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European Society of Emergency Radiology

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# ESER
## European Society of Emergency Radiology

proudly meeting

# DRK
## 94. Dt. Röntgenkongress 2013, Hamburg

**PD DR ULRICH LINSENMAIER, München**

# DRG meets ESER
# “Radiologische Bildgebung beim Polytrauma“

09:45; U Linsenmaier - Logistik und Patientenmanagement

10:00; S Wirth - Was muss & was kann erkannt werden ?

10:15; U Linsenmaier - Interventionelle Radiologie bei Polytrauma

10:30; F Mück – Interdisziplin. Team , Datenhandling, Dosisreduktion

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# Emergency Radiology

- ✓ Pediatric emergencies
- ✓ Emergent Neuroimaging
- ✓ Acute chest (non-trauma)
- ✓ Acute abdomen (non-trauma)
- ✓ Sports injuries (trauma)
- ✓ Highlights/Trends
- ✓ Polytrauma

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# ESER IS A NW SUBSPECIALTY SOCIETY (11 + 3 = 14)

**CIRSE** Cardiovascular and Interventional Radiological Society of Europe

**ESCR** European Society of Cardiac Radiology

**ESER** **European Society of Emergency Radiology**

**ESGAR** European Society of Gastrointestinal and Abdominal Radiology

**ESHNR** European Society of Head and Neck Radiology

**ESMOFIR** **European Society of Molecular and Functional Imaging in Radiology**

**ESMRMB** European Society for Magnetic Resonance in Medicine and Biology

**ESNR** European Society of Neuroradiology

**ESOI** **European Society of Oncologic Imaging**

**ESPR** European Society of Paediatric Radiology

**ESSR** European Society of Musculoskeletal Radiology

**ESTI** European Society of Thoracic Imaging

**ESUR** European Society of Urogenital Radiology

**EUSOBI** European Society of Breast Imaging

# Subspecialization in Radiology

- starting from anglo-american countries back in the 1980s
- early specialization based on organ systems or body regions (neuro, pediatrics, mammo) or modalities (CT, MR, XA, IR)

- new developments are ***process driven*** and result of ***complex and comprehensive imagining*** procedures, overcoming organ based specialization:

- **Oncologic Imaging** and **Emergency Imaging** are examples representing fastest growing fields in radiology.

A new
Subspecialty and Allied Sciences Society

# ESER . European Society of Emergency Radiology

- ✓ initiative launched 2008 by U. Linsenmaier, M. Scaglione, G. Schueller
- ✓ a group of 14 founding members was called in
- ✓ legally **founded in October 2011** under Austrian law "Vereinsrecht"
- ✓ **open for all European ER radiologist**

A new
Subspecialty and Allied Sciences Society

# ESER . European Society of Emergency Radiology

- to establish Emergency Radiology (ER) as an area of special interest supranational on a European Base …
- to collaborate with the National Radiological Societies (NRS), existing subspeciality groups (SERAU/ES, NORDTIC TRAUMA/Scandinavia, SIRM/IT)
- .. to provide a **scientific and educational forum**
- .. to promote **research and technical developments**
- .. to **foster emergency radiology** in 41 national radiological societies

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# A new
# Subspecialty and Allied Sciences Society

## ESER . European Society of Emergency Radiology

## www.eser-society.org

### ESER Executive Board

| | | |
|---|---|---|
| **President** | 2012-2013 | U. Linsenmaier, Munich/DE |
| **Vice President** | 2012-2013 | M. Scaglione, Castel Volturno/IT |
| **Treasurer** | 2012-2013 | G. Schueller, Buelach/CH |
| **Member at Large** | 2012-2013 | L. Derchi, Genoa/IT |
| **Member at Large** | 2012-2013 | L. Donoso, Barcelona/ES |

### ESER Representatives at ESR Committees

| | | |
|---|---|---|
| **ESR Subspecialities and Allied Science Committee** | 2012-2013 | U. Linsenmaier, Munich/DE |
| **ESR Educational Committee** | 2012-2014 | V. Miele, Rome/IT |
| **ESR Professional Organisation Committee** | 2012-2014 | G. Schueller, Buelach/CH |
| **ESR Research Committee** | 2012-2014 | St. Wirth, Munich/DE |

### ESER Website & Public Relations

| | | |
|---|---|---|
| **Website Coordinator & PR Officer** | 2012-2013 | G. Goh, London/UK |

# DRG meets ESER II
# “Radiologische Bildgebung beim Polytrauma“
# Logistik und Patientenmanagement

**Priv. Doz. Dr. Uli Linsenmaier**
**Institut für Diagnostische und Interventionelle Radiologie**
**Kliniken München Pasing & Perlach KMPP, Munich**

**Associate Professor of Radiology, LMU Munich**
**President European Society of Emergency Radiology ESER**

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# Happy Days in Soccer

# Unhappy Days in Soccer

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IPL
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Z LMU
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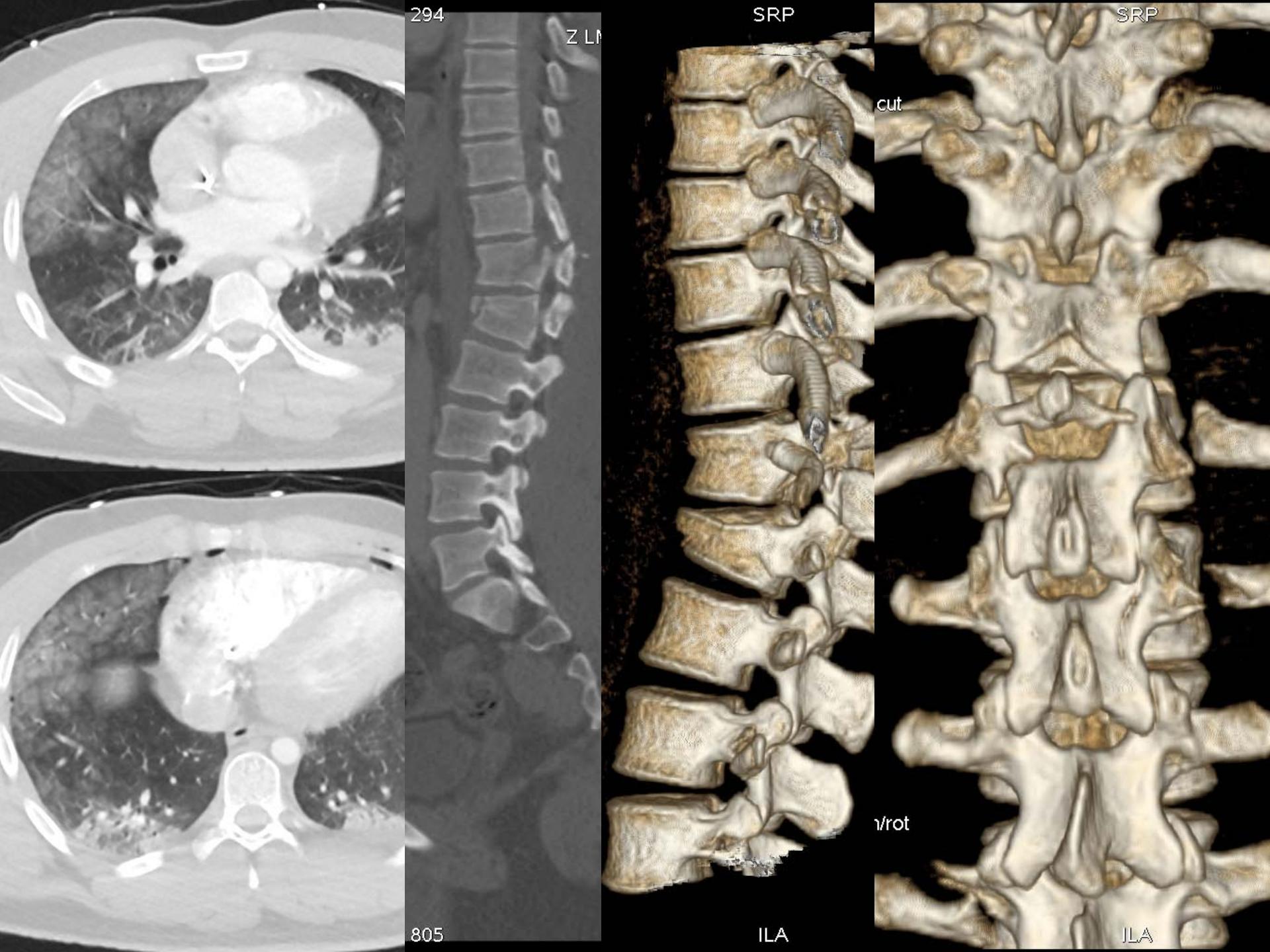
294
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ILA

# Definition & Ätiologie Polytrauma

- Verletzungen mehrerer Körperregionen (z.B. Kopf, Thorax, Abdomen etc.) vor, von denen eine oder die Kombinationen mehrerer Verletzungen potentiell tödlich ist*
- Injury Severity Score (ISS ≥ 16) (S BAKER)
- Über 18.000 Unfalltote in Deutschland (2007)**
- Häufigste Todesursache < 45 Jahre***

*Tscherne H et al., Langenbecks Arch Chir 1984
**Linsenmaier U Körner M et al., Radiologe 2009
***Mutschler W, Kanz KG, Radiologe 2002

# Verletzungsschwere

## AIS (abbreviated injury score):

Verletzungsschwere einzelner Organe/Regionen

| AIS-Code | |
|---|---|
| 1 | gering |
| 2 | mäßig |
| 3 | ernst, nicht lebensbedrohlich |
| 4 | schwer, lebensbedrohlich |
| 5 | kritisch, Überleben fraglich |
| 6 | tödlich, nicht behandelbar |

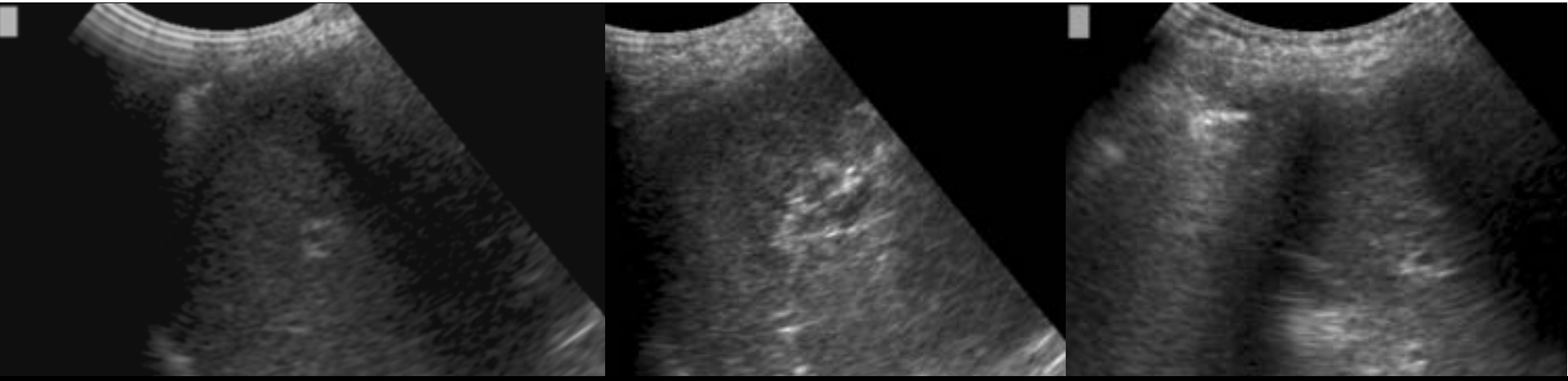
# Injury severity score (ISS)

- ISS max $[5^2] + [5^2] + [5^2] = 75$
- AIS 6 (tödliche Verletzung) => ISS 75
- AIS 4 (= lebensgefährliche Verletzungen) => ISS=16

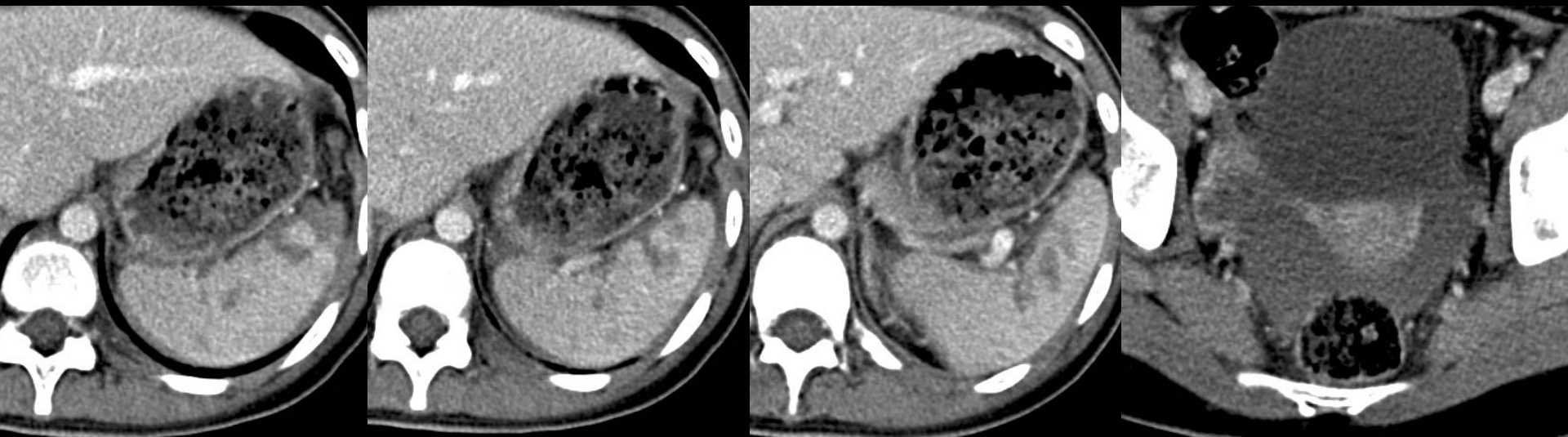
> 16 ( = schwerverletzter Patienten / Polytrauma)

- Gute Korrelation mit der Mortalitat
- Goldstandard für die Bewertung von Traumapatiente

# Traumascoring – Milzruptur III°



- Am häufigsten betroffenes parenchymatöses Organ
- Häufig Begleitverletzungen: Rippenfrakturen, Leber, Zwerchfell !!
- Zweizeitige Ruptur (subkapsuläres Hämatom, Tage bis Wochen später Ruptur der Kapsel)



# Scoring der Milzverletzungen

*Tab. 13.8* ⇢ *Schweregrad der Milzverletzung (Organ Injury Scale – AAST; modifiziert nach Federle et al, 1998)*

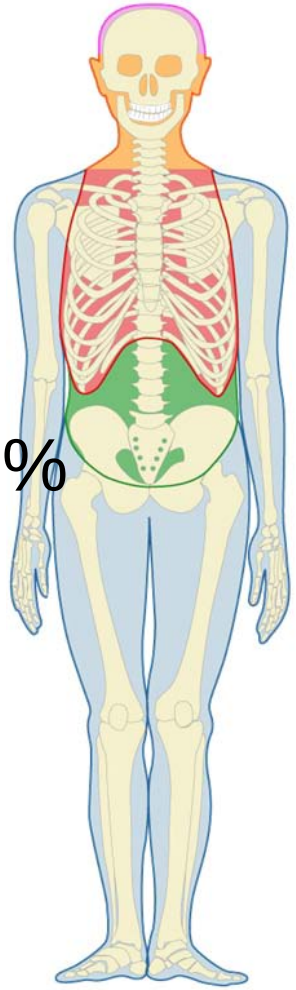
| Grad | Verletzung | Beschreibung |
|---|---|---|
| I | Hämatom | subkapsulär, nicht expansiv, <10 % der Oberfläche |
| | Lazeration | Kapselriss, keine Blutung, <1 cm Parenchymtiefe |
| II | Hämatom | subkapsulär, nicht expansiv, 10–50 % Oberfläche<br>intraparenchymal, <2 cm Durchmesser, nicht expansiv |
| | Lazeration | Kapselriss, aktive Blutung, 1–3 cm Parenchymtiefe |
| III | Hämatom | subkapsulär, >50 % Oberfläche oder expansiv<br>rupturiertes subkapsuläres Hämatom mit aktiver Blutung<br>intraparenchymatös, >2 cm im Durchmesser oder expansiv,<br>mehrere Grad-I- oder Grad-II-Verletzungen |
| | Lazeration | > 3 cm Parenchymtiefe |
| IV | Hämatom | rupturiertes intraparenchymatöses Hämatom mit aktiver Blutung |
| | Lazeration | Einbeziehung der Hilusgefäße mit Perfusionsstörung >25 % |
| V | Lazeration | Milzruptur |
| | vaskulär | Hilusgefäßverletzung mit devaskulierter Milz |

Fehlende Korrelation zwischen Grading und Versagen der konservativen Therapie

# Verletzungsmuster

## Chirurgische Klinik IS

- 226 Patienten (2009)
- Männlich: 77.1%
- Alter: 42.3 Jahre
- Stumpfes Trauma: 86.7%
- Mittlerer ISS: 21.4
- ISS > 15: 67.6%

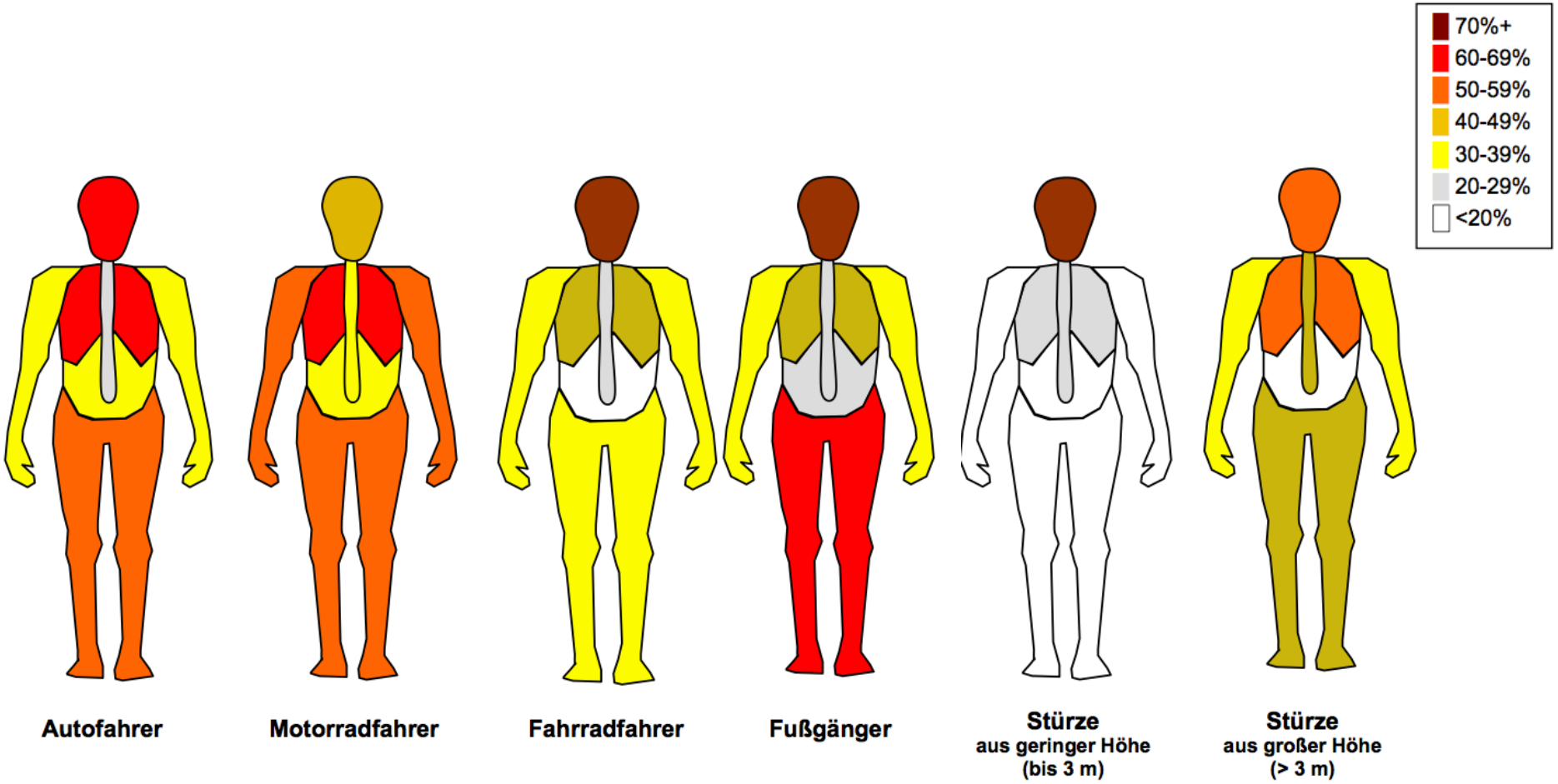


| | |
|---|---|
| Schädel/Hirn | 54.0% |
| Gesicht/Hals | 8.9% |
| Thorax | 58.8% |
| Abdomen | 23.5% |
| Extremitäten | 36.6% |

AIS ≥ 3 für jede Region

Jahresbericht der DGU (2005)

# Verletzungsmuster




Jahresbericht der DGU (2009)

# Wer kommt in den Schockraum?
# >> Ganzkörper CT >> WBCT

| Checkliste: Unfallmechanismus | Checkliste: Verletzungsmuster | Checkliste: Vitalparameter |
|---|---|---|
| ❑ Sturz aus mehr als 5 m Höhe | ❑ Instabiler Thorax | ❑ Glasgow Coma Scale < 10 |
| ❑ Explosionsverletzung | ❑ Offene Thoraxverletzung | ❑ Systolischer Blutdruck < 80mmHg |
| ❑ Einklemmung oder Verschüttung | ❑ Instabile Beckenfraktur | ❑ Atemfrequenz < 10 oder > 29/min |
| ❑ Ejektion aus dem Fahrzeug | ❑ Frakturen von ≥ 2 Röhren-knochen a.d. unteren Extremität | ❑ $SO_2$ < 90%(<85% bei >75 Jahren) |
| ❑ Tod des Beifahrers | ❑ Proximale Amputationsverletzung von großen Gliedmaßen | |
| ❑ Fahrradfahrer angefahren | ❑ Rippenserienfrakturen bei wertigen Zusatzverletzungen | |
| ❑ Fußgänger angefahren | | |
| ❑ Motorrad oder Autounfall mit höherer Geschwindigkeit | | |

## Unfa

- Sturz aus
- Explosion
- Einklemm
- Ejektion
- Tod des
- Fahrradfa
- Fußgäng
- Motorrad mit höher

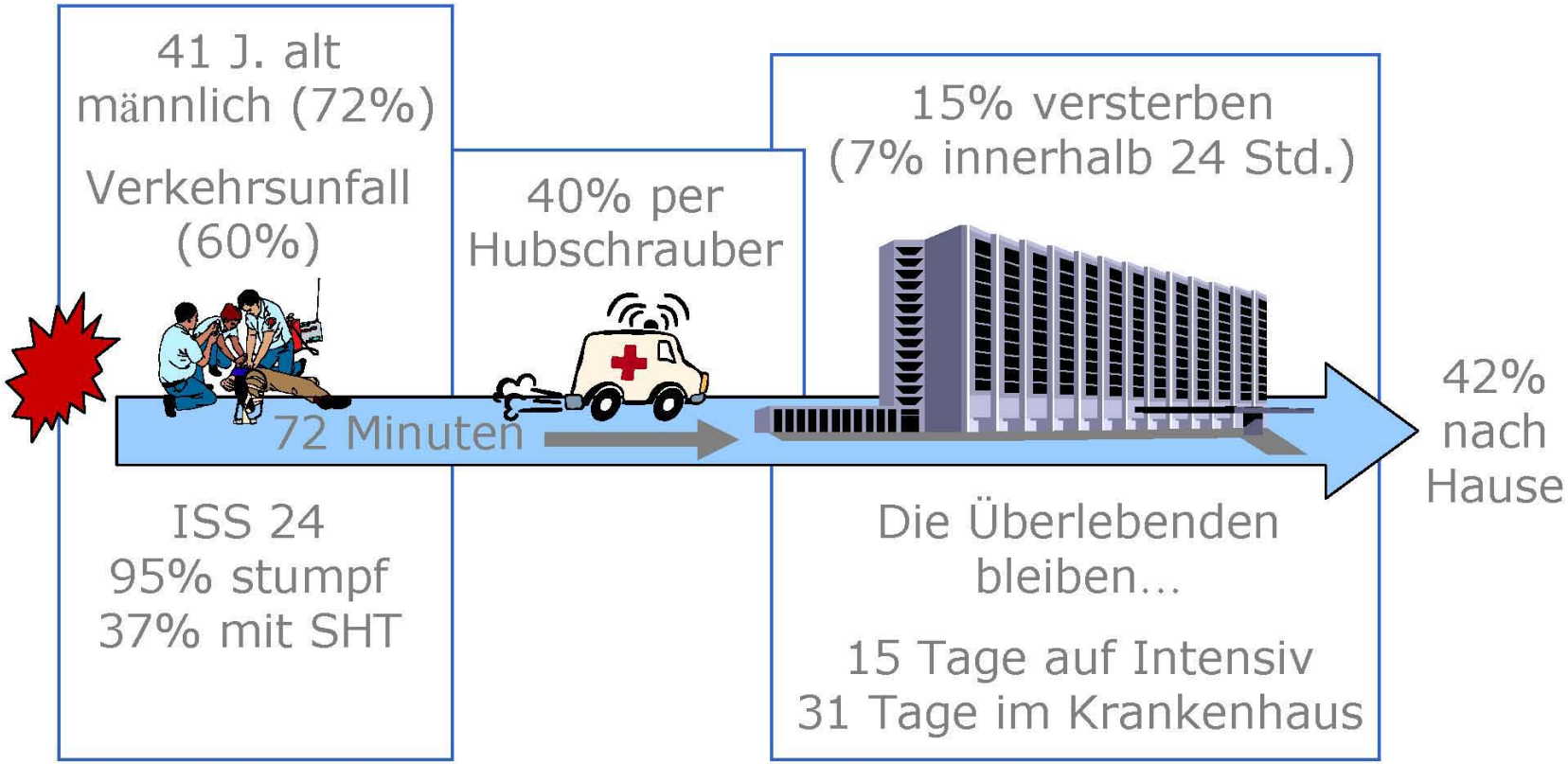
## Che Verletzu

- Instabiler Tho
- Offene Thora
- Instabile Beck
- Frakturen von knochen a.d.
- Proximale Am von großen G
- Rippenserient wertigen Zusa

## Checkliste: Vitalparameter

- Glasgow Coma Scale < 10
- Systolischer Blutdruck < 80mmHg
- Atemfrequenz < 10 oder > 29/min
- $SO_2$ < 90%(<85% bei >75 Jahren)

# Der typische Polytraumapatient



# Overtriage and critical mortality

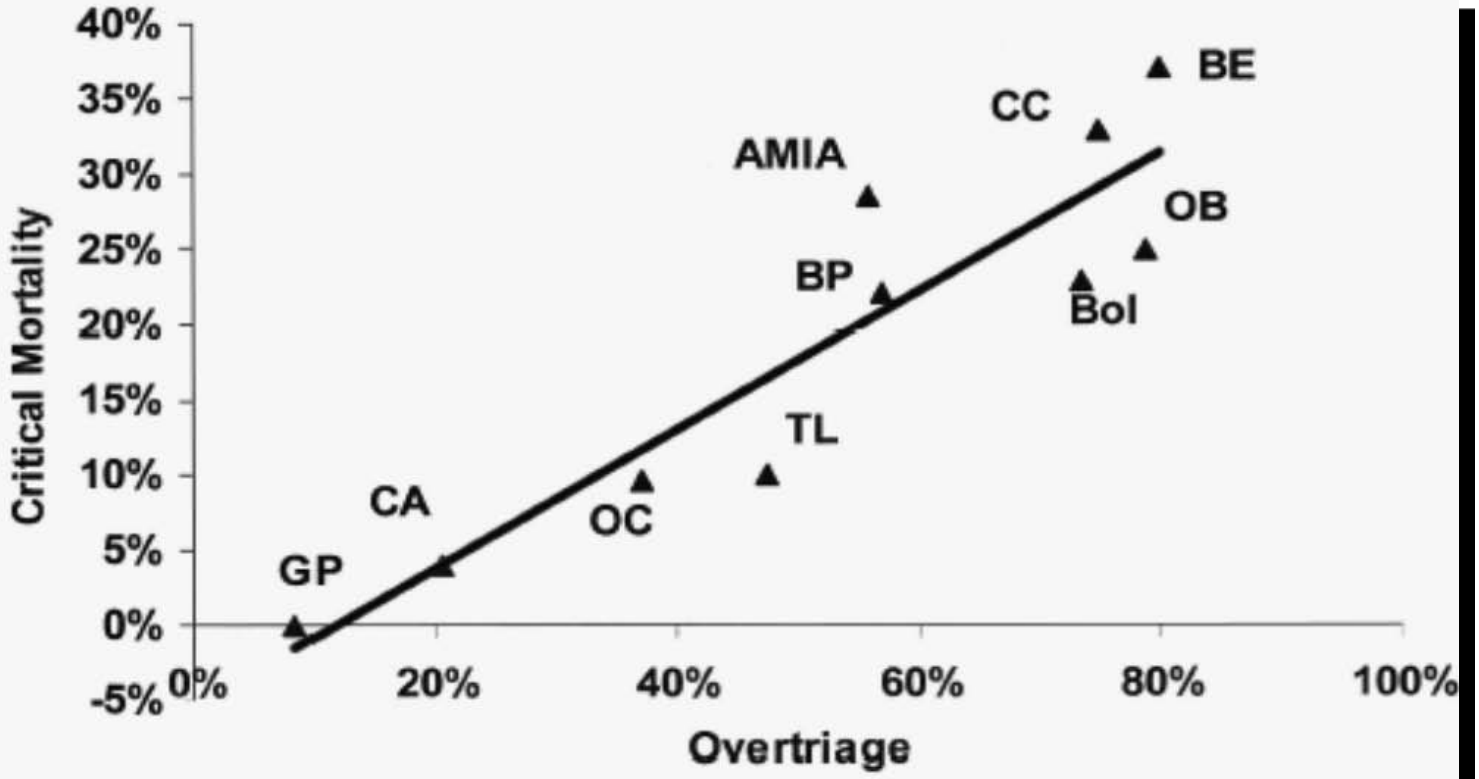



**Fig. 1.** *Graphic relation of overtriage rate to critical mortality rate, in 10 terrorist bombing incidents from 1969 to 1995, derived from data in Table 6. Linear correlation coefficient* (r) = *0.92. GP, Guildford pubs; CA, Craigavon; OC, Oklahoma City; TL, Tower of London; BP, Birmingham pubs; Bol, Bologna; AMIA, Buenos Aires; OB, Old Bailey; CC, Cu Chi; BE, Beirut.*

# Ablauf Notfallversorgung

## Nach Einlieferung in die Klinik:

- Körperliche Untersuchung (ATLS)
  - A: Airway
  - B: Breathing
  - C: Circulation
  - D: Disability
  - E: Environment
- Behebung akut lebensbedrohlicher Zustände
- **Apparative Diagnostik**
- Einleitung der Therapie

# Strategies & Priorities

- Pat is admitted by ER team (surgery, anesthesia, radiolog
- Identify priorities, bleeding control
- Diagnostic and therapeutic procedures parallel
- Diagnosis and therapy of life threatening injuries
- Prepare pat for early MDCT
- Quick primary survey (ATLS)
- Early whole body WB-MDCT

# Aktuelles Vorgehen (64-Zeiler)

- Ultraschall als FAST
- CR Thorax nur bei Intubation, TD, Instabilität

- **Ganzkörper CT**
- „feet first“, GK-Scout
- CCT Spirale, o. Tilt
  Thorax + HWS arteriell, Bolustracking, cau>cra
  Abdomen + Becken portalvenös, 70 s, cra>cau
- Gesamtdauer: unter 4 min
- Volume Image Reading (Workstationen)
- Aotorekons: MPR sag/cor 3mm
- Knochenrekons:  WS, Becken
- Elktivrekons: Extremitäten; < evtl Zusatzscans

# Whole Body MDCT in the ER - Time

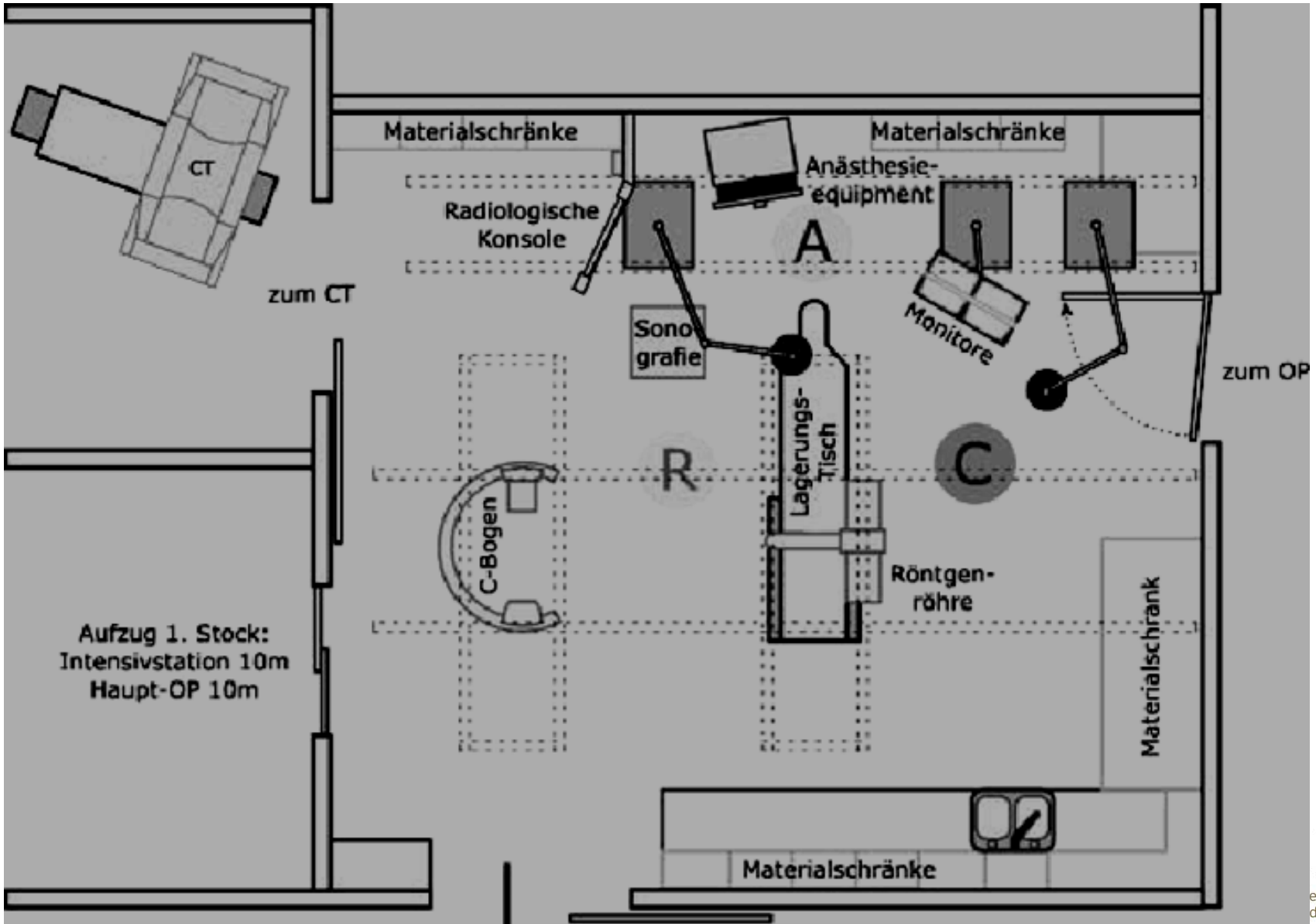
| | ER admission - first images | CT examination | MPR data calculation | Scan time | ER admission - end of scan |
|---|---|---|---|---|---|
| Median | 21:12 | 6:08 | 5:29 | 0:56 | 25:17 |
| Minimum | 11:03 | 3:02 | 1:36 | 0:49 | 15:22 |
| Maximum | 1:40:51 | 24:29 | 1:36 | 1:05 | 1:54:12 |
| IQR | 18:13 – 27:52 | 4:04 – 8:27 | 3:36 – 8:14 | 0:52 – 0:59 | 20:06 – 29:42 |

In 75% of all patients a whole body MSCT including MPRs of the spine was completed <n 30 min after admission to the ER

# Computertomographie (CT)

# MDCT „close to“ or „in the“ ER

Department of Clinical Radiology, Munich University Hospital

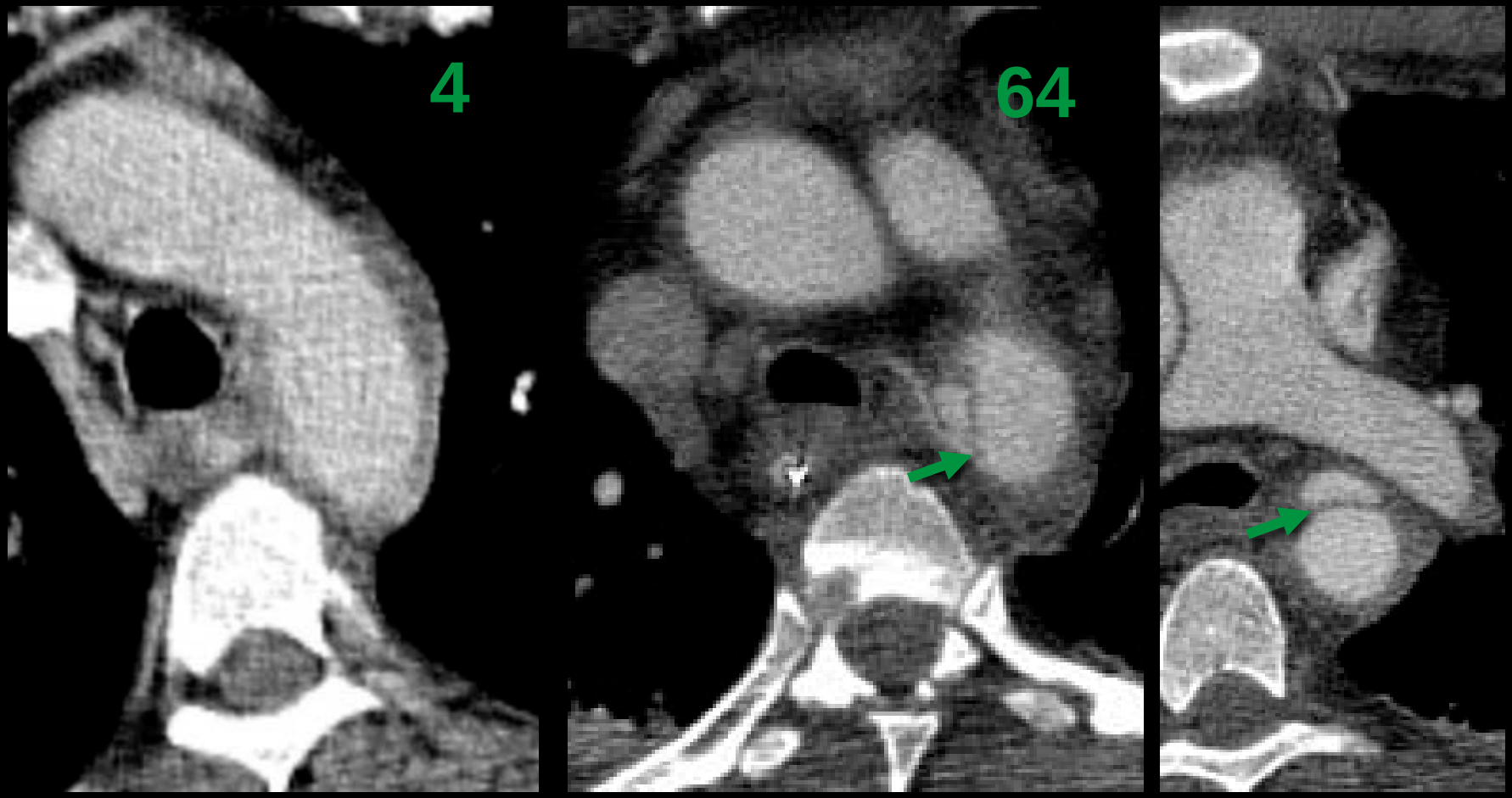


# Probleme bei der CT

> 200 kg

> 55 cm

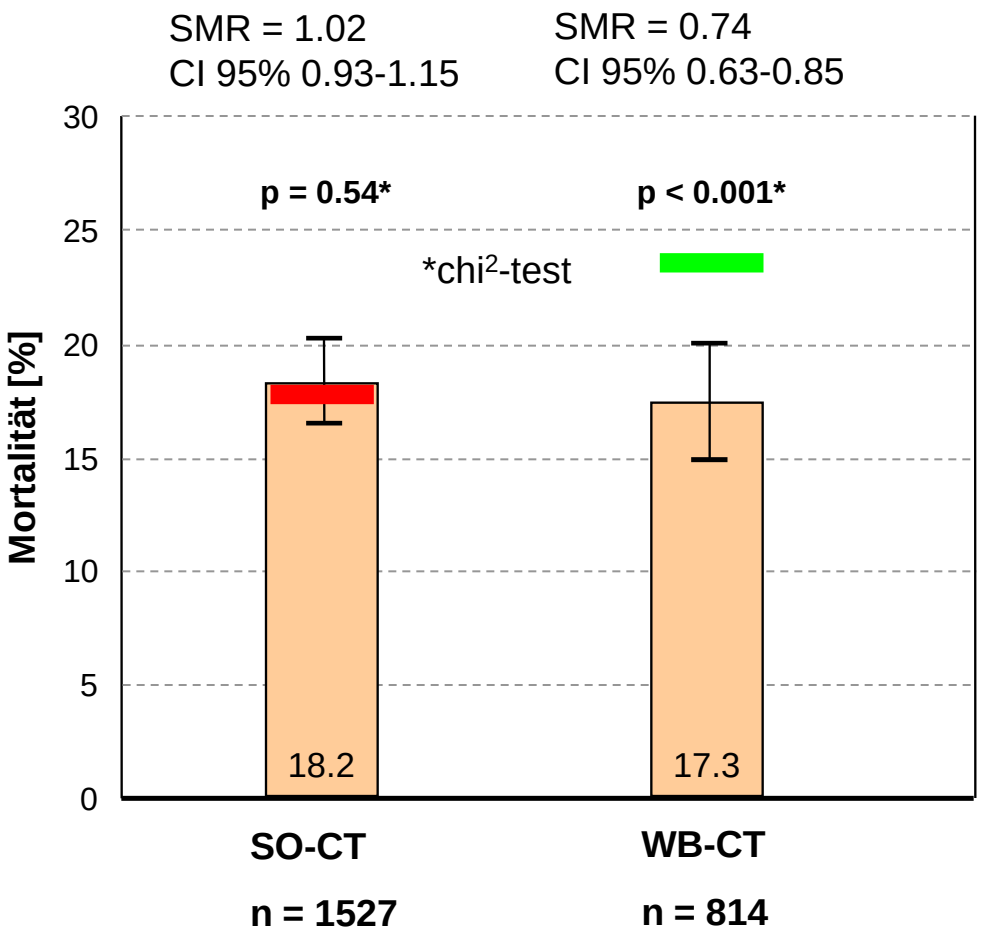
# Probleme: Optimale Technik



# Instabile Patienten

# GK CT: Überlebensvorteil

9,689 Patienten: GK-CT vs. selektive CT



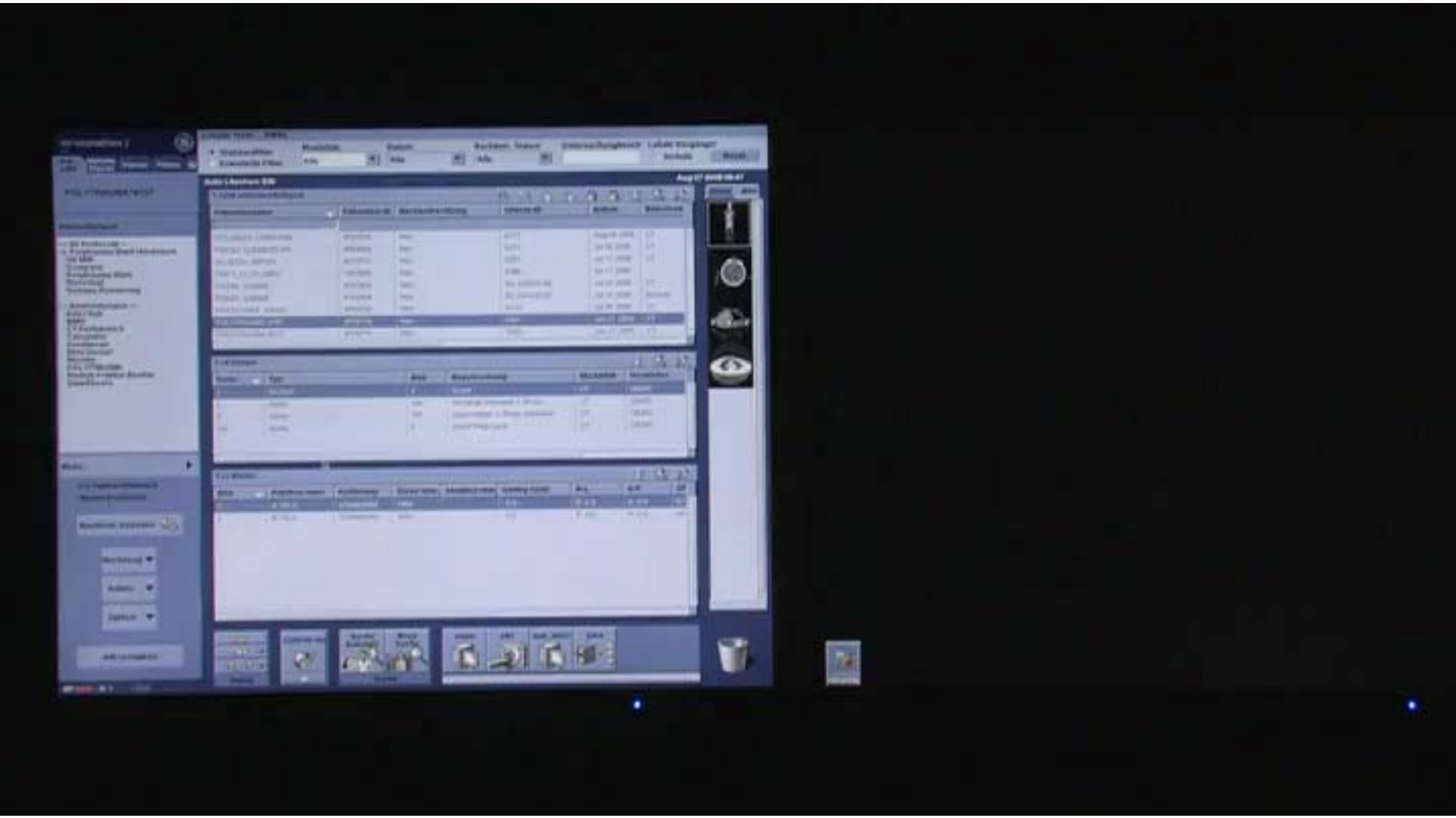

- beobachtete Mortalität signifikant geringer als erwartete Mortalität bei der Ganzkörper-CT

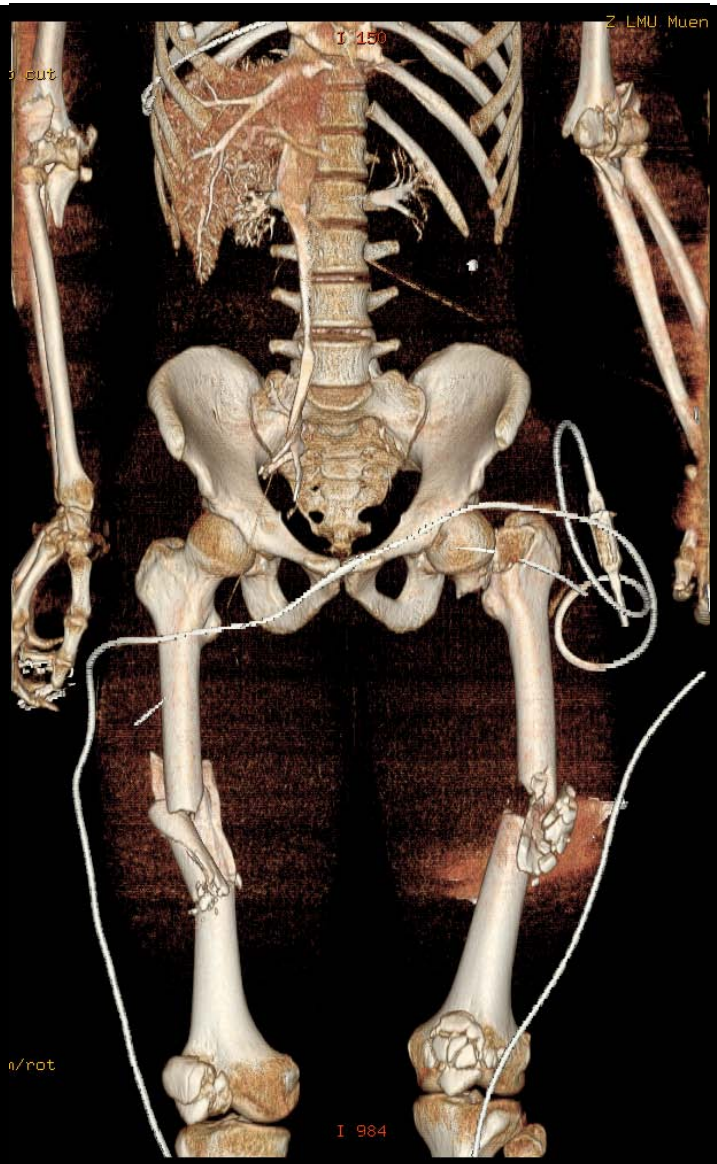
Linsenmaier, Körner M et al., ASER 2006
Huber-Wagner S, Körner M et al., Lancet 2009

# Volume Image Reading (VIR)

Körner M et al., AJR 2011

# VIR – Volume Image Reading

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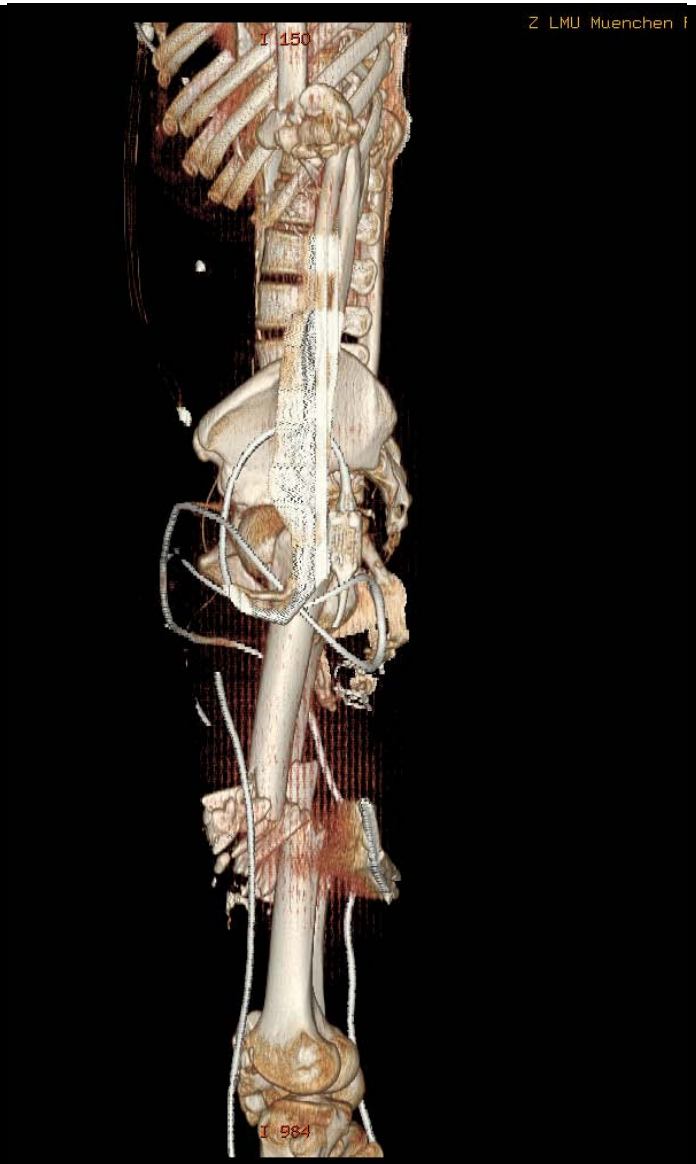
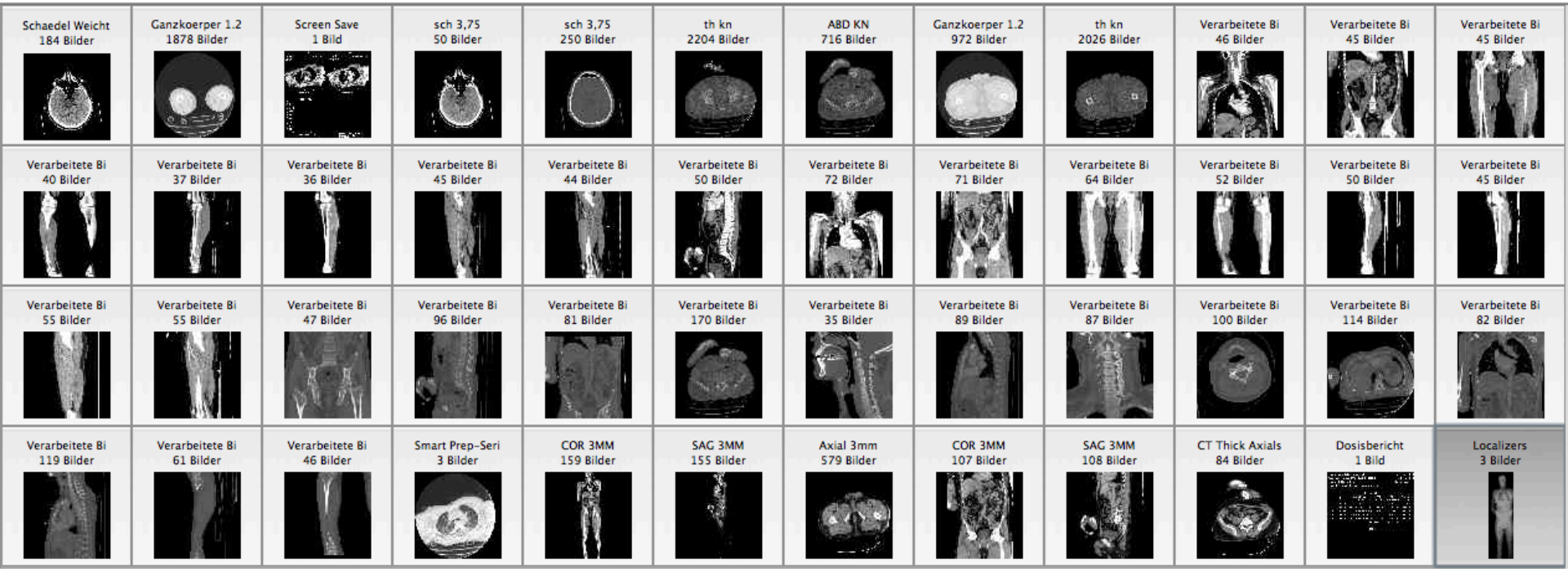
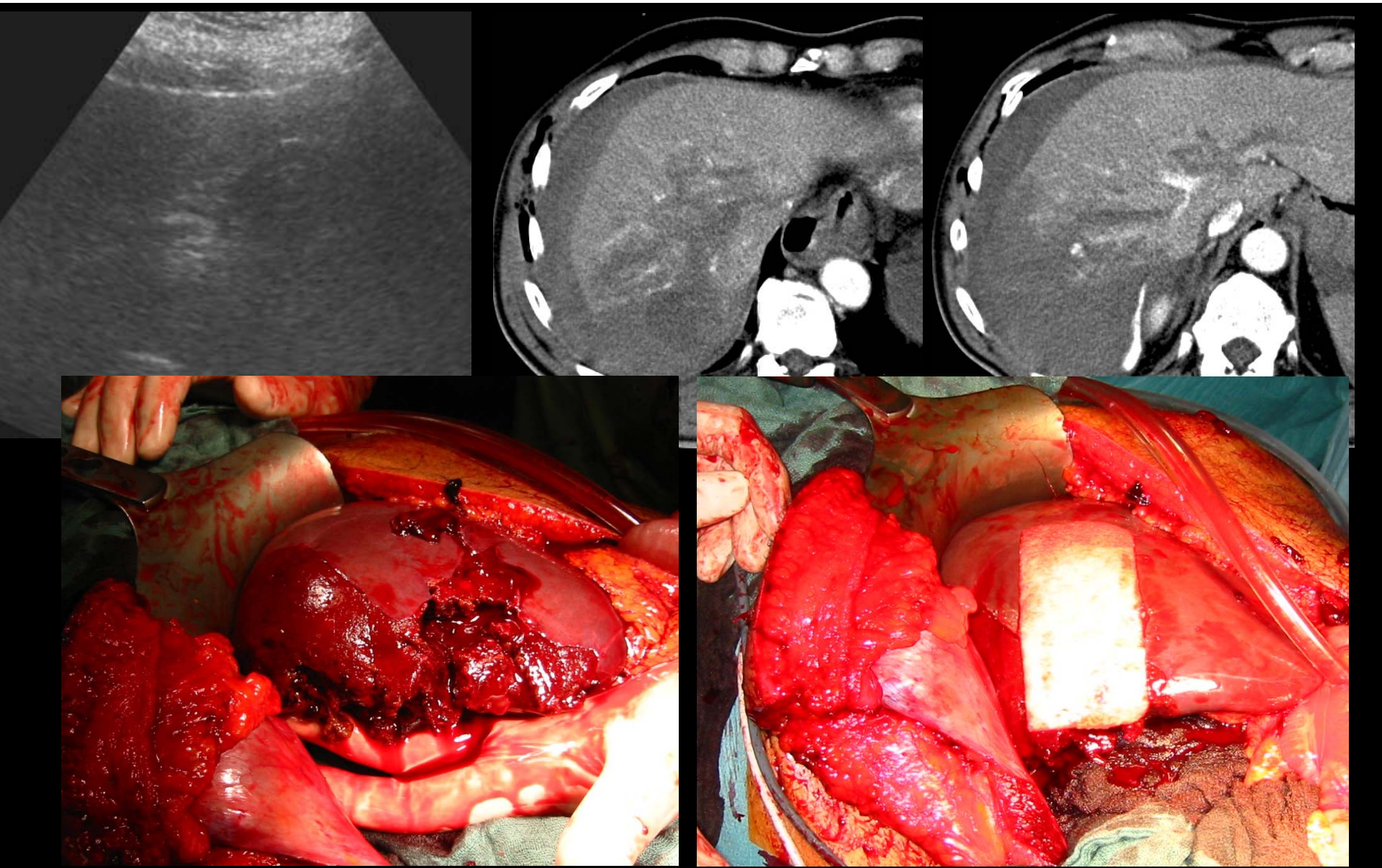

Z LMU Muenchen
I 150
I 984

# Archivierung



# Leber ? -- Ultraschall



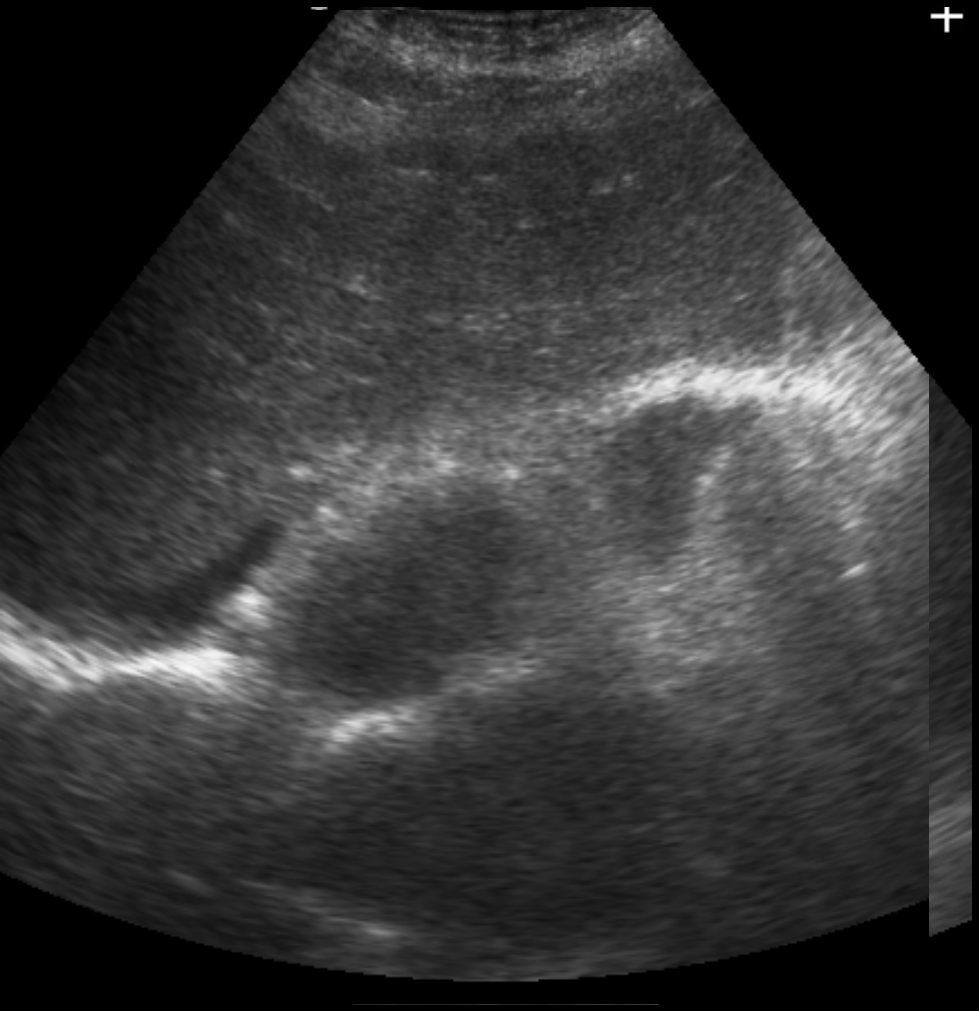
# Ultraschall

## Sensitivitäten:

| | |
|---|---|
| ▪ Freie Flüssigkeit: | 0.81 (0.28 – 0.98) |
| ▪ Organläsionen: | 0.79 (0.44 – 0.95) |
| ▪ Leber | 0.65 (0.15 – 0.88) |
| ▪ Milz | 0.65 (0.37 – 0.85) |
| ▪ Niere | 0.55 (0.23 – 1.00) |
| ▪ Pankreas | 0.58 (0.44 – 0.71) |
| ▪ Darm/Mesenterium | 0.24 (0.00 – 0.38) |
| ▪ **Perikard** | **0.98 (0.97 – 1.00)** |

Körner M et al., RadioGraphics 2008

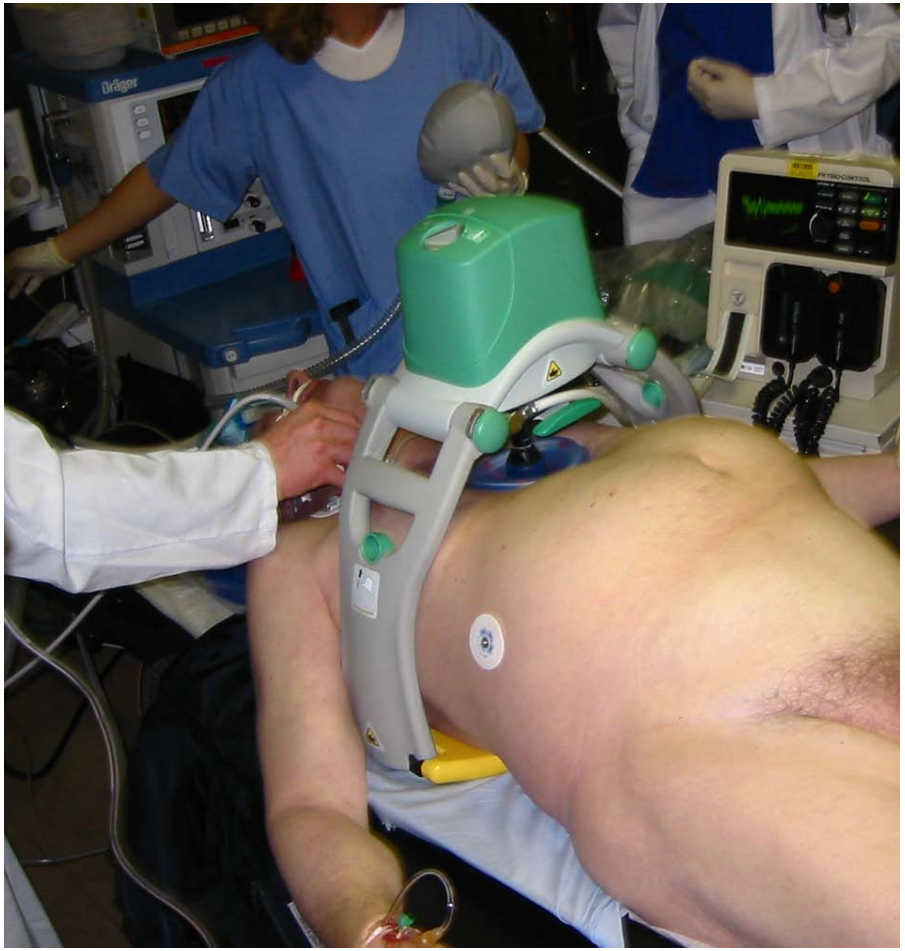
# Warum dennoch Ultraschall?



Leidel BA et al., Unfallchirurg 2008

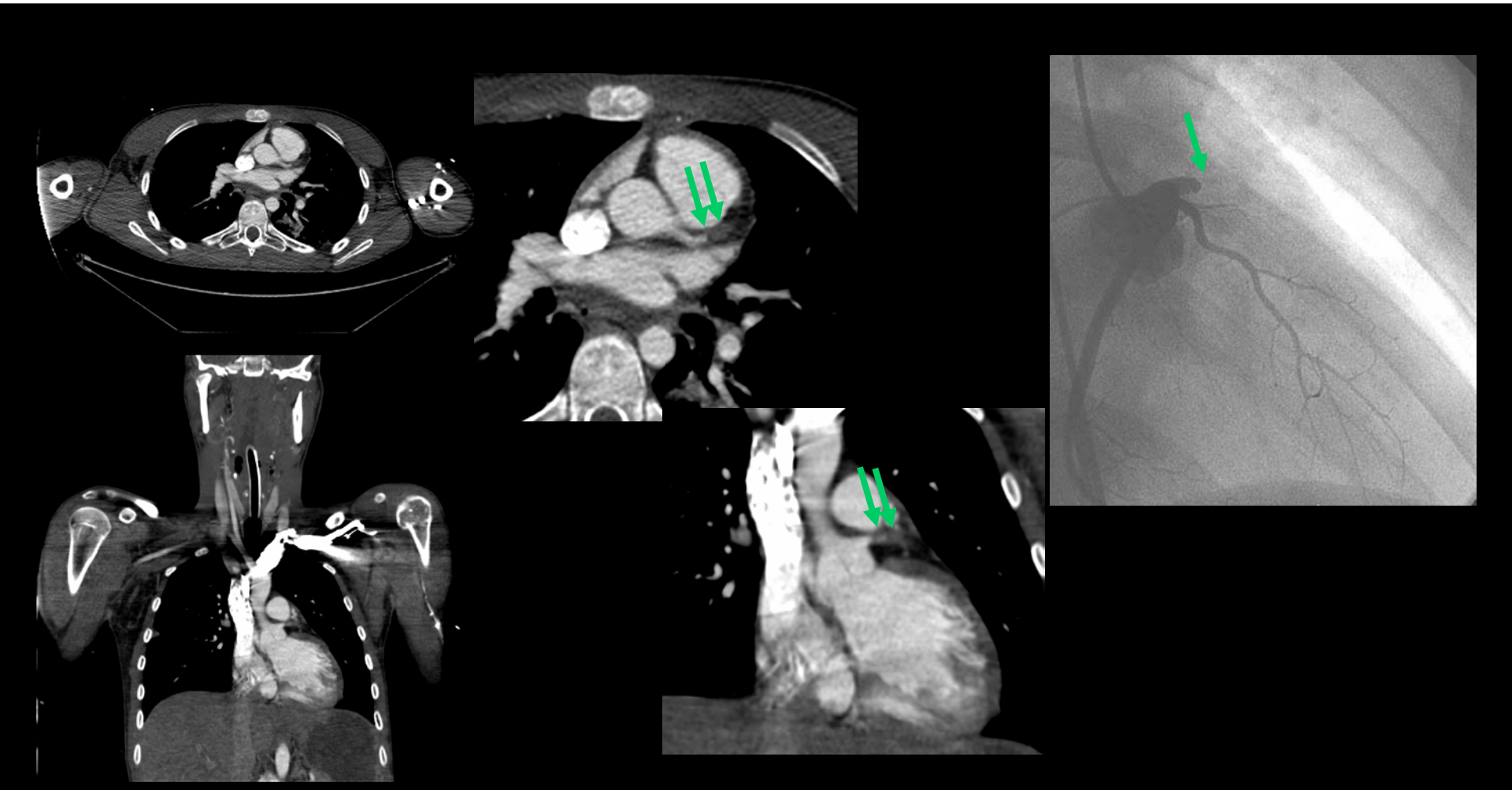
# New capabilities of Emergency Radiology In Polytrauma ?

# CT unter Reanimation



# Dissection of the LAD on non gated MDCT

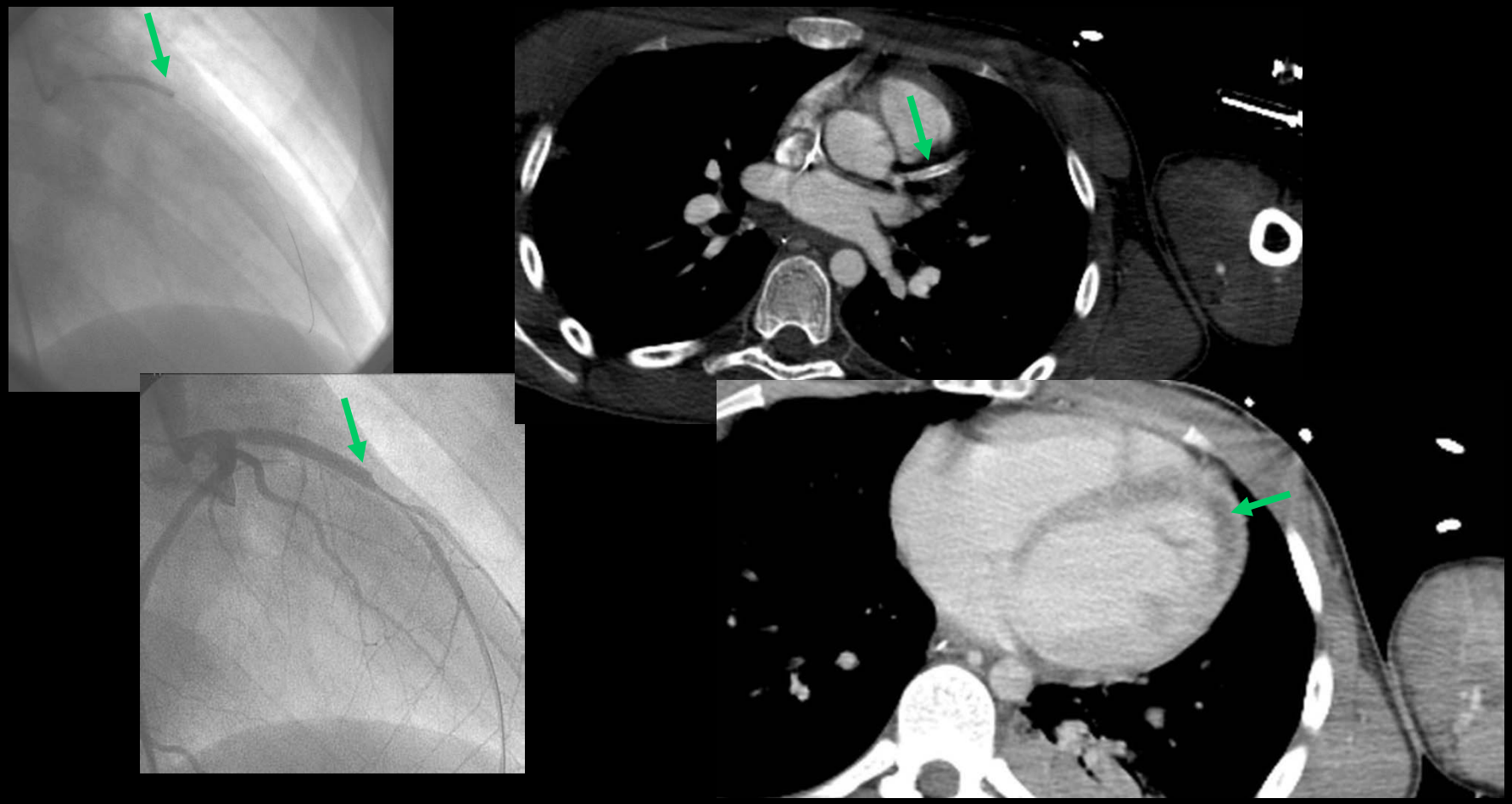
## 19yo S.p. high speed MVA



U. Linsenmaier, M.Körner et al. MDCT of Blunt Cardiac Injury. RSNA 2010

# Acute LAD recanalization

## Myocardial ischemia on follow up CT after stenting



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# Trends in use of CT in the ED
## (from 1995 to 2007)

Department of Clinical Radiology, Munich University Hospital

- Exponential rise of the CT use in the ED
  - 6-fold increase of the number of ED visits w CT
  - 5-fold increase of the percentage of ED visit w CT
  - continuous increase in the older population

Nat Hospital Ambulatory Medical Care Survey
> 350.000 or 30 044 visits / year evaluated 1995 to 2007

Larson DB et al. (2011). Radiology. *258:* 164-173

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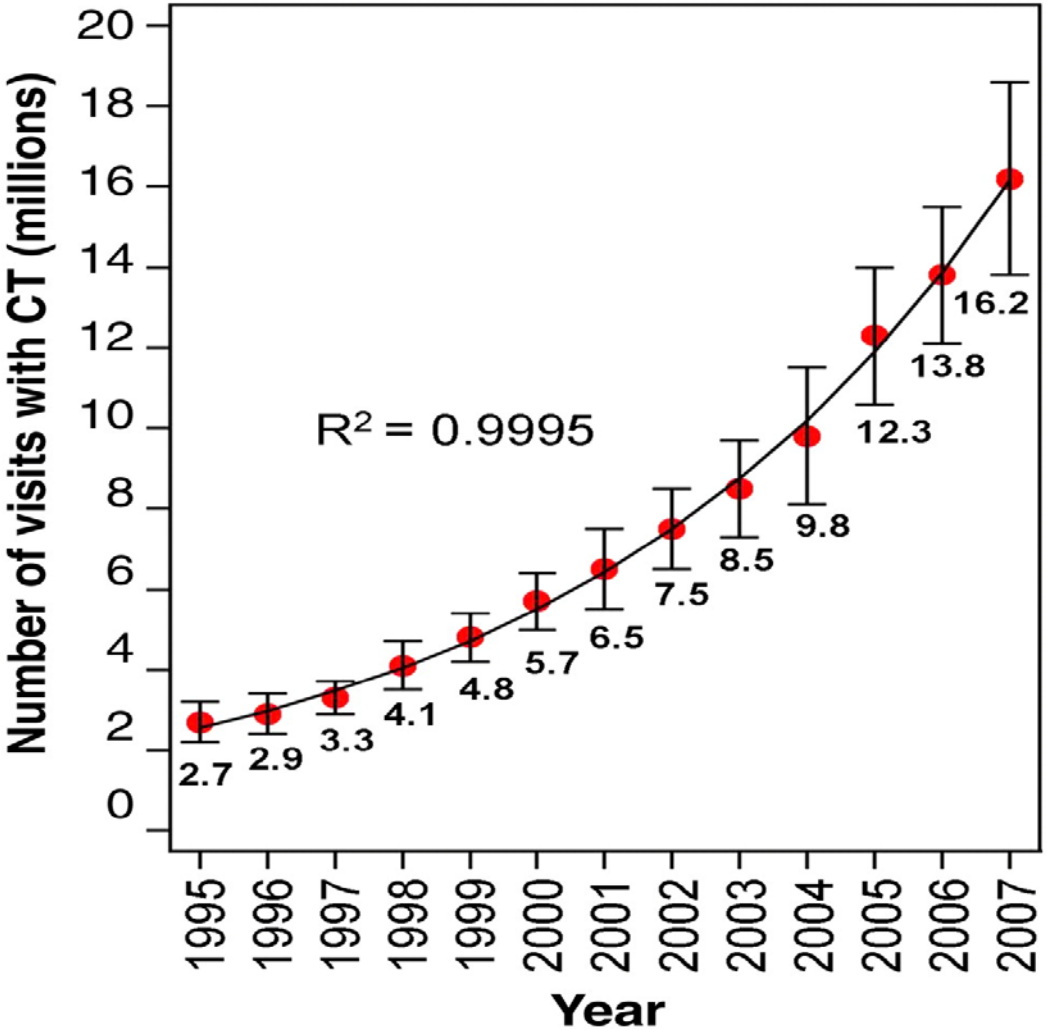
# Numbers of ED visits with CT from 1995 to 2007.




- exponential growth
- annual growth rate 16.0%
- doubling time 4.7 years

Larson DB et al. (2011). Radiology. *258:* 164-173

# Trends in the ED

Department of Clinical Radiology, Munich University Hospital

- MDCT improves patient triage and door-to-treatment times
- MDCT is the most important diagnostic tool for ED physicians
- MDCT: 1 out of 5 ED patients receive a CT
- MDCT use increased 330% (since 1995)
  largest increase: pts older than 79 (9.1% in 1996 to 29.1% in 2007).
- MDCT: Correlation between with drop in hospital admissions and *shift away* from expensive ICU admissions.

Nat Hospital Ambulatory Medical Care Survey
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Larson DB et al. (2011). Radiology. *258:* 164-173

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- ✓ Sports injuries (trauma)
- ✓ Highlights/Trends
- ✓ Polytrauma

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# Danke

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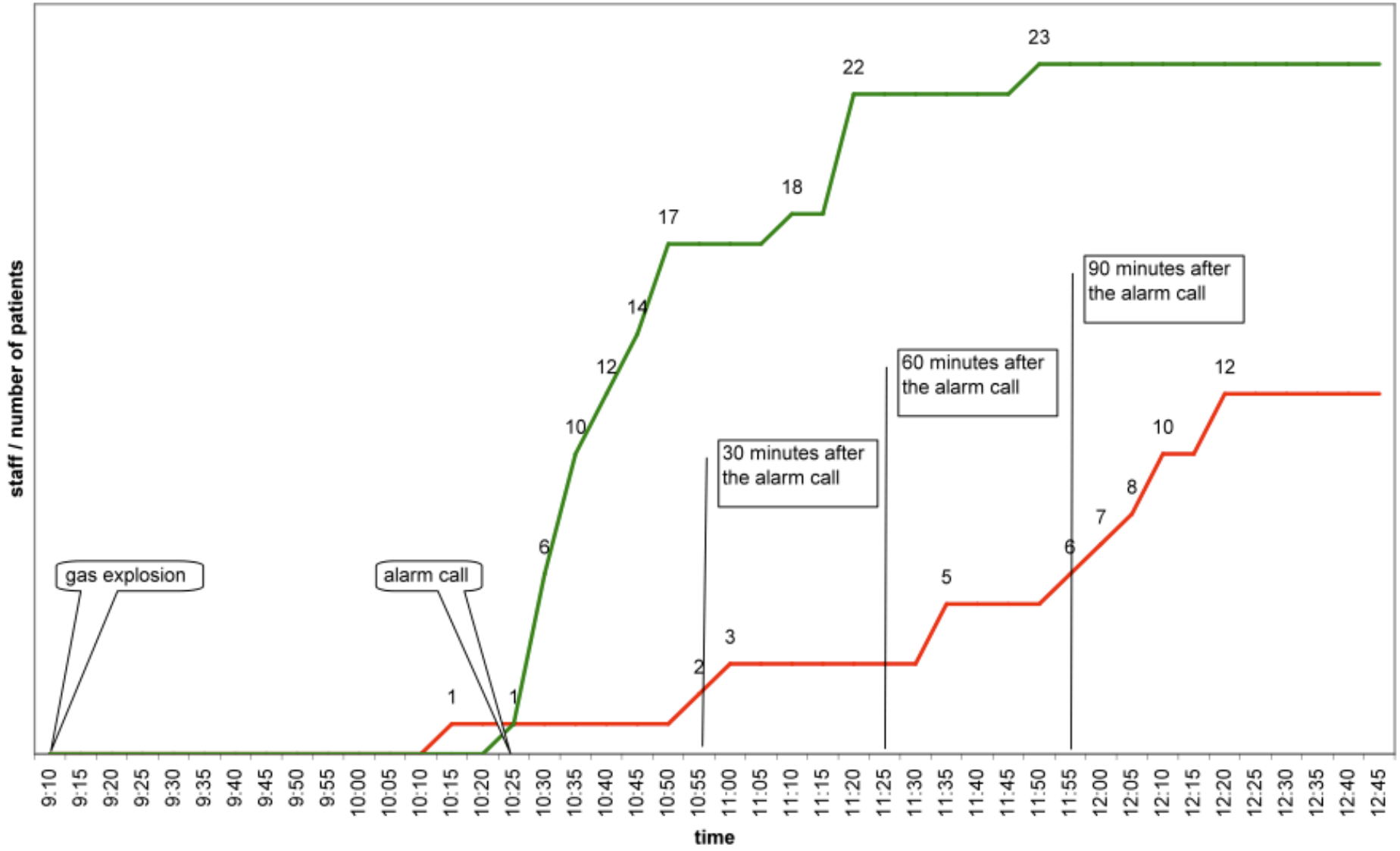
# Multiple CT scanners

## You may have two or more scanners but…

- You only have one network and PACS
- You need twice the staff at least
- You need more OR and ICU capacities

# Getting more staff



# Response time after alarm

| | Attending | Resident/Fellow | Tech |
|---|---|---|---|
| **Count** | 8 | 13 | 28 |
| **Call successful, response** | 63% | 63% | 36% |
| **Call successful, no response** | 37% | 31% | 57% |
| **Call unsuccessful** | 0% | 7% | 7% |
| **Mean ETA [min.]** | 19:36 | 22:08 | 41:00 |
| **ETA < 30 min.** | **4 (50%)** | **7 (54%)** | **4 (14%)** |

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# Emergency Radiology

- ✓ Pediatric emergencies
- ✓ Emergent Neuroimaging
- ✓ Acute chest (non-trauma)
- ✓ Acute abdomen (non-trauma)
- ✓ Sports injuries (trauma)
- ✓ Highlights/Trends
- ✓ Polytrauma

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# SUBSPECIALTY AND ALLIED SCIENCES SOCIETIES (11 + 3 = 14)

**CIRSE** Cardiovascular and Interventional Radiological Society of Europe

**ESCR** European Society of Cardiac Radiology

**ESER** **European Society of Emergency Radiology**

**ESGAR** European Society of Gastrointestinal and Abdominal Radiology

**ESHNR** European Society of Head and Neck Radiology

**ESMOFIR** **European Society of Molecular and Functional Imaging in Radiology**

**ESMRMB** European Society for Magnetic Resonance in Medicine and Biology

**ESNR** European Society of Neuroradiology

**ESOI** **European Society of Oncologic Imaging**

**ESPR** European Society of Paediatric Radiology

**ESSR** European Society of Musculoskeletal Radiology

**ESTI** European Society of Thoracic Imaging

**ESUR** European Society of Urogenital Radiology

**EUSOBI** European Society of Breast Imaging

# Subspecialization in Radiology

- starting from anglo-american countries back in the 1980s
- early specialization based on organ systems or body regions (neuro, pediatrics, mammo) or modalities (CT, MR, XA, IR)
- some grew and increased in importance (e.g. CT and MR, ) in one modality others further developed (Abdominal, Thoracic, MSK imaging) using multiple modalities
- new developments are ***process driven*** and result of ***complex and comprehensive imagining*** procedures, overcoming organ based specialization:
- **Oncologic Imaging** and **"Emergency Imaging** are examples representing fastest growing fields in radiology.

new
Subspecialty and Allied Sciences Societies

# ESER . European Society of Emergency Radiology

- ✓ Initiative launched in the year 2008-2009
  discussed with ESR @CR 2010
  by U. Linsenmaier, M. Scaglione, G. Schueller

- ✓ A group of 14 founding members was called in

- ✓ legally founded in October 2011 under Austrian law "Vereinsrecht"

# ESER Founding Members

Dominic Barron, MD; Leeds, UK
Paul Bode, MD, Leiden, NL
Otto Chan; London, UK
Markus Körner, MD; Munich DE
Digna Kool; Nijmegen, NL
Seppo Koskinen; Helsinki, FI
Bertil Leidner, MD, Stockholm, SW
Ulrich Linsenmaier; Munich, DE
Vittorio Miele, MD; Roma, IT
Michael Rieger, MD, Innsbruck, AT
Mariano Scaglione, MD; Napoli, IT
Gerd Schueller, MD; Vienna, AT
Michele Tonerini, MD; Pisa, IT
Stefan Wirth, MD, Munich, DE

Prof. Dr. Fred E. Avni, ESR Subspecialties Committee Chairman, Bruxelles, BE
Prof. Dr. Lorenzo Bonomo, President of ECR 2012, Rome, IT
Univ. Prof. Dr. Christian HEROLD, Past President of ESR, Vienna, AT
Prof. Dr. Dr. med. M. Reiser, FACR, FRCR, Past President of ESR, Munich, DE

new
Subspecialty and Allied Sciences Societies

# ESER . European Society of Emergency Radiology . Purpose

- to establish Emergency Radiology (ER) as an area of special interest and expertise …
- to collaborate with the European Society of Radiology (ESR), its committees and established subspecialty societies
- .. to provide both, a scientific and educational forum
- .. to promote research and technical developments
- .. to collaborate with 41 national radiological societies and their ER sections
- .. to promote a joint European approach in Emergency Radiology

## ESER Executive Board

| | | |
|---|---|---|
| President | 2012-2013 | U. Linsenmaier, Munich/DE |
| Vice President | 2012-2013 | M. Scaglione, Castel Volturno/IT |
| Treasurer | 2012-2013 | G. Schueller, Buelach/CH |
| Member at Large | 2012-2013 | L. Derchi, Genoa/IT |
| Member at Large | 2012-2013 | L. Donoso, Barcelona/ES |

## ESER Representatives at ESR Committees

| | | |
|---|---|---|
| ESR Subspecialities and Allied Science Committee | 2012-2013 | U. Linsenmaier, Munich/DE |
| ESR Educational Committee | 2012-2014 | V. Miele, Rome/IT |
| ESR Professional Organisation Committee | 2012-2014 | G. Schueller, Buelach/CH |
| ESR Research Committee | 2012-2014 | St. Wirth, Munich/DE |

## ESER Website & Public Relations

| | | |
|---|---|---|
| Website Coordinator & PR Officer | 2012-2013 | G. Goh, London/UK |