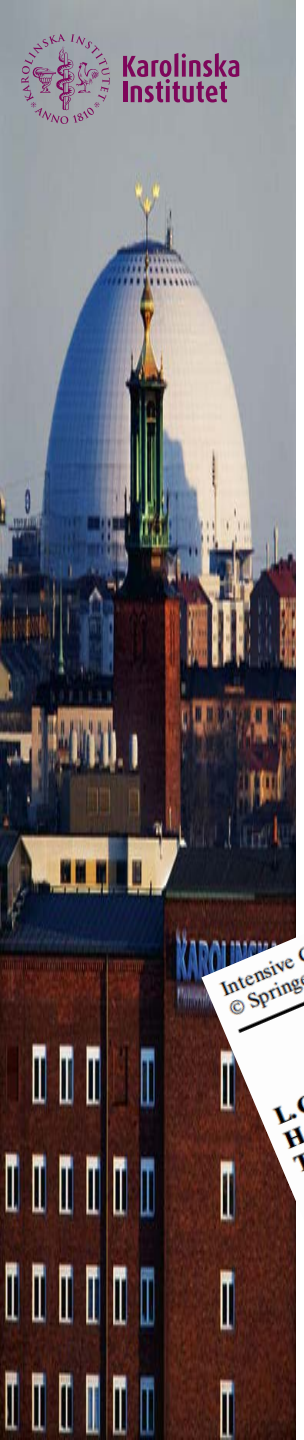
of fixation or not

but of treating

the right patient at the right time”

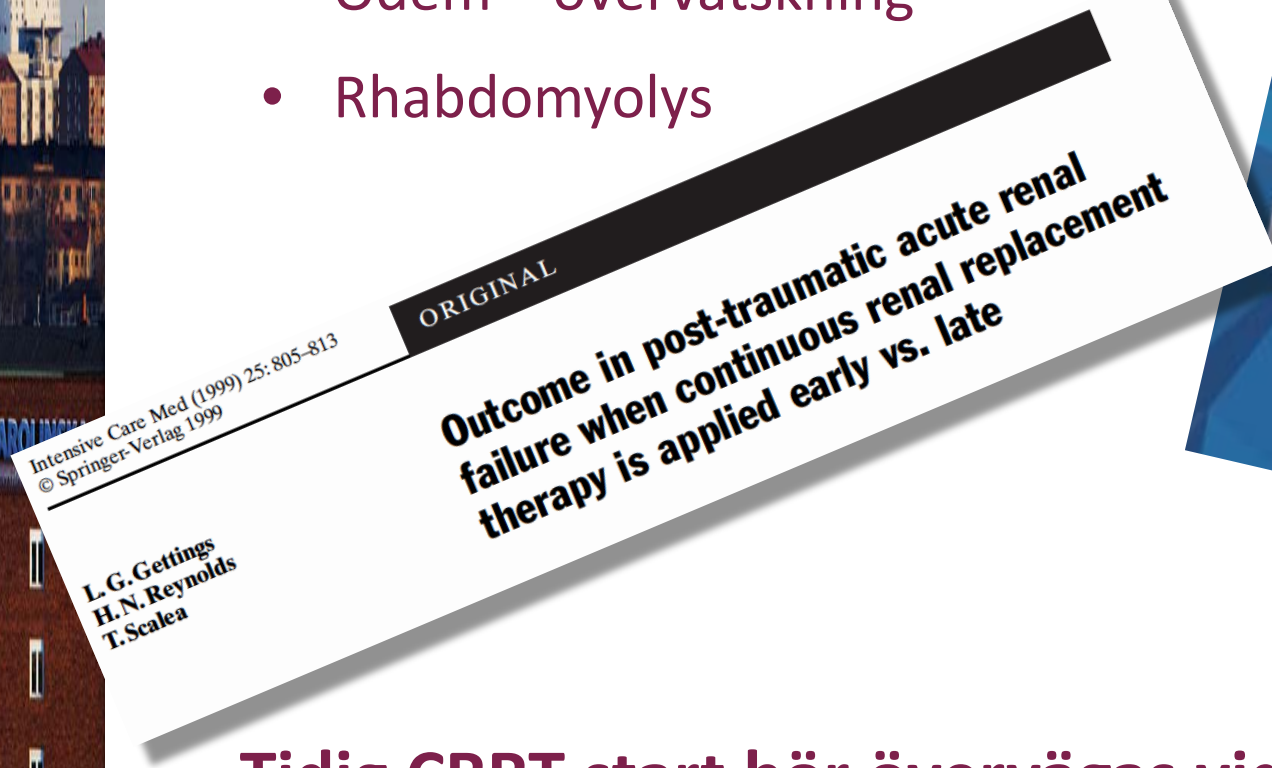
Njursvikt i tidig fas





CRRT vid trauma

- Ischemi/reperfusion
- Pro-inflammation
- Ödem – övervätskning
- Rhabdomyolys

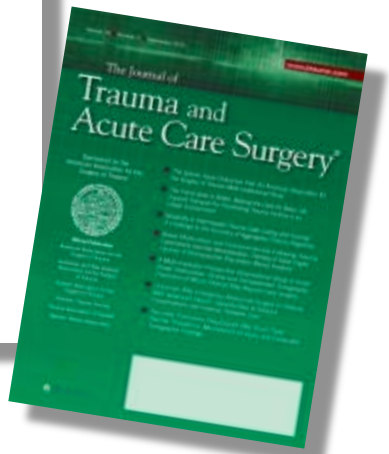


Tidig CRRT start bör övervägas vid oliguri

ORIGINAL ARTICLE

Acute kidney injury following severe trauma: Risk factors and long-term outcome

Mikael Eriksson, MD, Olof Brattström, MD, PhD, Johan Mårtensson, MD, PhD, Emma Larsson, MD, PhD, *and* **Anders Oldner, MD, PhD,** *Stockholm, Sweden*



idence in ICU-treated trauma patients

HES är kopplat till AKI även vid trauma

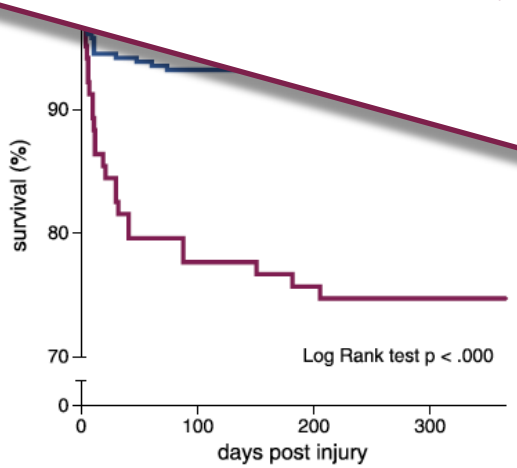


Figure 1. One-year postinjury survival. Kaplan-Meier curves displaying 1-year postinjury survival for AKI (n = 103, *red line*) and non-AKI patients (n = 310, *blue line*).

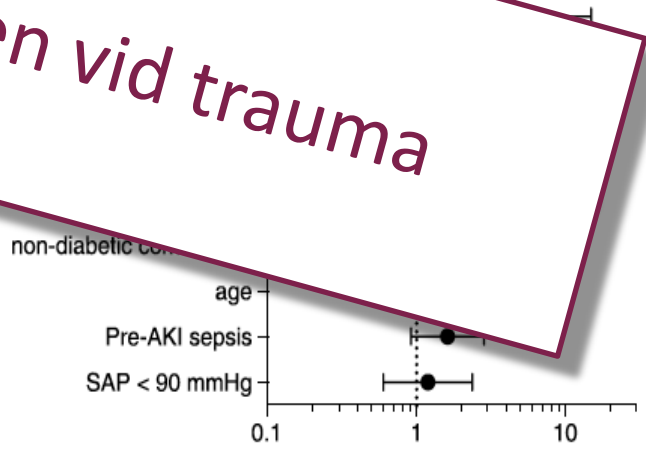


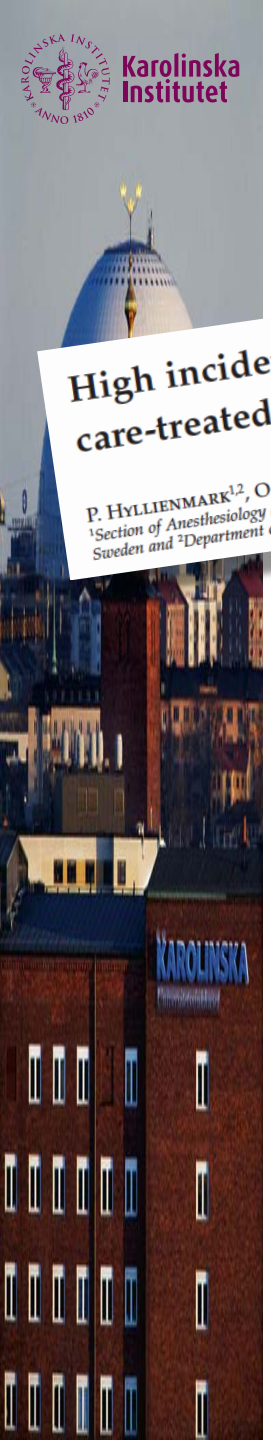
Figure 2. Multivariable model for AKI risk. Odds ratio and 95% confidence interval. Admission refers to the admission to the trauma unit.

Traumapatienten på IVA

Medicinskt panorama
i sen fas > 48 h – ”sedvanliga diagnoser”

- SEPSIS
- MOF
- ARDS
- VAP/PNEUMONI

Diagnoser senare IVA-fas



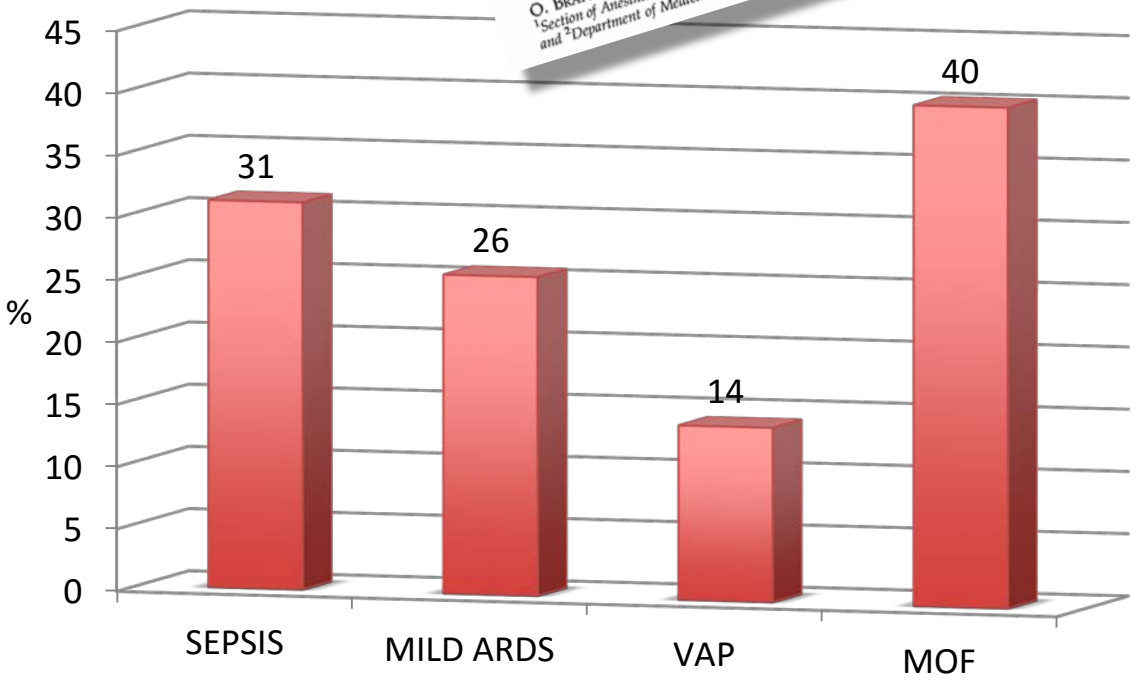
High incidence of post-injury pneumonia in intensive care-treated trauma patients

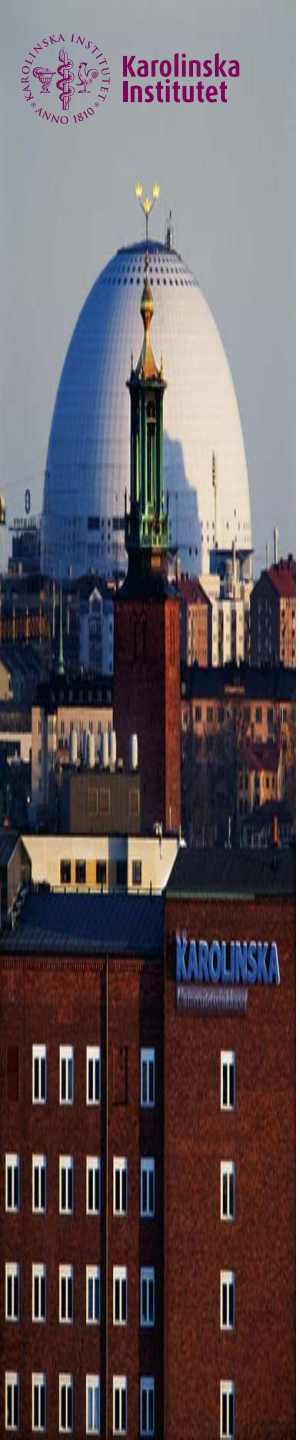
P. Hyllienmark[1,2], O. Brattström[1,2], E. Larsson[1,2], C.-R. Martling[1,2], J. Petersson[1,2] and A. Oldner[1,2]
[1]Section of Anesthesiology and Intensive Care Medicine, Department of Physiology and Pharmacology, Karolinska Institutet, Stockholm, Sweden and [2]Department of Anaesthesiology, Surgical Services and Intensive Care, Karolinska University Hospital, Stoc

Acta Anaesthesiol Scand 2010; 54: 1007–1017
Printed in Singapore. All rights reserved

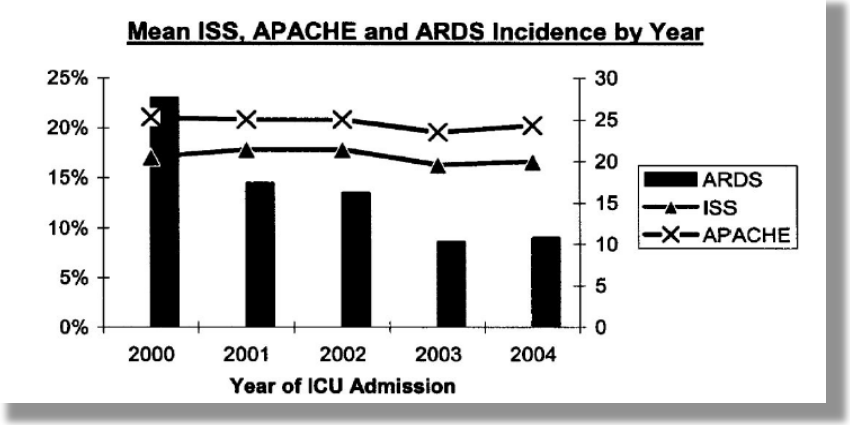
Early predictors of morbidity and mortality in trauma patients treated in the intensive care unit

O. Brattström[1], F. Granath[2], P. Rossi[1] and A. Oldner[1]
[1]Section of Anesthesiology and Intensive Care Medicine, Department of Physiology and Pharmacology, Karolinska Institutet, Stockholm, Sweden and [2]Department of Medicine, Clinical Epidemiology Unit, Karolinska University Hospital, Stockholm, Sweden





Traumarelaterad ARDS



Martin et al. J Trauma. 2005.

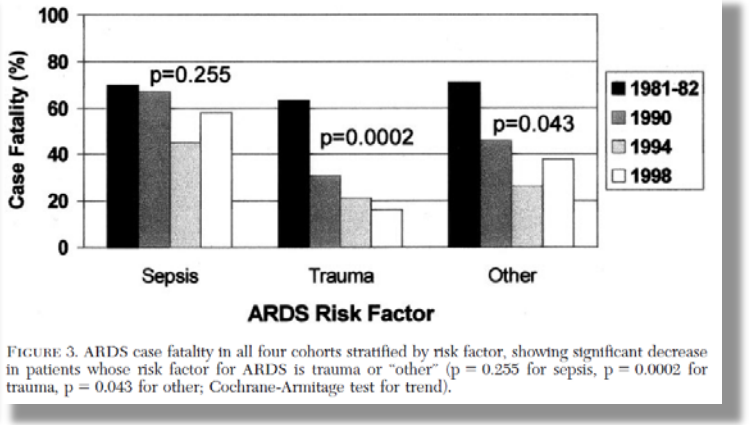
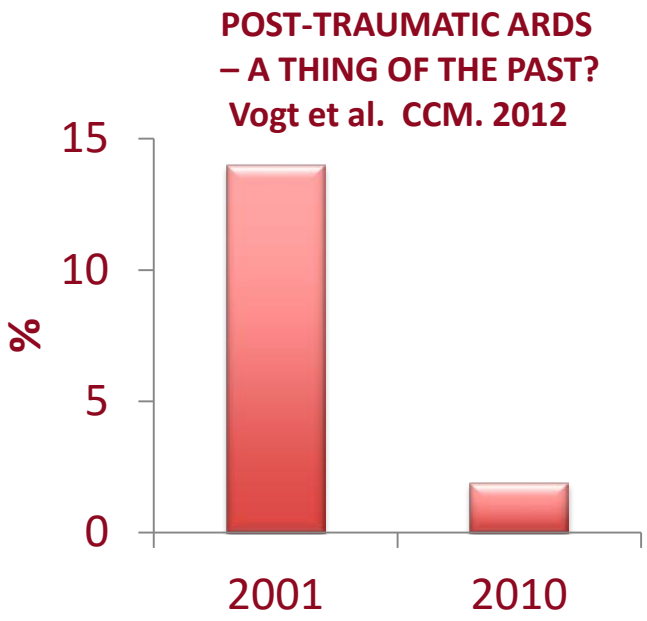
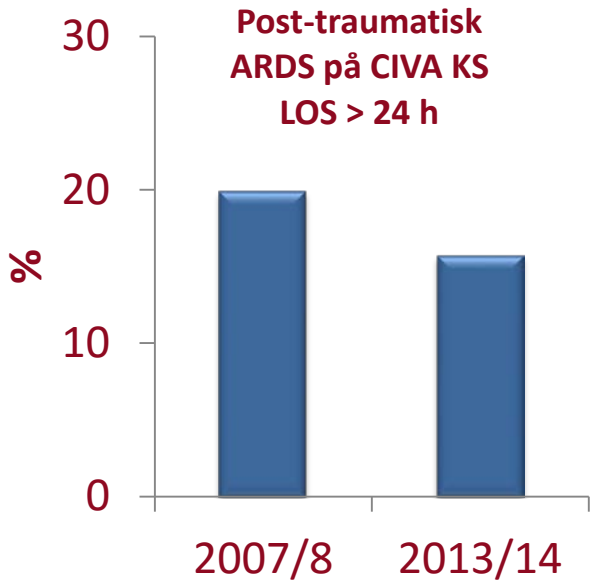
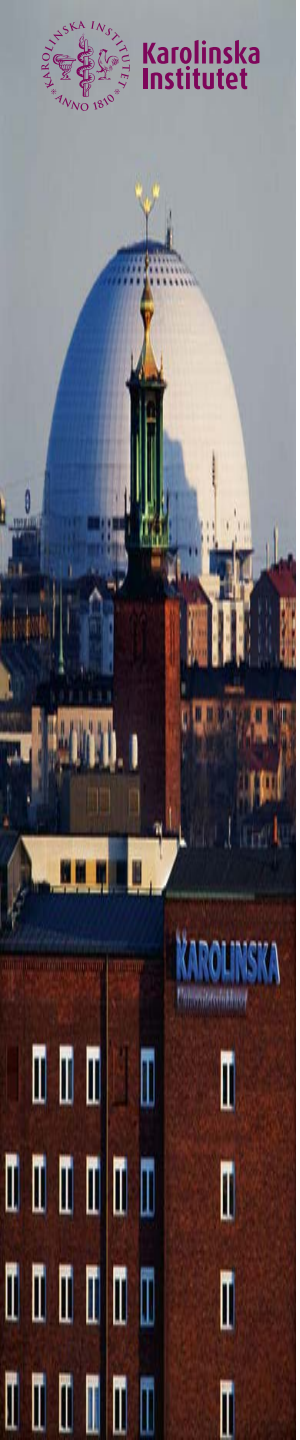


FIGURE 3. ARDS case fatality in all four cohorts stratified by risk factor, showing significant decrease in patients whose risk factor for ARDS is trauma or "other" (p = 0.255 for sepsis, p = 0.0002 for trauma, p = 0.043 for other; Cochrane-Armitage test for trend).

Stapleton et al. Chest 2005







Multipel organsvikt

The solution of one problem unfolds a new

A chain is only as strong as its weakest link. When links are strengthened where the chain has broken previously, new weak spots appear simply because the chain holds to test them. The obvious weak link in the severely wounded in this war (W.W. II) was the kidney.

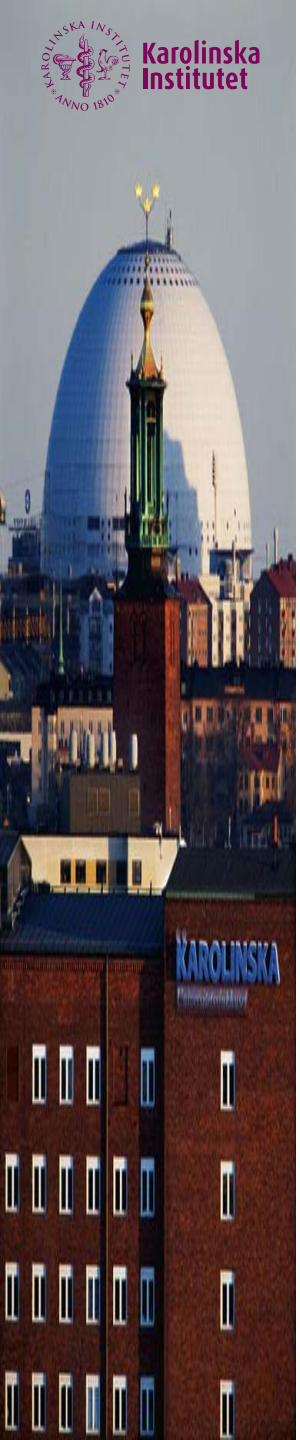
EDWARD D. CHURCHILL[1]

Early WW II - cardiovascular collapse – shock

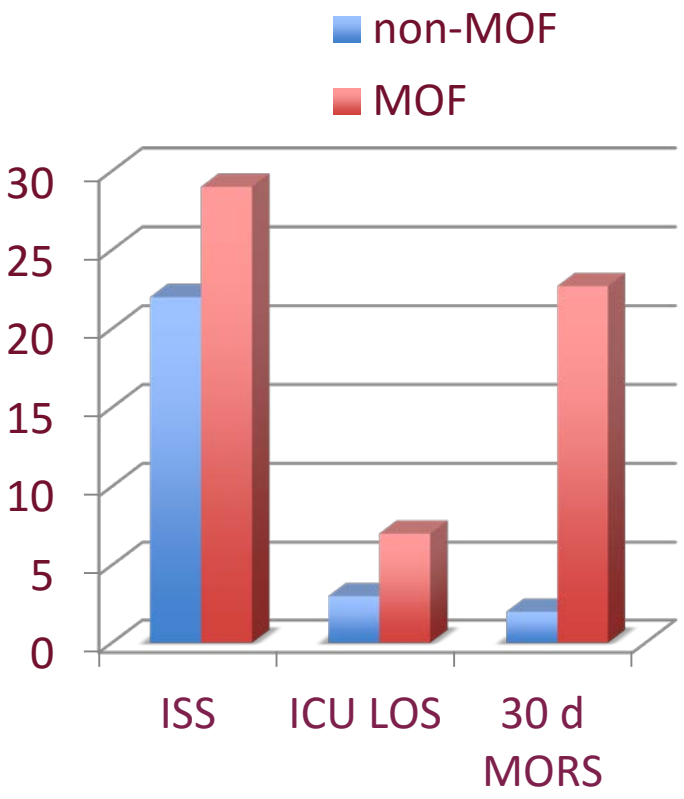
Late WW II & KOREAN WAR – transfusions – AKI

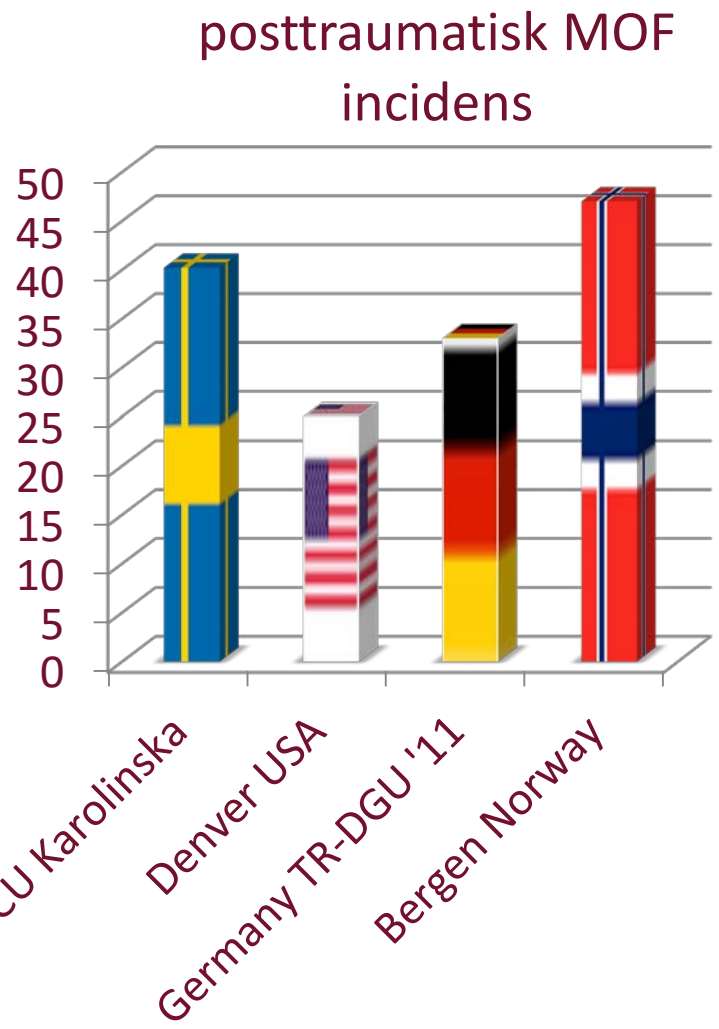
VIETNAM WAR – crystalloid treatment – ARDS

1970s – Multiple organ failure - MOF



Multipel organsvikt – effekt och incidens

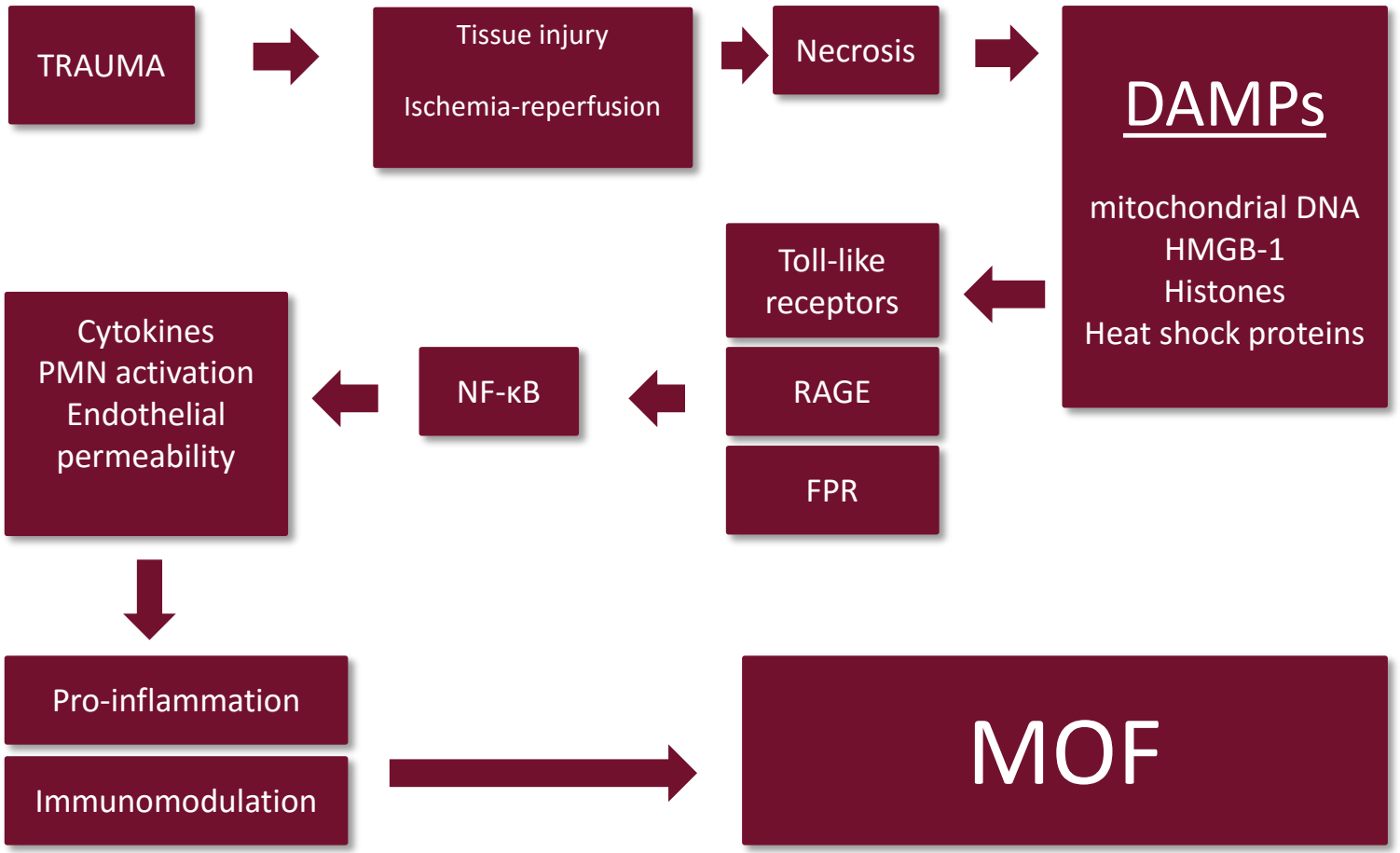


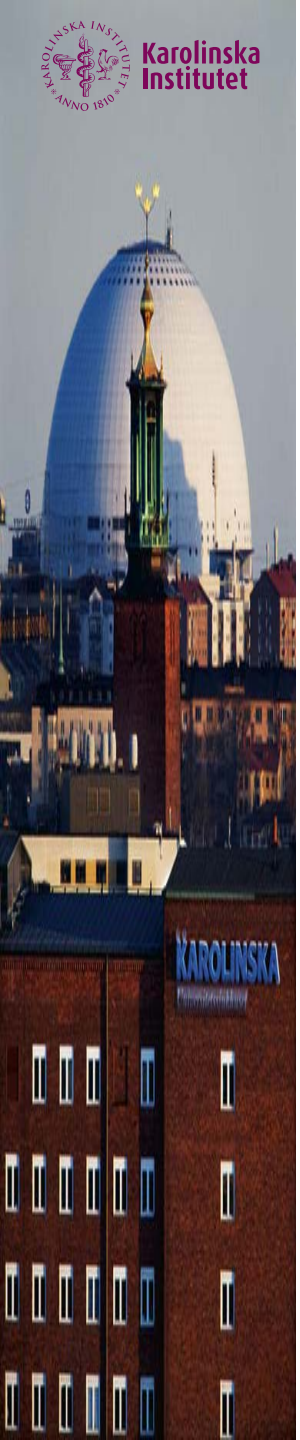


Damage-associated molecular patterns

DAMPs

- en länk till multipel organsvikt

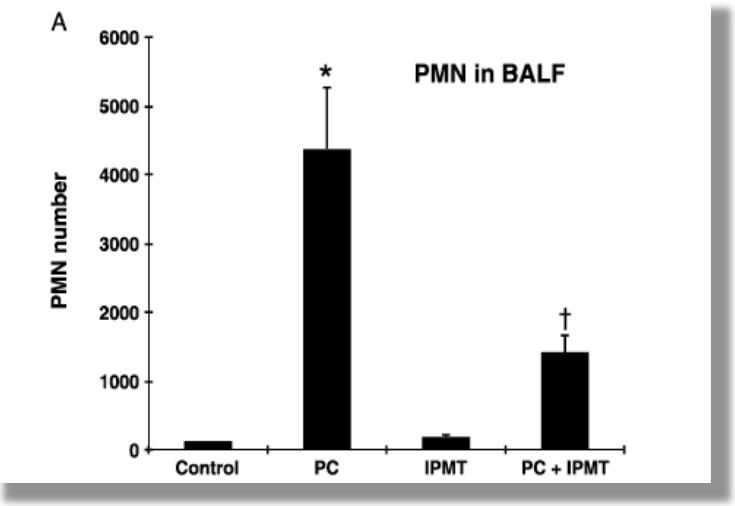


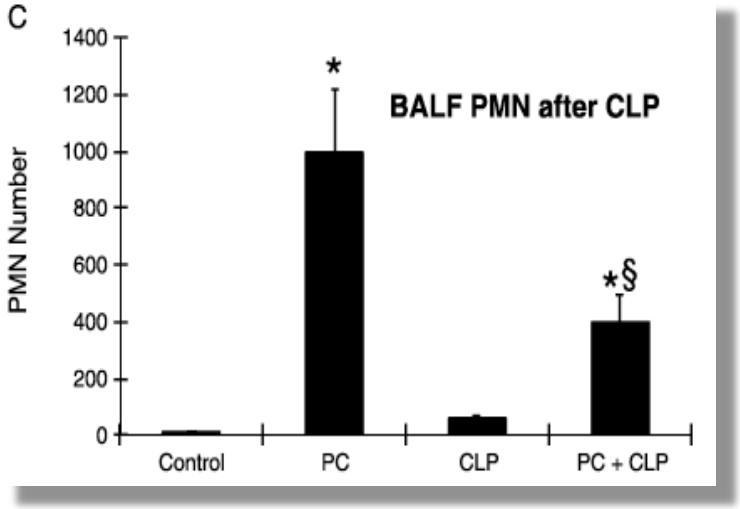


DAMPs
infektioner efter trauma?

Mitochondrial damage-associated molecular patterns released by abdominal trauma suppress pulmonary immune responses

Cong Zhao, MD, Kiyoshi Itagaki, PhD, Alok Gupta, MD, Stephen Odom, MD, Nicola Sandler, MBBS, *and* **Carl J. Hauser, MD,** *Boston, Massachusetts*





Multipel organsvikt trender

AAST 2013 Plenary Paper

Temporal trends of postinjury multiple-organ failure:
Still resource intensive, morbid, and lethal

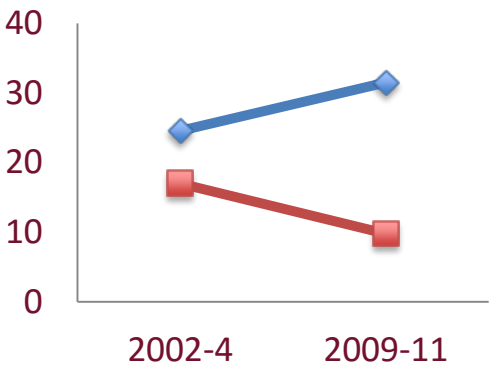
Angela Sauaia, MD, PhD, Ernest E. Moore, MD, Jeffrey L. Johnson, MD, Theresa L. Chin, MD,
Anirban Banerjee, PhD, Jason L. Sperry, MD, Ronald V. Maier, MD,
and C. Cothren Burlew, MD, *Aurora, Colorado*

AAST 2013 Plenary Paper

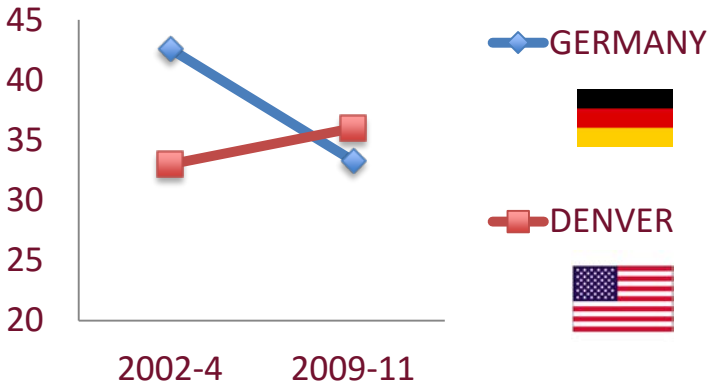
Epidemiology and risk factors of multiple-organ failure after multiple trauma: An analysis of 31,154 patients from the TraumaRegister DGU

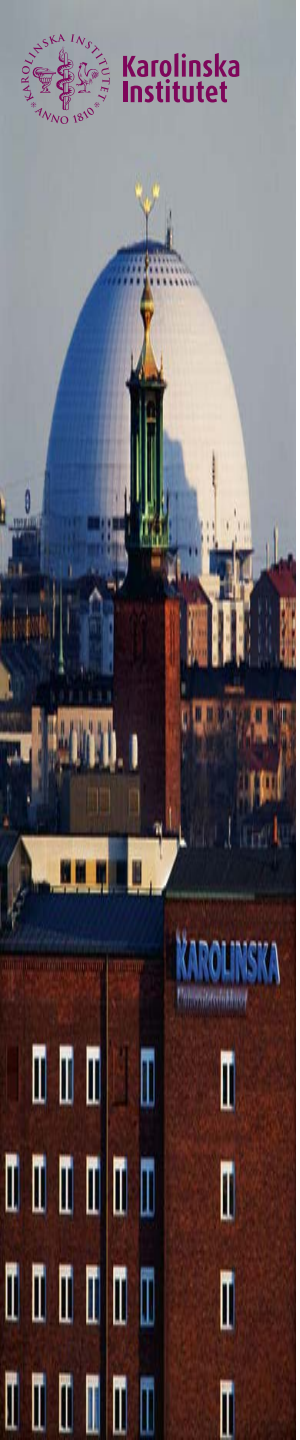
Matthias Fröhlich, MD, Rolf Lefering, PhD, Christian Probst, MD,
Thomas Paffrath, MD, Marco M. Schneider, MD, Marc Maegele, MD,
Samir G. Sakka, MD, Bertil Bouillon, MD, Arasch Wafaisade, MD,
and Committee on Emergency Medicine, Intensive Care and Trauma Management
of the German Trauma Society (Sektion NIS), *Cologne, Germany*

MOF incidence



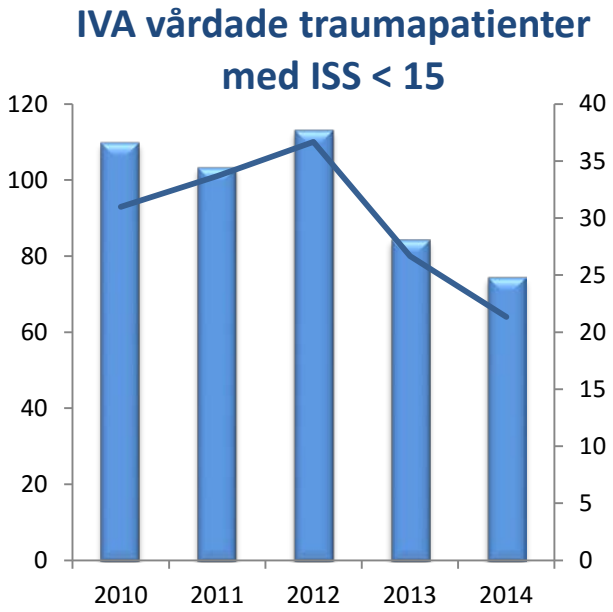
MOF mortality

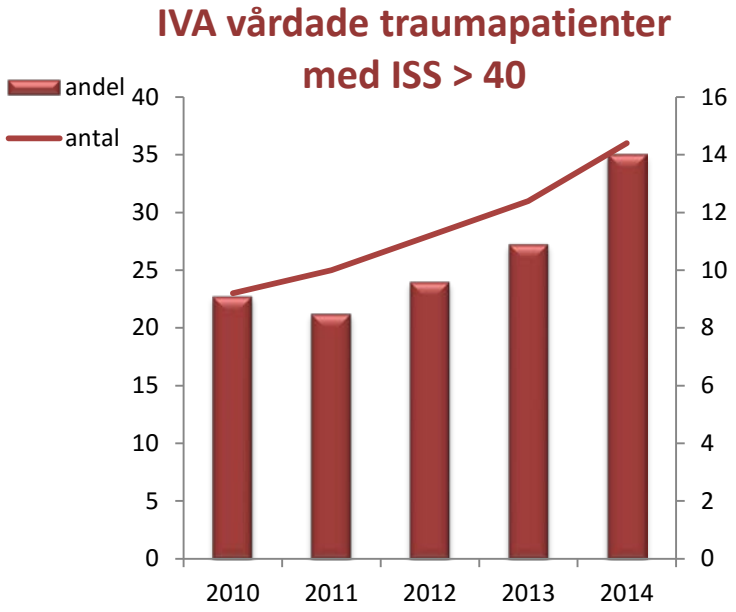


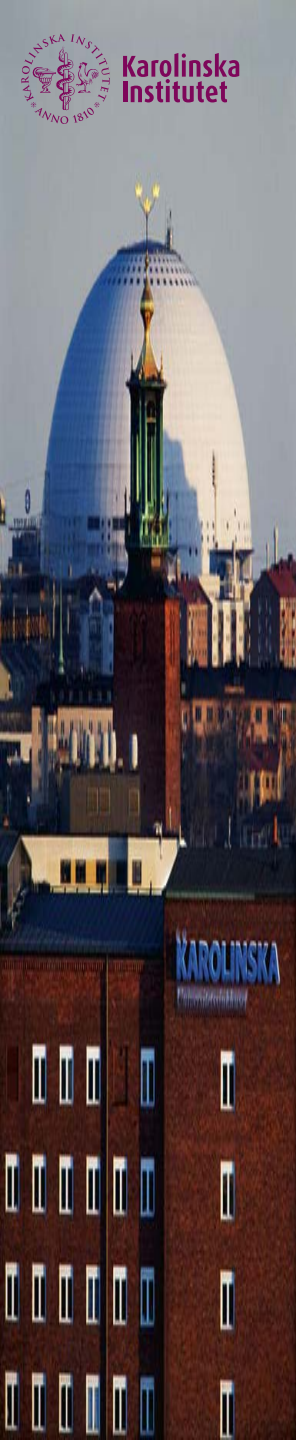


Trauma på IVA - trender

- Förbättrad traumavård
  - Svårare skador överlever till IVA
- Förändringar i trender svårtolkade
  - Förbättrat utfall maskeras av svårare skador







Sammanfattning

- Intensivvården en viktigt del i traumavårdkedjan
- Fler svårt skadade patienter överlever till IVA
- En tydlig trend mot tidigare IVA intag
- Posttraumatisk organdysfunktion står för en betydande del av traumarelaterad mortalitet och morbiditet
- Sannolikt föreligger en betydande del “preventable death” i intensivvårdsfasen

Posttraumatisk pneumoni

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High incidence of post-injury pneumonia in intensive care-treated trauma patients

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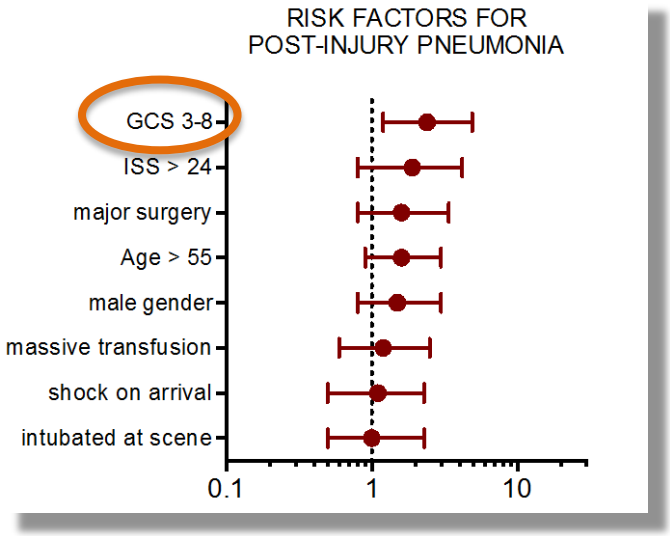
26 % incidence in ICU-treated trauma patients (n 322)



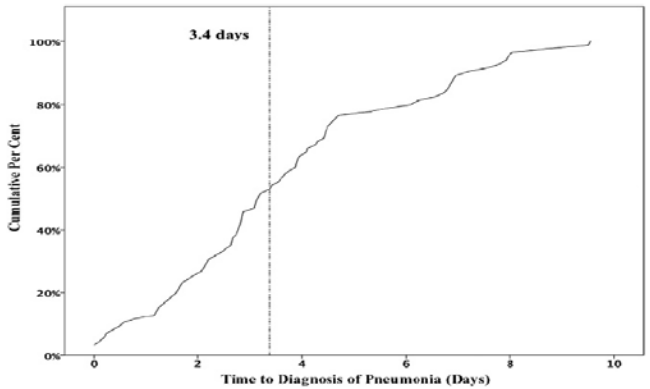
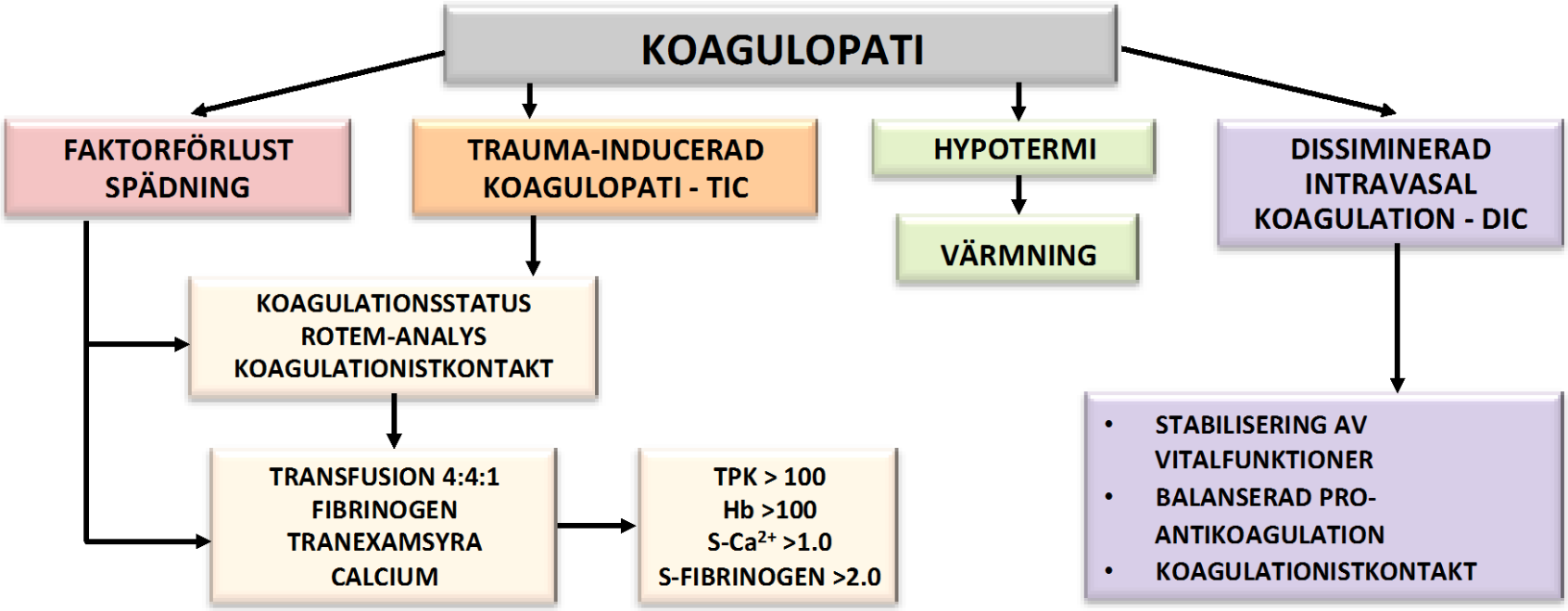


Fig. 1. The figure illustrates the cumulative incidence of pneumonia. Percentage refers to all patients that developed pneumonia during their first 10 days of intensive care treatment. Dashed vertical line depicts the median time from admission to pneumonia.

Koagulopati i tidig fas



Sammanfattning I

- **Intensivvården är en del i kedjan vid trauma omhändertagande**
- **Tappa inte tempo för att patienten lämnar trauma/op**

avdelningen

- **Etablera adekvat monitorering**
- **Aggressiv behandling av vitalfunktionsstörningar**
- **Etablera och ompröva vb behandlingsplanen.**

Sammanfattning I

- **Post traumatisk organdysfunktion står för en betydande del av traumarelaterad mortalitet och morbiditet.**

- **Ny kunskap om patofysiologi kan ge framtida behandlingsmetoder.**

Traumapatienten på IVA faser

- **Ankomst**
- **Tidig fas 0-48 h**
  - Aggressiv behandling av störda vitalfunktioner
  - Diagnostik och ev. behandling av dolda skador
  - Kompletterande diagnostik och behandling av kända skador
- **Sen fas > 48 h**
  - Sedvanliga diagnoser
    - Sepsis
    - MOF
    - ARDS

Changes over a decade