Il percorso diagnostico del Trauma Maggiore:

stratificazione del rischio per intensita' clinico-assistenziale

Osvaldo Chiara, SC Chirurgia Generale -Trauma Team - DEA-EAS, Ospedale Niguarda Ca'Granda

Parma, 23 gennaio 2013

First level diagnostic work-up:

-Clinical (primary, secondary)

-laboratory (ALT, AMY, LACTATE, urine)

-extended FAST

-chest xray

-pelvis xray

AIM:

1. identification of life-treathening injuries in unstable patients

2. Identification of stable or stabilized patients who need second level studies

Second level diagnostic work-up:

-xray of extremities

-ceMDCT + spine

-angiography

-NMR

AIM:

1. Stadiation of injuries in stable or stabilized patients

2. Resolution of special problems

Unstable

1° lev +

ICU monitoring

Unstable

Angio-embol

bleeding

Stable

1° lev +

TRAUMA TEAM

Trauma Protocol

Background……

ATLS 8° edition: Initial assessment: primary, ultrasound, chest and pelvis xray secondary, blood lab.

1. identification of life-treathening injuries in unstable patients
2. Identification of stable patients who need second level studies

Whole body multislice computed tomography as the first line diagnostic tool in patients with multiple injuries

Wurmb TE, et al: J Trauma 2009, 66: 658

Kanz KG, et al: Unfallchirurg 2004, 107:937

Exadactylos AK, et al: J Trauma 2001, 51: 1173

1. Increased accuracy (ch
2. Reduced time to OR

	ER tests +MDCT	AB + eFAST + MDCT	p
Time to full diagnosis (min)	**41±27**	**12±9**	**0.001**
Ready to OR (min)	**58±21**	**29±4**	**0.025**
Mortality	**0.16**	**0.17**	**n.s.**

Airway – Breathing – E-Fast – body MDCTscan

Whole-body multislice computed tomography as the primary and sole diagnostic tool in patients with blunt trauma: searching for its appropriate indication

American Journal of Emergency Medicine (2007) 25, 1057–1062

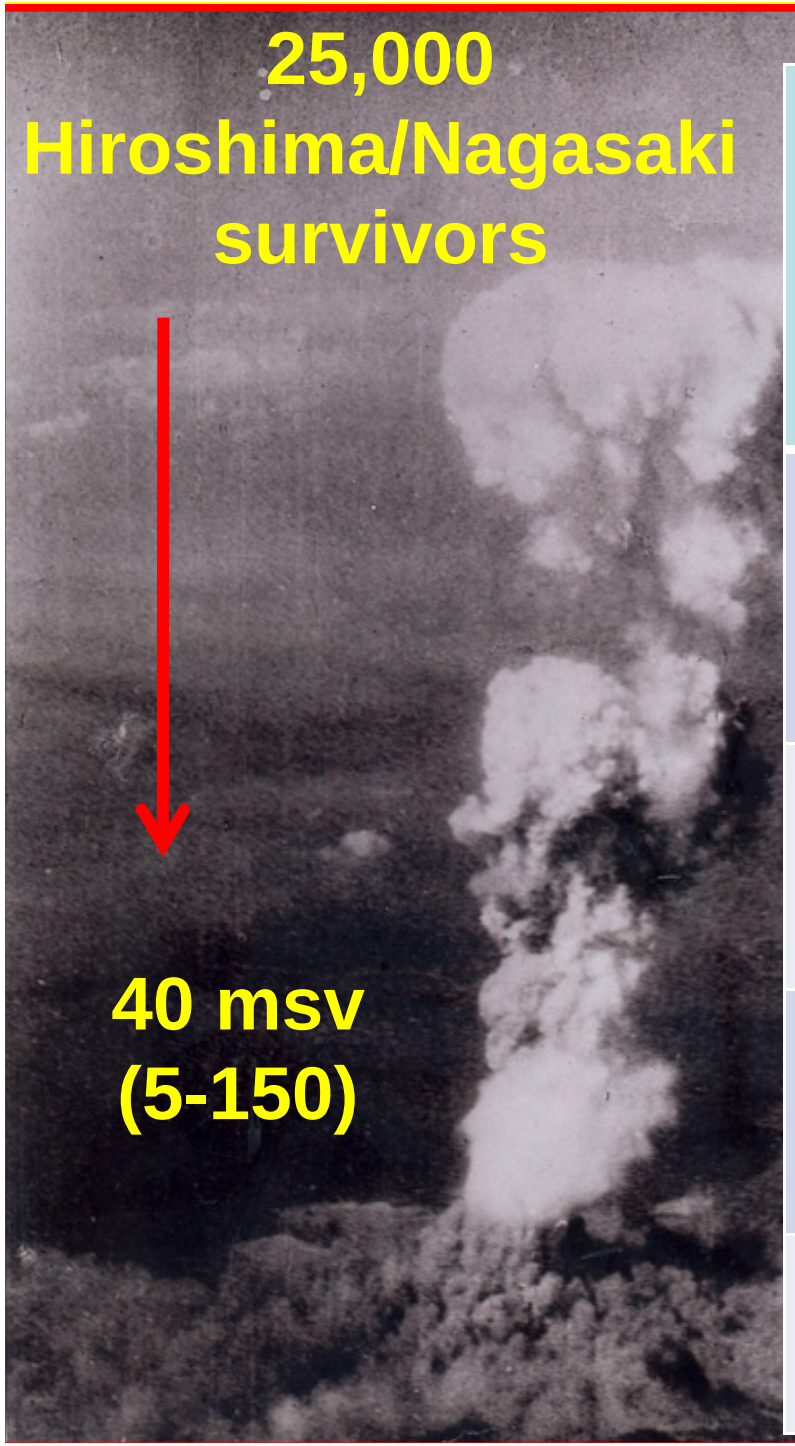
Thomas Erik Wurmb MD[a,*], Peter Frühwald MD[b], Wittiko Hopfner Cand Med[c], Norbert Roewer MD[a], Jörg Brederlau MD[a]

Table 1 Multiple trauma triage scheme

Category I, mechanism of trauma	Category II, vital signs	Category III, clinical apparent injuries
Falls >5 m	Blood pressure <80 mm Hg	Flail chest
Traffic accident	Respiratory rate <10; others, >29	Open chest wound
1. High-speed crash		
2. Crash against a truck		
3		
Au		
1		
2		
3		
4. Ejection from auto		
5. Death in same passenger compartment		
Explosion, buried person	Intubated patient with an initial GCS <9 on scene	Unstable pelvis ≥2 Proximal long-bone fractures Amputation proximal to wrist or ankle

patients with: (1) high energy mechanism of trauma, (2) altered vital signs, (3) anatomy of severe injury, all received whole body MDCT

Overtriage 30% !!!



Type of exam (single scan)	Effective Dose mSv	Equivalent n° of chest x-ray
CT brain + Cspine	8.2	400
CT chest	8	400
CT abd	10	500
CT pelvis	10	500

Richards P, Injury 2007, 39:347

PPV 0.95

Pre-hospital triage criteria (200 consecutive pts)

Physiologic data	# pts	ISS≤15	ISS>15	PPV
GCS<14	82 (67,21%)	5	77	0,94
PAS<90 mmHg	23 (18,85%)	0	23	1,00
FR<10 o >29 atti/min	17 (13,94%)	0	17	1,00

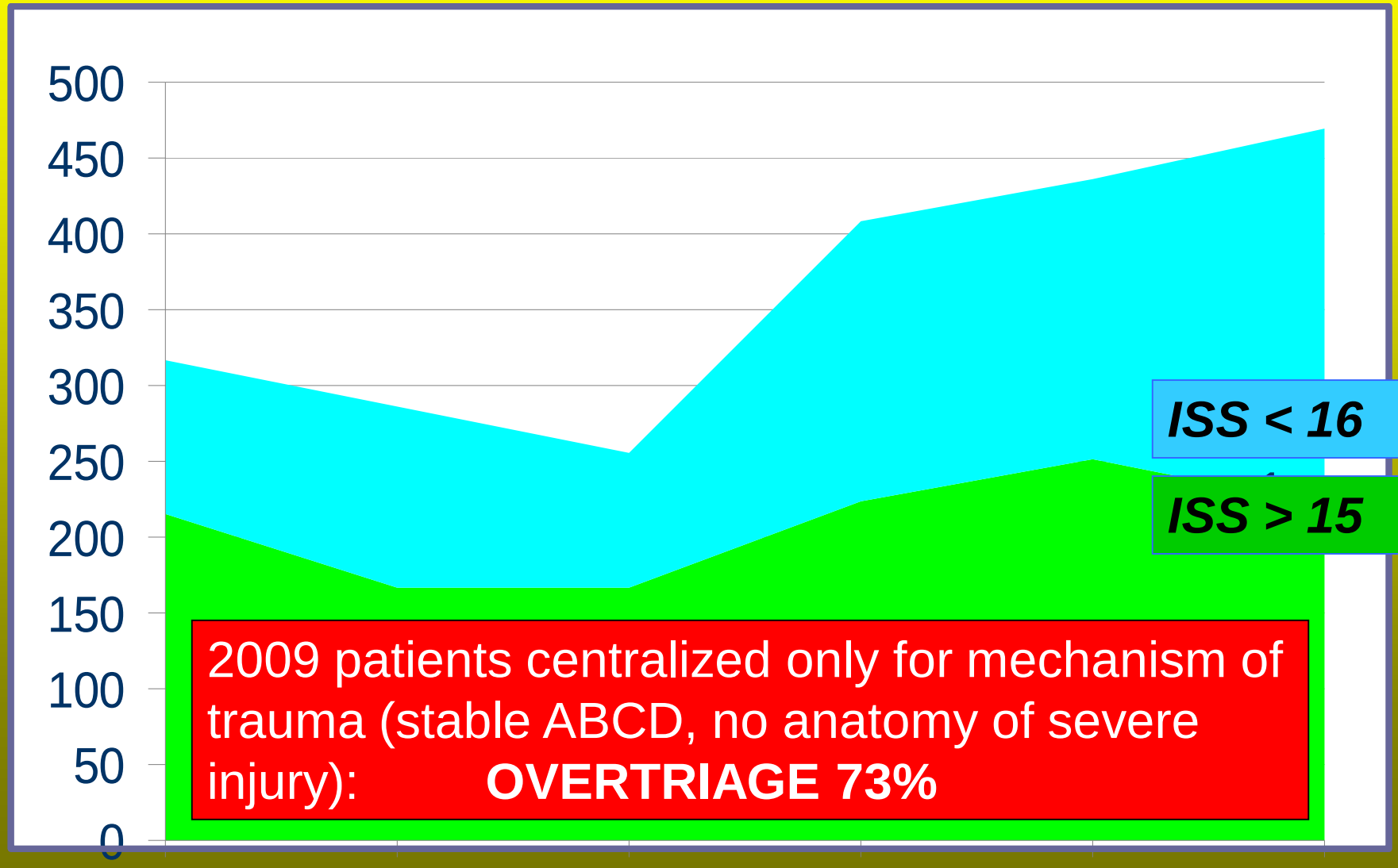
Chiara O, et al

Data	# pts	ISS≤15	ISS>15	PPV
Ejection	10	3	7	0,70
speed>60 km/h	32	13	19	0,59
Deformity>50 cm	18	9	9	0,50
Intrusion >30 cm	4	0	4	1,00
Rollover	11	4	7	0,64
Death in the same compartment	6	0	6	1,00
Injury car-ped/bicycle>10 km/h	31	4	27	0,87
Pedestrian thrown or rollover	27	6	21	0,78
Motorcycle injury speed>40 km/h	34	3	31	0,91
Motorcycle driver thrown or rollover	17	4	13	0,76
fall>6 mt	29	4	25	0,86
Crash imjury	8	1	7	0.87
Estrication time >20 min	18	6	12	0,67

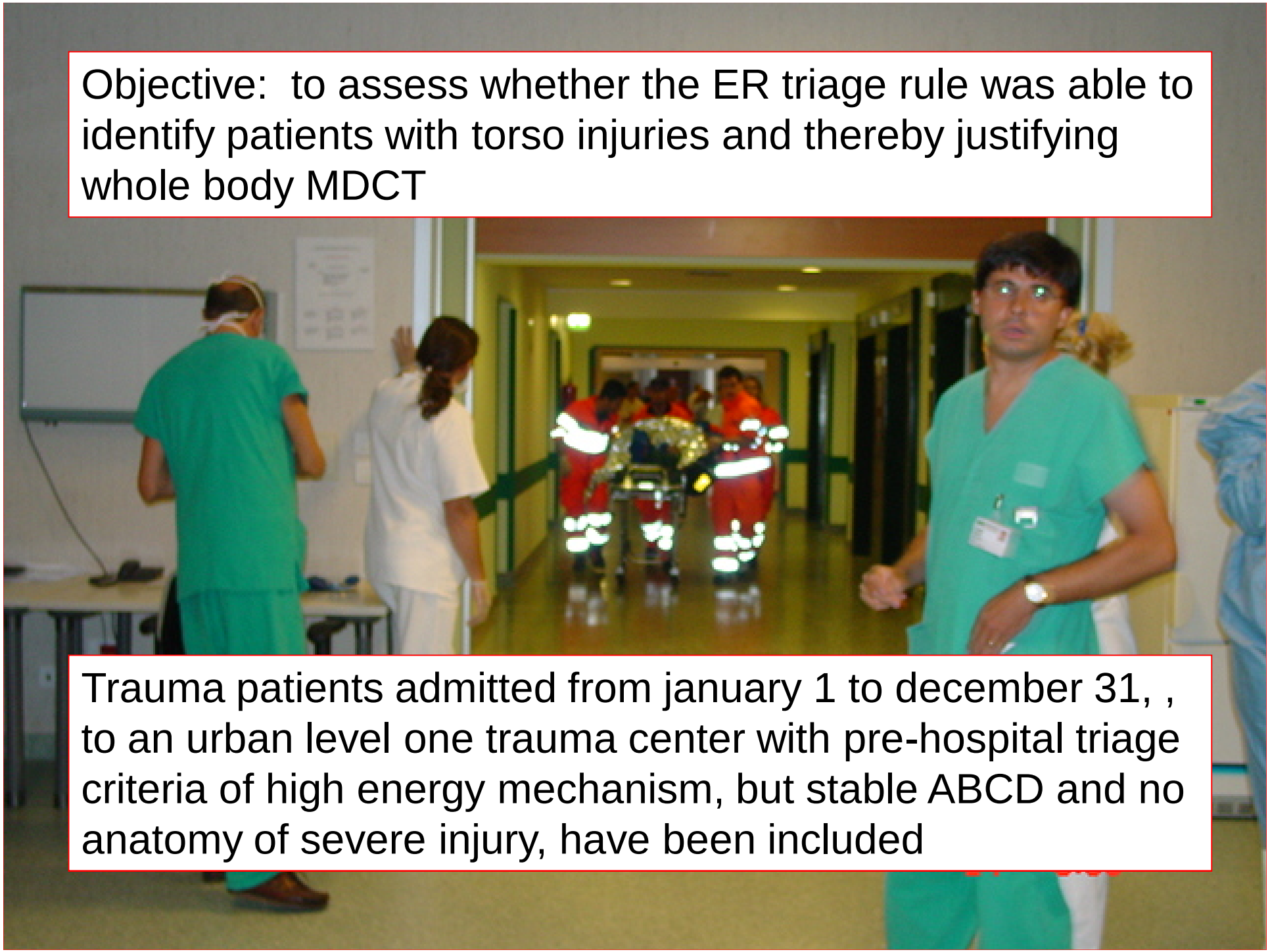
PPV 0.76

overtriage

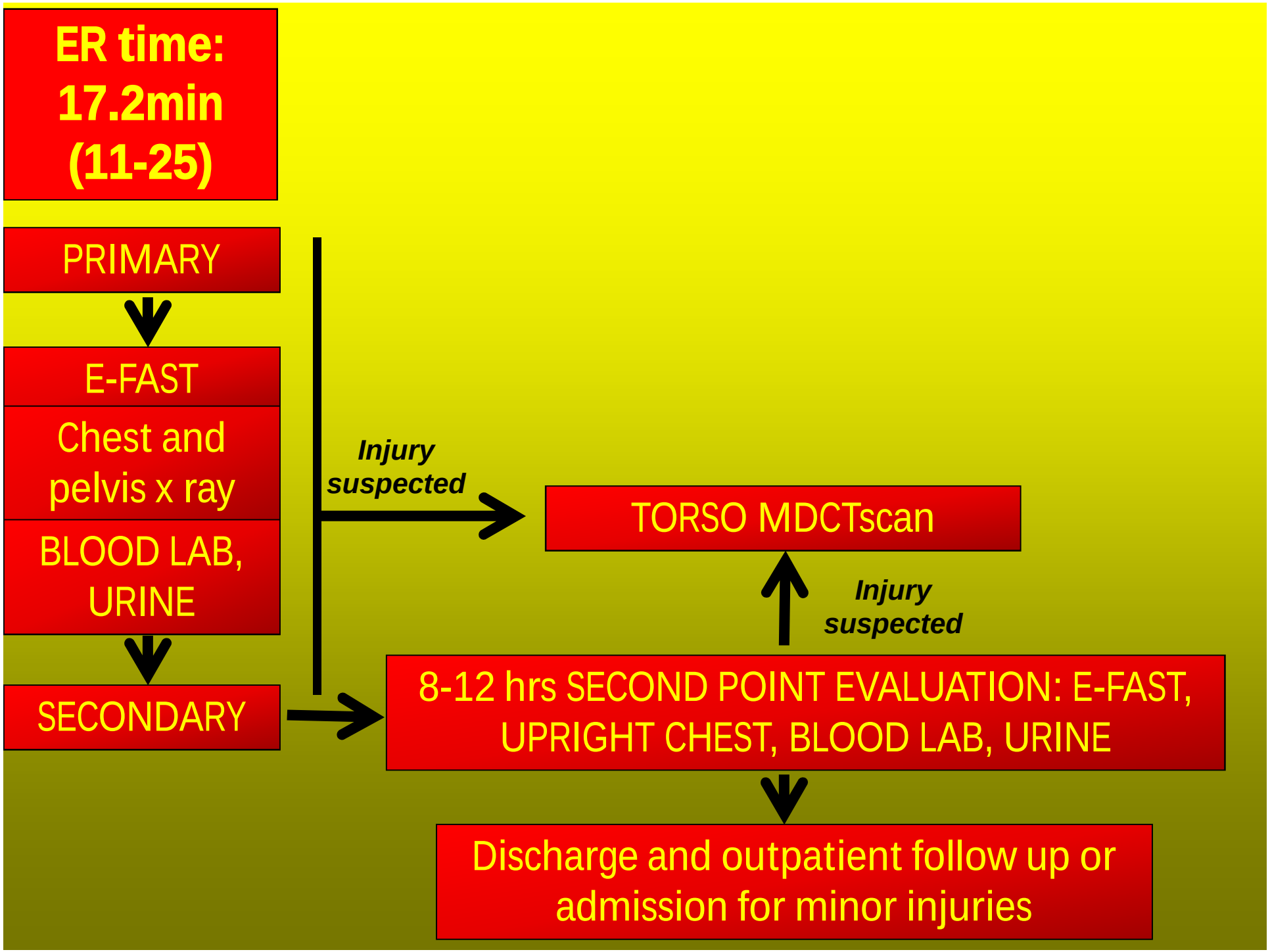
TRAUMA ADMISSIONS NIGUARDA 2003 - 2009



Objective: to assess whether the ER triage rule was able to identify patients with torso injuries and thereby justifying whole body MDCT



Trauma patients admitted from january 1 to december 31, , to an urban level one trauma center with pre-hospital triage criteria of high energy mechanism, but stable ABCD and no anatomy of severe injury, have been included


ER time: 17.2min (11-25)
PRIMARY
E-FAST
Chest and pelvis x ray
BLOOD LAB, URINE
SECONDARY
Injury suspected
TORSO MDCTscan
Injury suspected
8-12 hrs SECOND POINT EVALUATION: E-FAST, UPRIGHT CHEST, BLOOD LAB, URINE
Discharge and outpatient follow up or admission for minor injuries

CRITERIA FOR SECOND LEVEL WORK-UP

- ->2 rib fractures or bilateral or 1-2 rib
- -Scapula, spine, pelvis
- -Pulmonary contusion/hypoxia/hypercapnia
- -Pneumo-hemothorax
- -Mediastinal shape, diaphragm
- -Emphysema (mediastinum, subcutaneous)
- -High energy, suspected BCI (EKG, TnI)
- -Penetrating wound of torso
- -Positive extended FAST
- -Positive blood tests
- -Blood in urine
- -Positive phisical exam

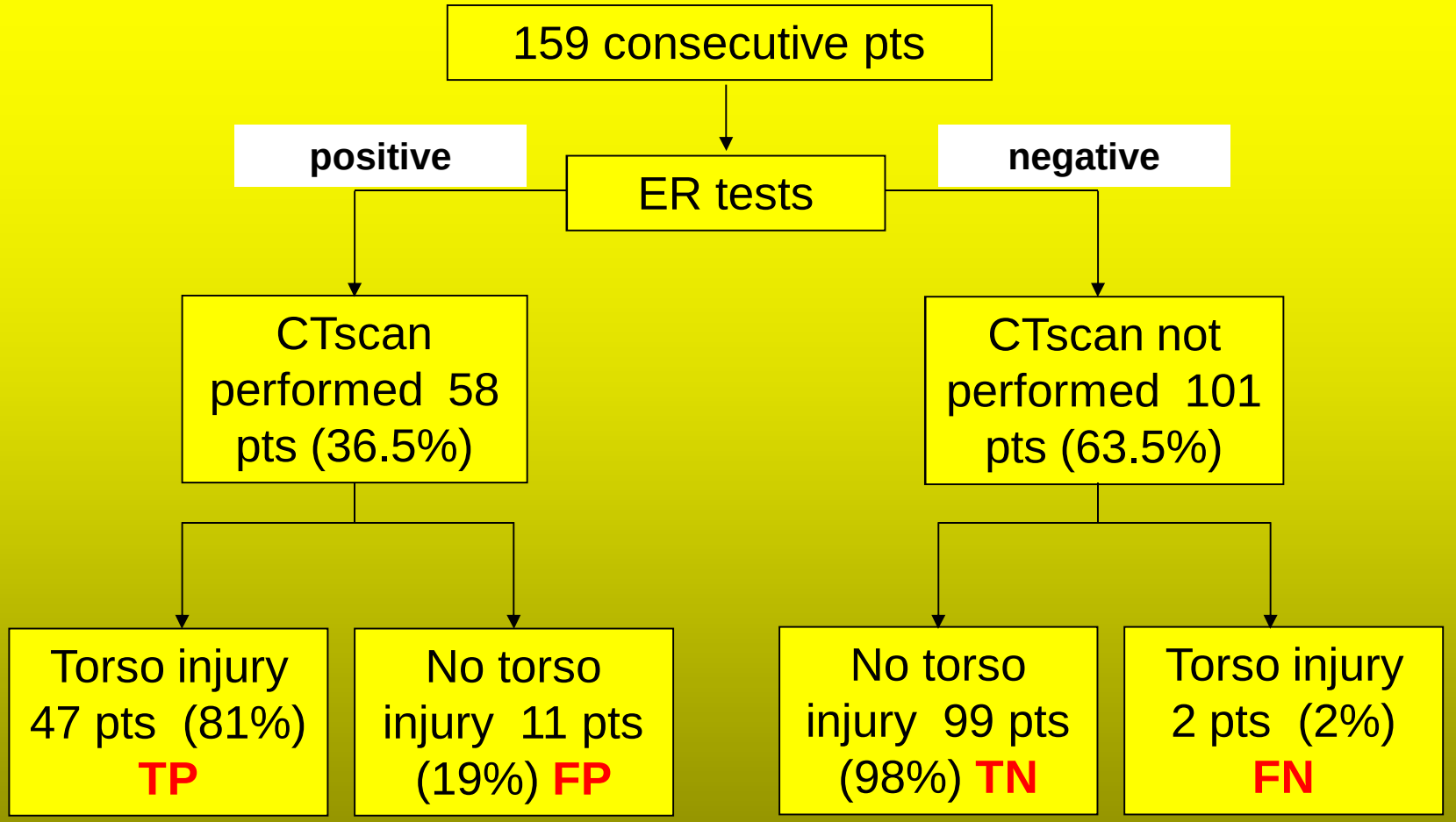
AIMS

Ability of ER tests to identify patients positive for torso injuries at body contrast CTscan has been evaluated. Organ specific CTscan (head, spine) was not considered

Sensitivity, specificity, accuracy, PPV, NPV have been calculated. Abscence of torso injuries in pts who did not receive body CT has been presumed from negative follow up

Patients who received CTscan have been compared with patients who did not receive CTscan for ISS, NISS, probability of death, number of admissions

HIGH ENERGY MECHANISM (YELLOW CODE)



Sensitivity 0.95 **PPV 0.79**
Specificity 0.88 **NPV 0.98**
Accuracy 0.91

- 1 pulmonary contusion AIS 2
- 1 small hemothorax AIS 2

No MDCT				
	ISS*	NISS*	Pd Triss*	Pd ASCOT*
mean±SD	8.07±6.7	9.20±9.27	1.91±4.81	1.52±4.41
median (min-max)	6(1-33)	6(1-66)	0.5(0.3-35)	0.3(0.3-34)

Preliminary ER tests identified more severe patients. 99 MDCT have been avoided (62%). Only two minor injuries have been missed without threat for patients

mean±SD	15.39±9.99	16.96±10.06	3.47±6.67	2.47±5.65
median (min-max)	13(1-48)	17(1-43)	1.1(0.3-33)	0.8(0.3-34)

** p<0,001 Mann-Whitney Rank Sum Test*

Altered vital signs (red code)

ABC (± D) unstable: Protocol ABC (CT head)

ER tests

↓

resuscitation

↓

(± CT head)

↓

OR

→ Total body ceMDCT

DAMAGE CONTROL TECHNIQUES: MDCT scan after DCS, angioembolization if persistent bleeding

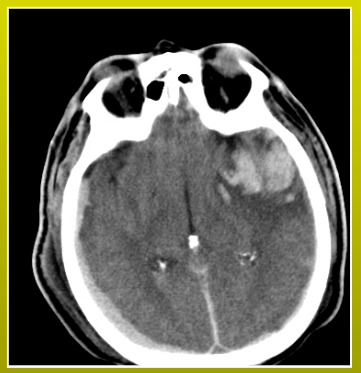
Altered vital signs (red code)

ABC stable, D unstable: Protocol AB-CT scan

AB - resuscitation

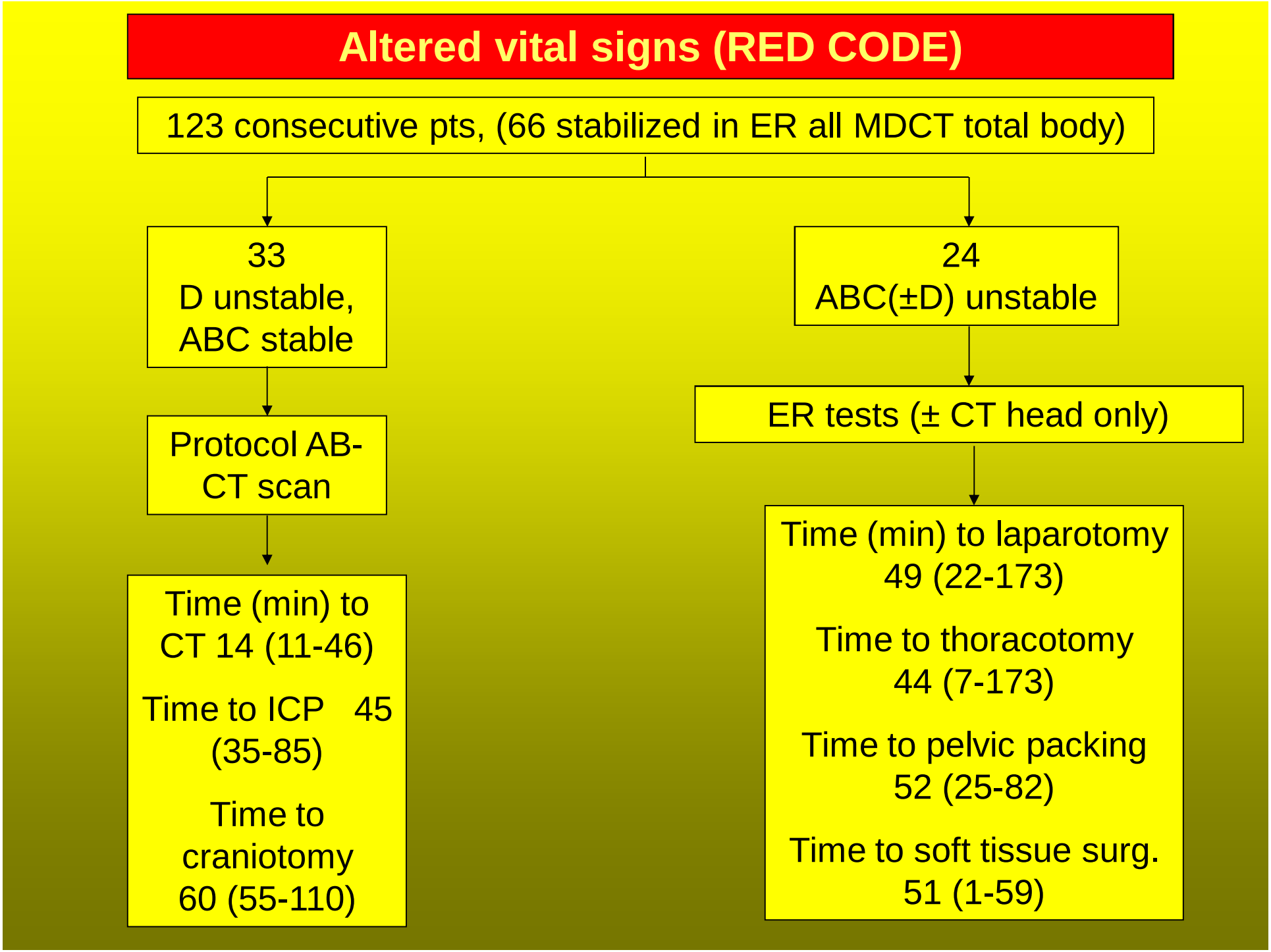
E-FAST (AB check)

If AB problem streat



Brain-C5 ncCT
CeMDCT C6-pubis


GENERAL
NEURO


Altered vital signs (RED CODE)
123 consecutive pts, (66 stabilized in ER all MDCT total body)
33
D unstable,
ABC stable
24
ABC(±D) unstable
Protocol AB-
CT scan
ER tests (± CT head only)
Time (min) to
CT 14 (11-46)
Time to ICP 45
(35-85)
Time to
craniotomy
60 (55-110)
Time (min) to laparotomy
49 (22-173)
Time to thoracotomy
44 (7-173)
Time to pelvic packing
52 (25-82)
Time to soft tissue surg.
51 (1-59)

Predictors for the Selection of Patients for Abdominal CT After Blunt Trauma

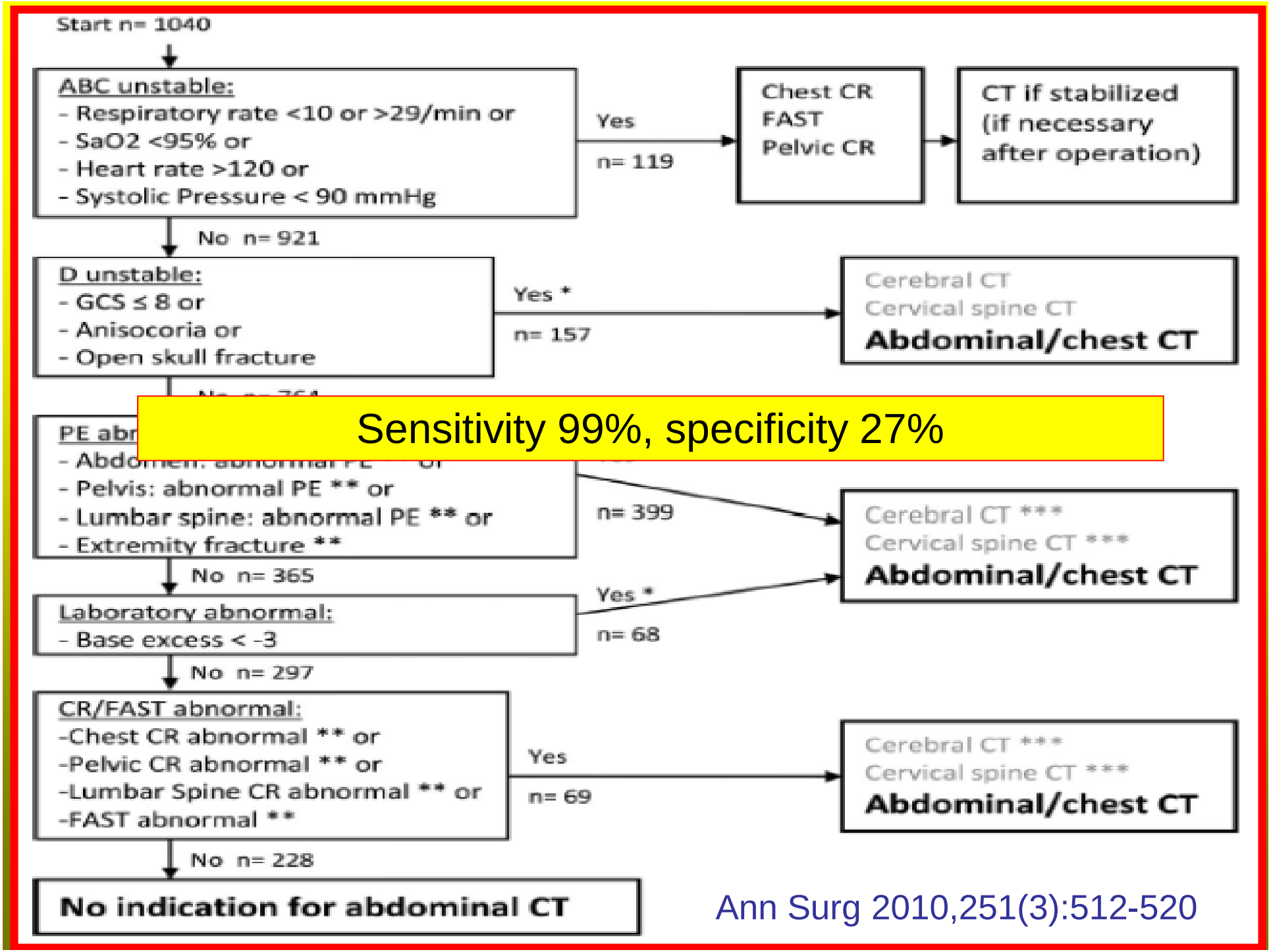
A Proposal for a Diagnostic Algorithm

Jaap Deunk, MD, Monique Brink, MD,† Helena M. Dekker, MD,† Digna R. Kool, MD,† Johan G. Blickman, MD, PhD,† Arie B. van Vugt, MD, PhD,‡ and Michael J. Edwards, MD, PhD**

(*Ann Surg* 2010;251: 512–520)

TABLE 6. The Predicting Variables and Their Adjusted OR With 95% CI to Predict the Presence of ≥1 Traumatic Injury on CT, Using Multivariate Logistic Regression Analysis

Variable	n	OR	95% CI
Abnormal pelvic CR	146	46.8	23.7–92.4
FAST-positive	69	26.7	11.8–60.7
Abnormal lumbar spine CR	69	16.2	7.89–33.3
Hypotension	59	3.81	1.73–8.40
Abnormal PE of the lumbar spine	151	2.53	1.49–4.31
Abnormal PE of the abdomen and/or pelvis	248	2.41	1.54–3.80
Laboratory BE <−3	350	2.39	1.57–3.64
Abnormal chest CR	340	2.37	1.57–3.58
Fracture of the extremities	262	1.61	1.03–2.50



Ann Surg 2010,251(3):512-520

Conclusions……

1. In unstable patients DCS after ER tests and body CTscan after stabilization (protocol 1)

2. AB- body CTscan is useful in stable patients with neurological impairment (protocol 2)

3. Trauma patients in yellow code triage (only high energy mechanism) have an overtriage of 70% or more

4. Overscanning may represent a problem, because of radiation exposure (standard radiology 0.62 mSv vs MDCT 18-24 mSv)

5. A more selective use of body CT in stable trauma patient with normal physical exam, normal lab, normal conventional radiology may be considered (protocol 3)


GRAZIE……
AG
D-KHAG