

Fehler vermeiden



ÖSTERREICHISCHE ZENTRUM FÜR
DOKUMENTATION UND QUALITÄTS-
SICHERUNG IN DER INTERNISTISCHEM MEDIZIN

Andreas Valentin
Allgemeine u. Internist. Intensivstation
Rudolfstiftung, Wien
andreas.valentin@wienkav.at



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profil
Das unabhängige Nachrichtenmagazin Österreichs

Das unabhängige Nachrichtenmagazin Österreichs

LEHRER-STREIK
Warum die Ministerin
zehnfach Irrt

AFFÄRE MENDORFF 14 Millionen und zwei Verstorbene

TODESFALLE KRANKENHAUS

**Österreich-Studie.
Tausende Tote durch Dilettantismus,
Übermüdung, falsche Arzneien.**



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50

Profil, 9. März 2009

Adverse events in hospitals

- 21 Dutch hospitals
AEs in **5.7%** of all admissions
Zegers M, Qual Saf Health Care 2009

Diagnostic errors in **0.4%** of hospital admissions
Zwaan LM, Arch Intern Med 2010
- 28 Swedish Hospitals
AEs in **12.3%** of 1967 admissions
Soop M, Int J Qual Health Care 2009
- 24 Spanish Hospitals
AEs in **8.9%** of 5908 admissions
Aranaz-Andres JM, Int J Qual Health Care 2009

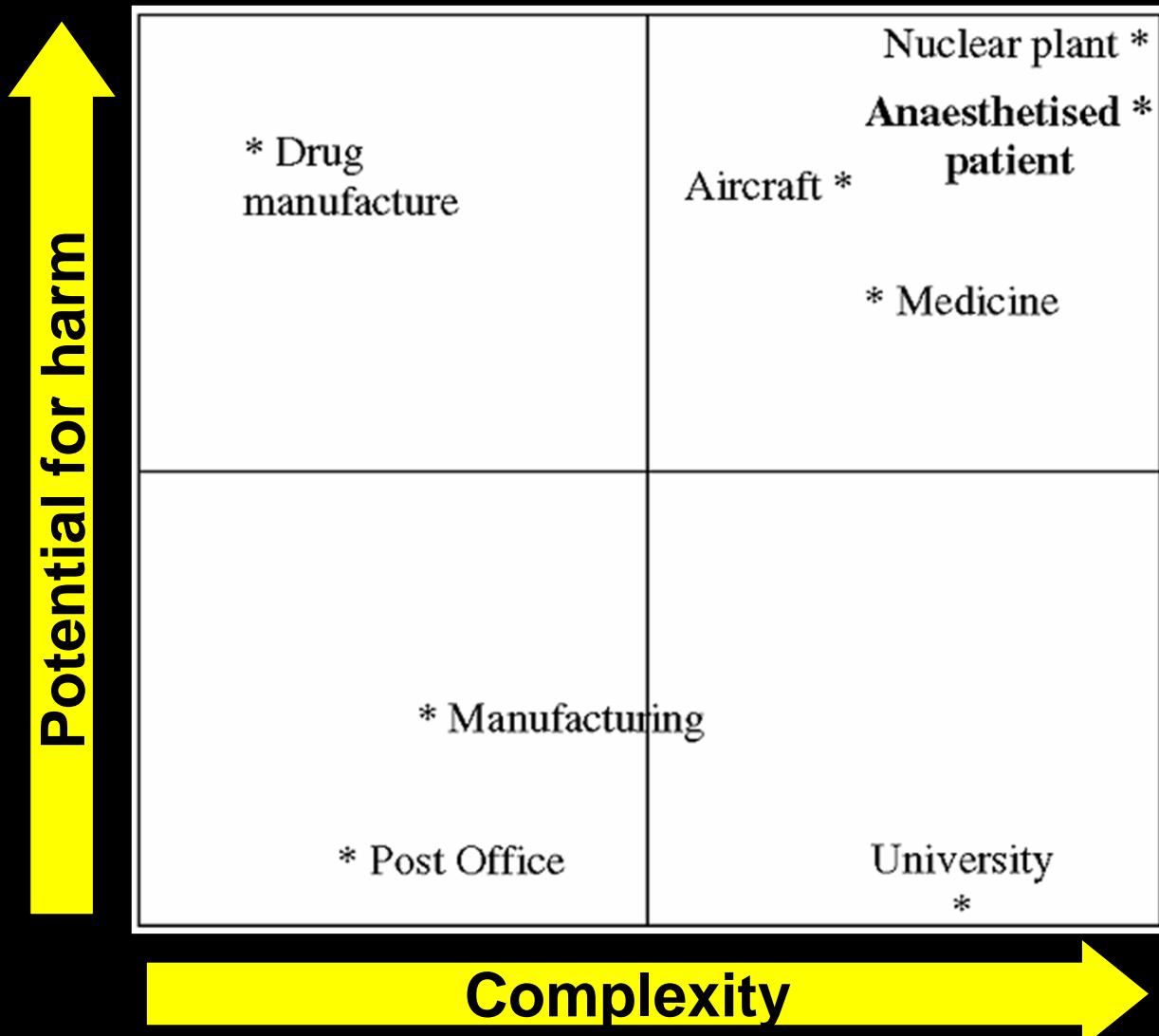
Andreas Valentin
Maurizia Capuzzo
Bertrand Guidet
Rui P. Moreno
Lorenz Dolanski
Peter Bauer
Philipp G. H. Metnitz

205 ICUs
29 countries
1913 patients

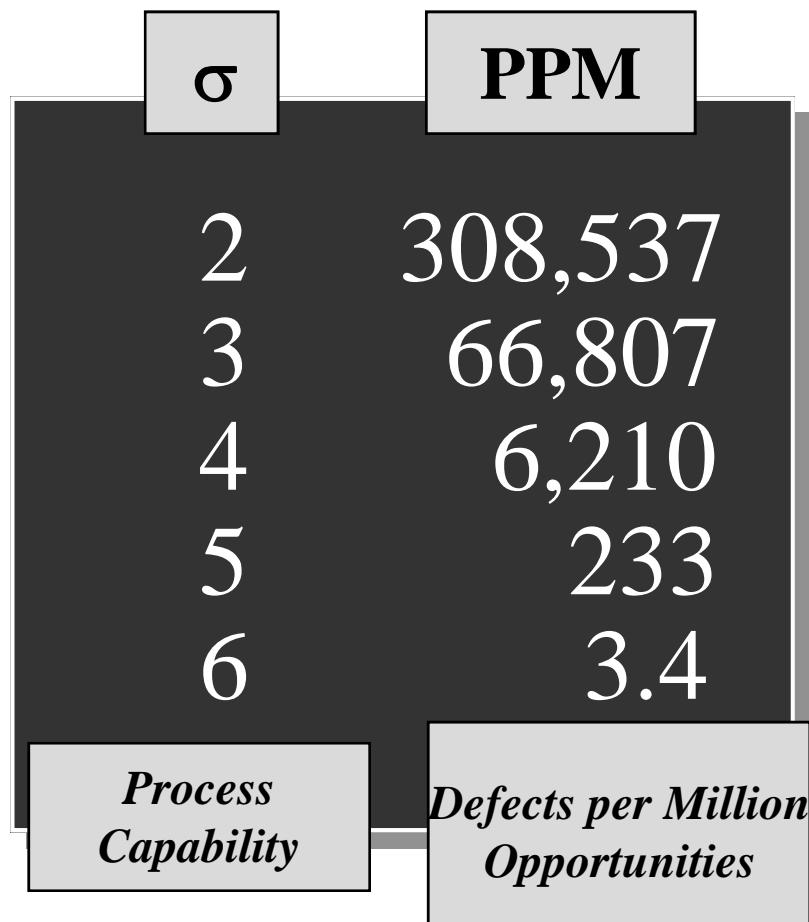
ICUs:
At least 1 SE 73%
No event 27%

Patient safety in intensive care: results from the multinational Sentinel Events Evaluation (SEE) study

	Events / 100 pt days	lower 95% CI	upper 95% CI
All	38.8	34.7	42.9
Lines, drains	14.5	12.0	16.9
Medication	10.5	8.6	12.4
•Prescription	5.7	4.4	7.1
•Administration	4.8	3.6	6.0
Equipment	9.2	7.4	11.1
Airway	3.3	2.4	4.3
Alarms	1.3	0.6	1.9



Six Sigma



8 bed ICU

520.000 activities / year

2 critical incidents / year



Risk as probability of an unfavourable outcome

Intrinsic Risk

- Premorbidity & Age
- Current Diagnosis
- Severity of Illness



Extrinsic Risk

- Diagnostic accuracy
- Treatment decisions
- Process of care
-

Selected medical errors in the intensive care unit: results of the IATROREF study: parts I and II

Medical Error	Number of Medical Errors	ME/1,000 Days with Domain of Care; Median (IQR)
Suction circuit failure during intubation	2	0.6; 0 (0)
Laryngoscope dysfunction	0	0; 0 (0)
Medication administered to wrong patient	23	4.1; 0 (0)
Error administering anticoagulant medication	23	5.3; 0 (9)
Error prescribing anticoagulant medication	30	6.3; 0 (9)
Error administering vasoactive drugs	29	21.0; 0 (0)
Error administering insulin ^a	630	185.9; 0 (34)
Accidental removal of a central venous catheter	9	2.6; 0 (0)
Accidental extubation		
Accidental extubation	14	4.3; 0 (0)
Self-extubation	21	6.5; 0 (0)
Failure to place patient in semirecumbent position, in the absence of contraindication, during invasive artificial ventilation with enteral nutrition	121	37.5; 0 (48)
Overinflation of intubation catheter balloon	261	81.0; 0 (73)
Pneumothorax related to insertion of central venous catheter	7	2.0; 0 (0)
Fall	6	1.1; 0 (0)
Delay in surgical treatment	10	1.8; 0 (0)

**Having > 2 adverse events increased the risk of death
OR 3.1 (95% CI 1.3-7.4)**

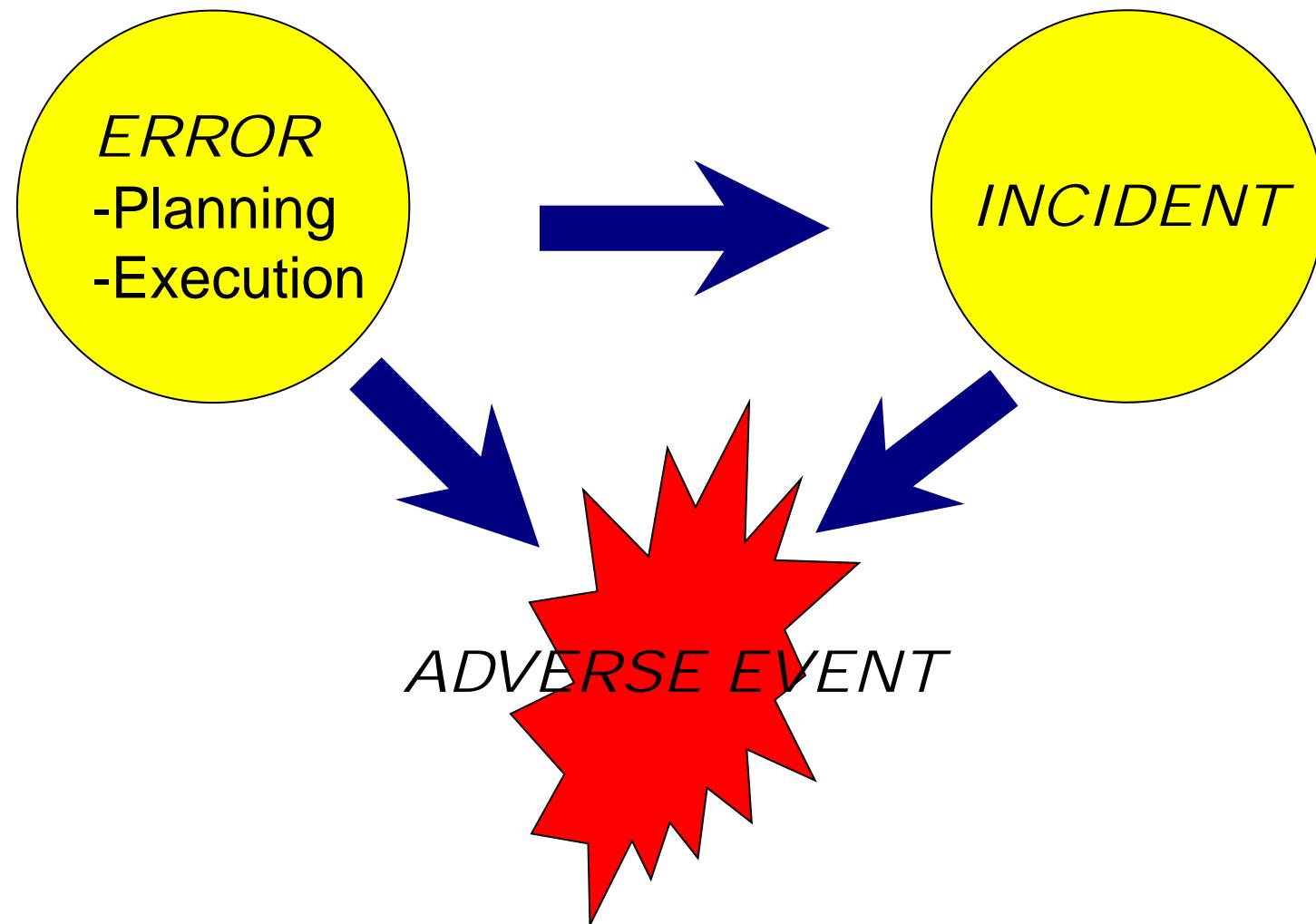
RISK REDUCTION

**Keep the extrinsic
risk at the lowest
possible level**

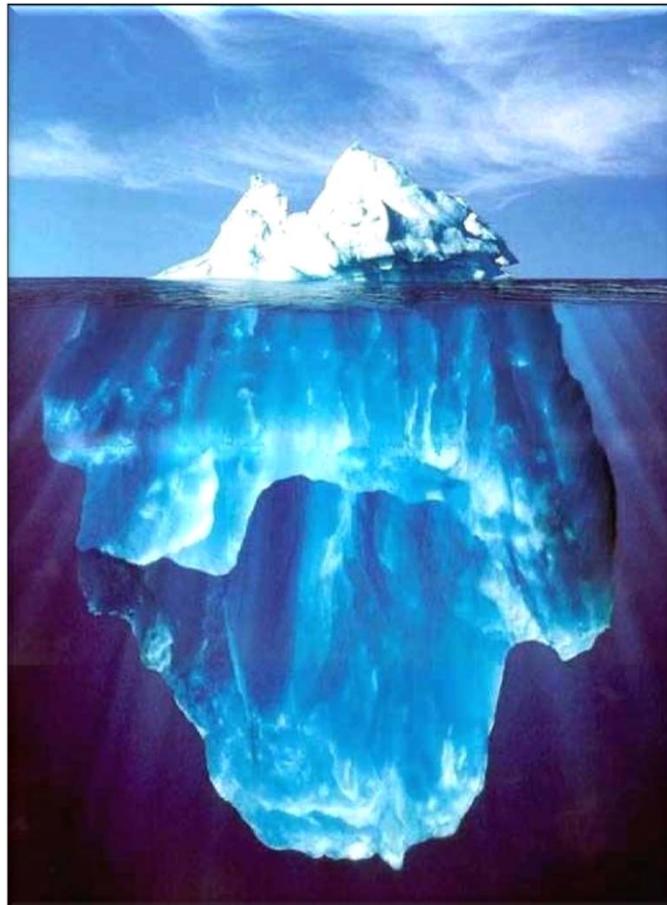


RISK ASSESSMENT

Critical Incidents

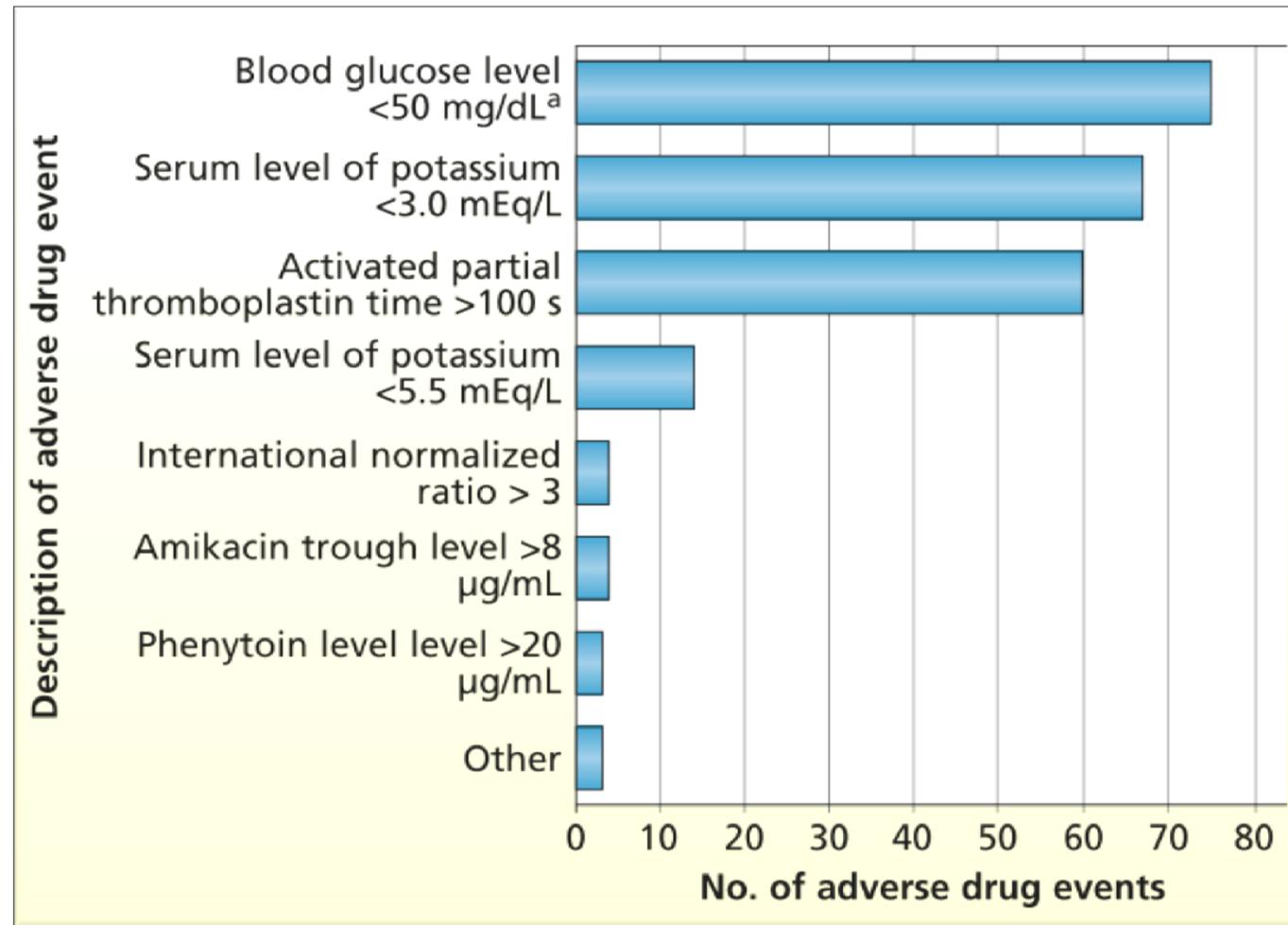


How do we get the whole picture ?



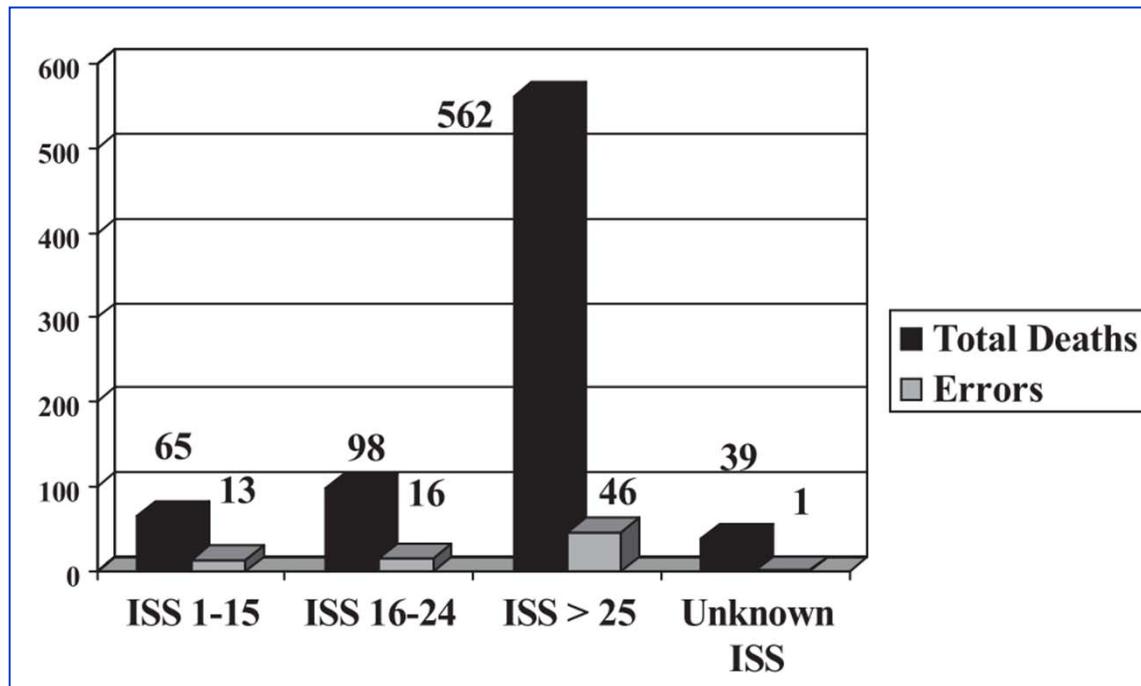
- **M&M conference**
- **Chart review**
- **Incident reporting**
- **Observer**
- **Electronic screening**

Seynaeve S, Am J Crit Care 2011
Adverse drug events in intensive care units: a cross-sectional study of prevalence and risk factors



Patient safety in trauma: maximal impact management errors at a level I trauma center

Ivatury RR, J Trauma 2008



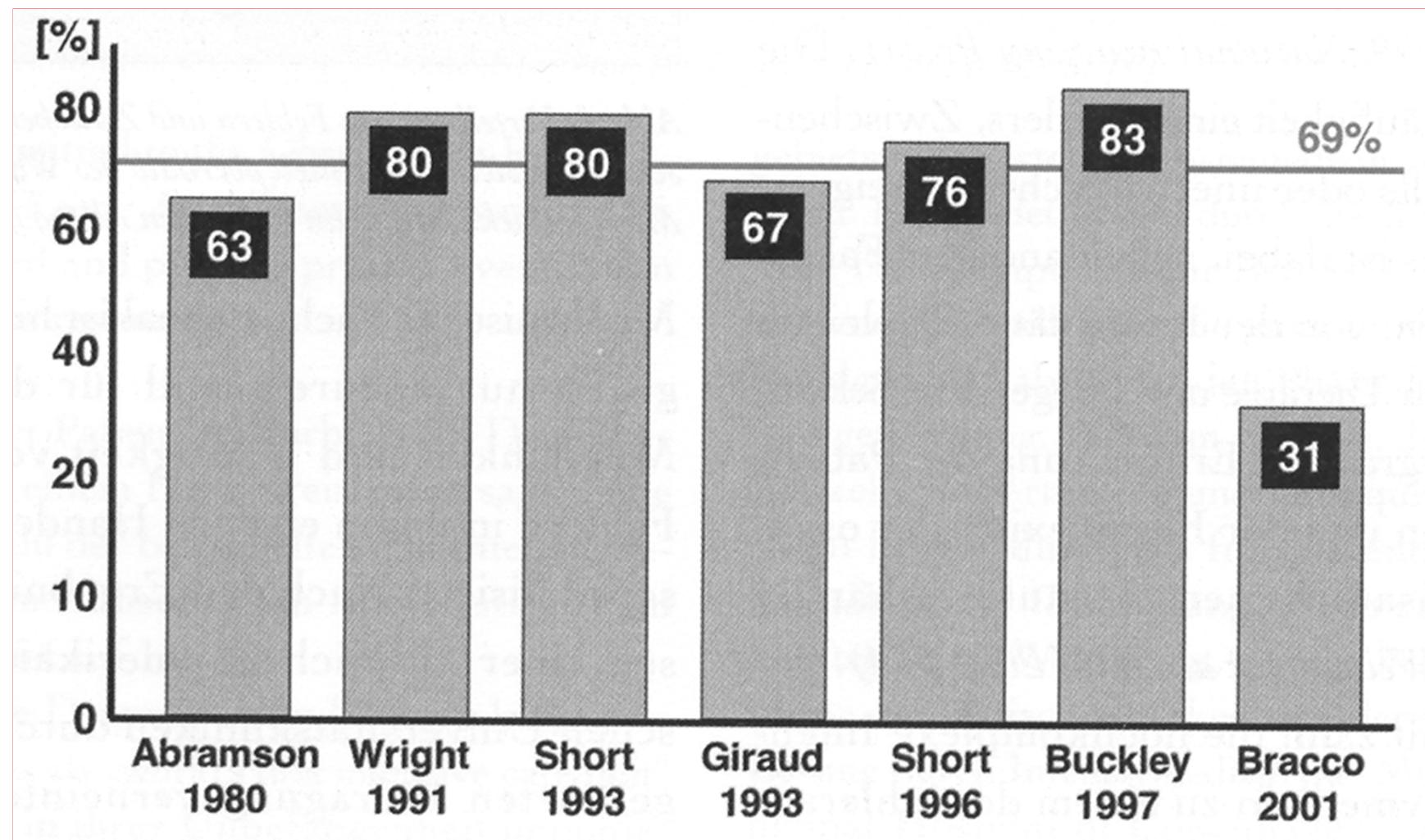
- Deaths 764
- Potentially preventable: 7.8%
- Preventable: 2.1%
- Human factors: 97%



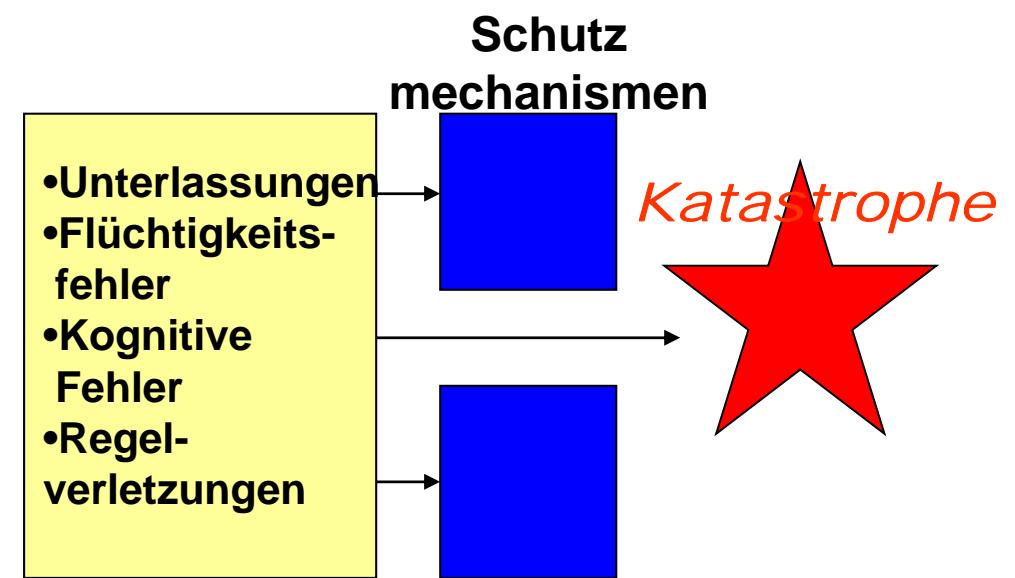
HUMAN FACTORS
&
SYSTEM FACTORS

Rate of „human errors“

Graf J, IntensivNews 2004

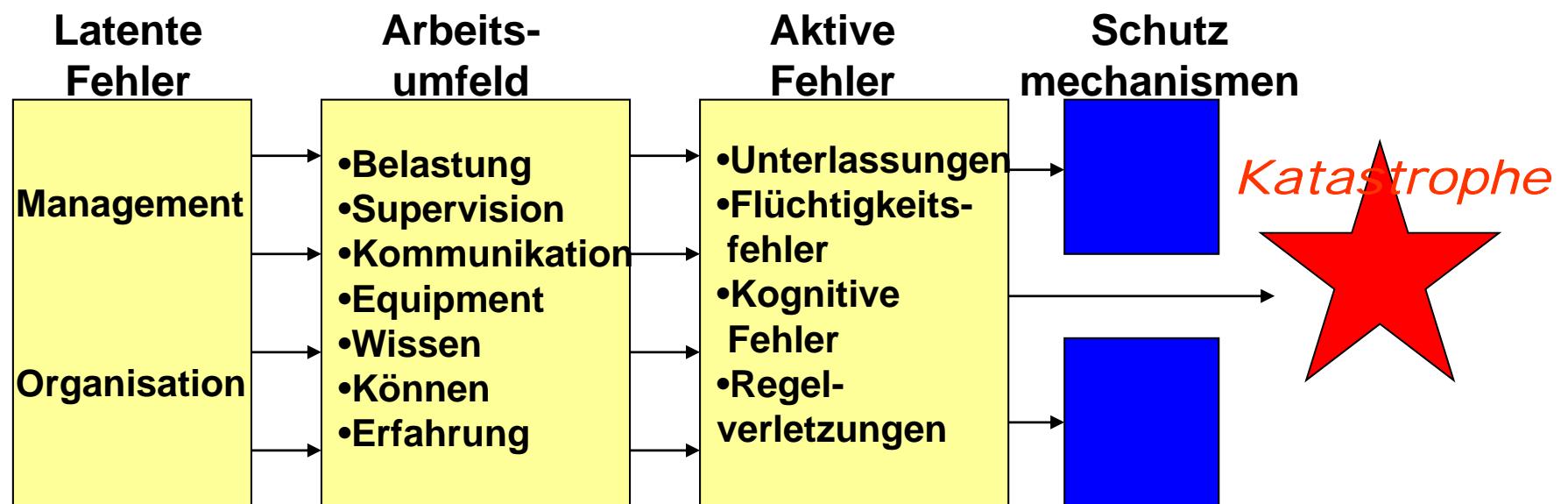


Katastrophenmodell



nach Vincent et al. BMJ 1998

Katastrophensmodell



nach Vincent et al. BMJ 1998

Most errors are committed by good,
hardworking people trying to do the right thing

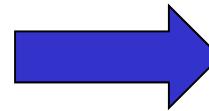
Wachter RM & Pronovost PJ, NEJM 2009

"Every system is perfectly designed to achieve the results it does"

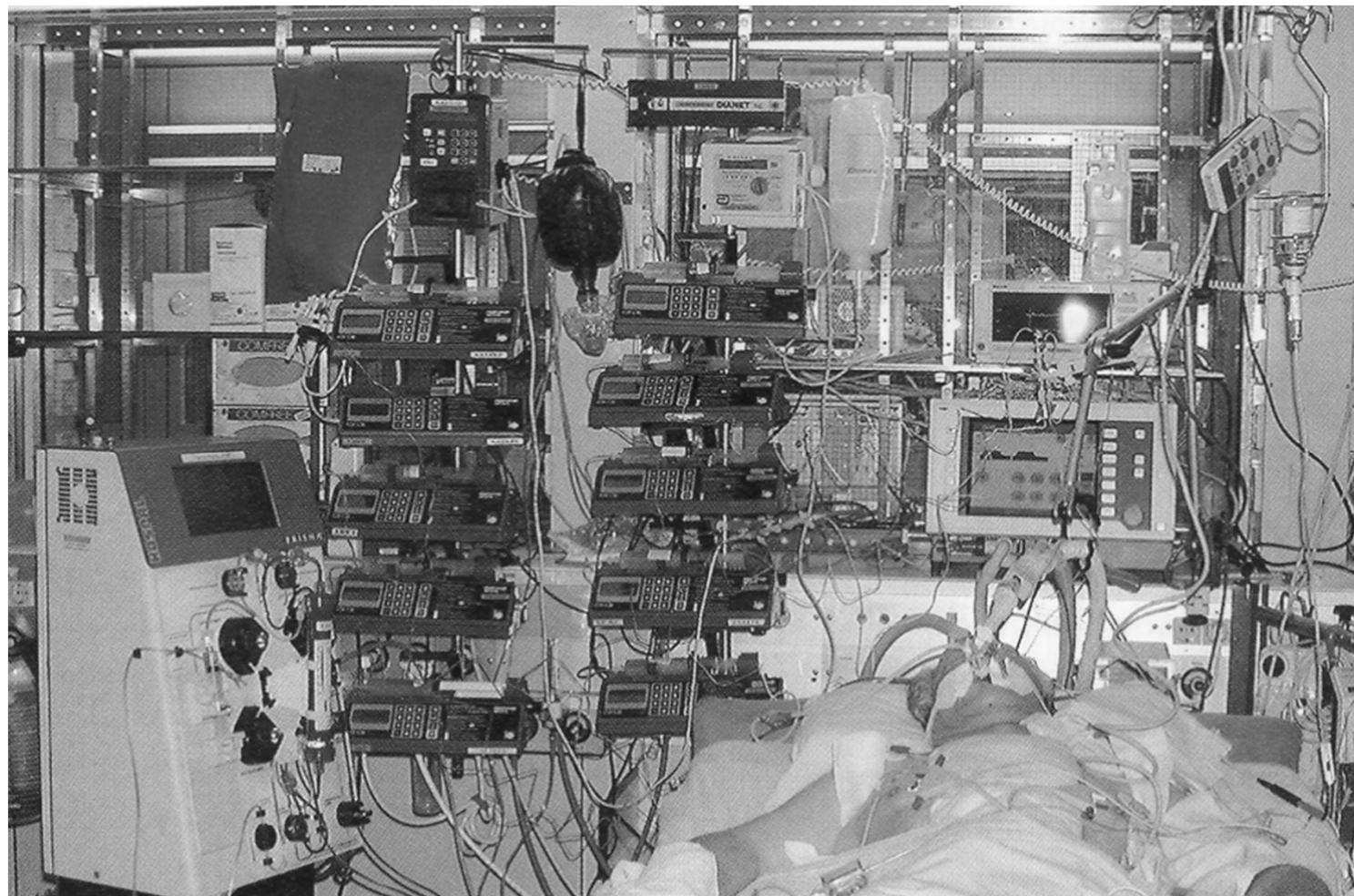
Berwick DM



Task will only be achieved after all steps are finished



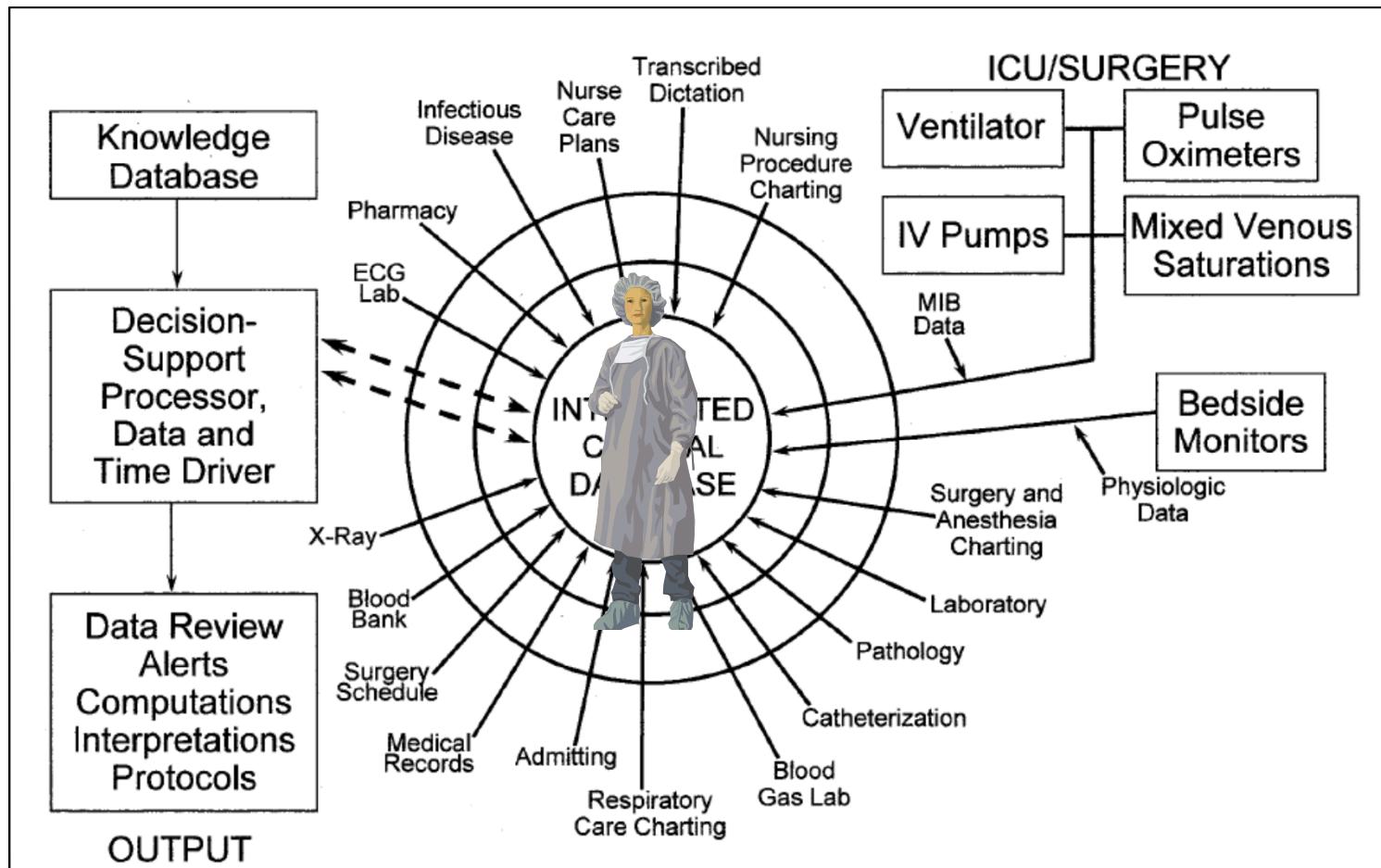
„An Ergonomic Nightmare“



The hostile environment of the intensive care unit

Yoel Donchin, F. Jacob Seagull, Curr Opin Crit Care 2002

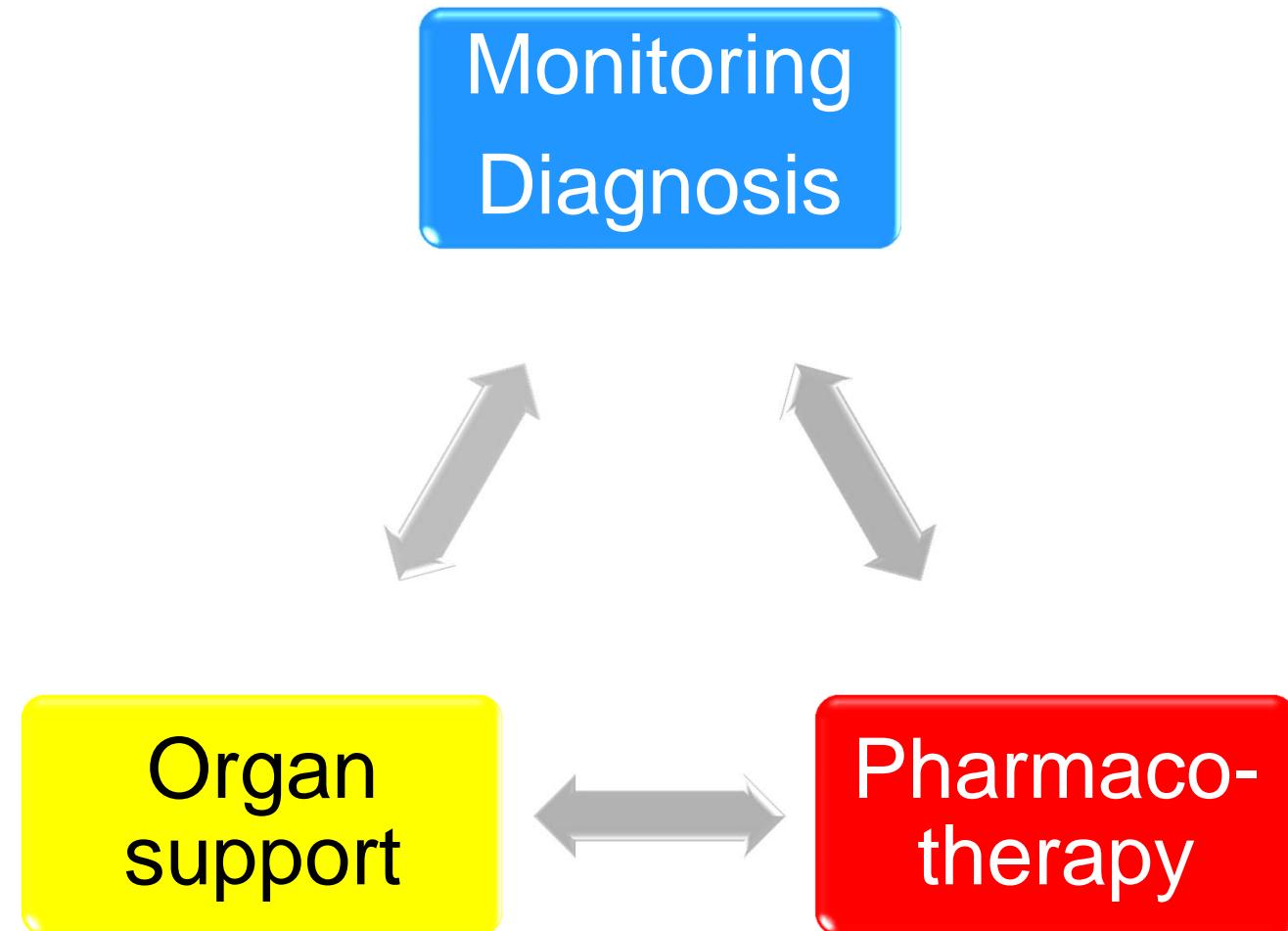
Multitasking and Information overload





*WHAT WILL INCREASE
PATIENT SAFETY?*

Key processes in acute care



BMJ

RESEARCH

Errors in administration of parenteral drugs in intensive care units: multinational prospective study

Andreas Valentin, associate professor¹, director of intensive care unit,² Maurizia Capuzzo, consultant in anaesthesia and intensive care medicine,³ Bertrand Guidet, professor,^{4⁵6} Rui Moreno, professor,⁷ Barbara Metnitz, statistician,⁸ Peter Bauer, professor and head of core unit of medical statistics and informatics,⁸ Philipp Metnitz, professor⁹ on behalf of the Research Group on Quality Improvement of the European Society of Intensive Care Medicine (ESICM) and the Sentinel Events Evaluation (SEE) Study Investigators



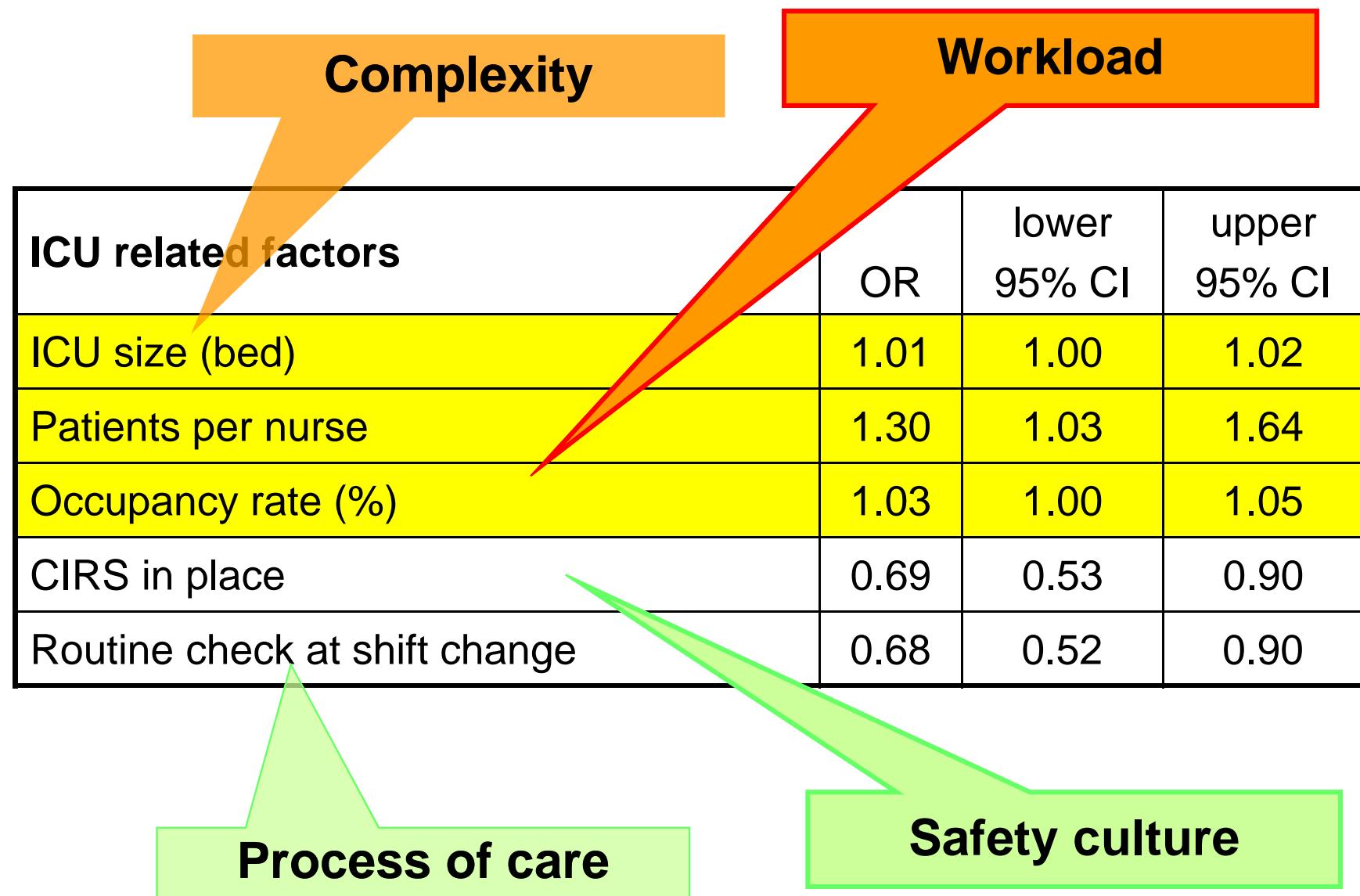
ECCRN



SEE 2

	Events / 100 pt days	lower 95% CI	upper 95% CI
All	74.5	69.5	79.4
Wrong time	33.4	30.1	36.7
Missed medication	22.4	19.7	25.1
Wrong dose	10.2	8.4	12.0
Wrong drug	5.3	4.0	6.6
Wrong route	3.2	2.2	4.2

SEE 2



What will increase patient safety?

- **Consider human limitations**
 - Cognitive limits
 - Work load and staffing
 - Design of work environment, tools, etc.
- **Reduce complexity**
 - Standardisation
 - Routine situations
- **Develop a culture of safety**

Human Perception & Cognition

- *Recognition of known patterns*
- *Focusing and ignoring*
- *Priority for the „obvious“*
- *Priority for the „known“*
- *Priority for the „treatable“*

SEE 2

Contributing factors	
Workload, Stress, Fatigue	33%
Recently changed drug name (Genericon)	18%
Communication-Written	14%
Experience, Knowledge, Supervision	10%
Communication-Oral	9%
Violation of protocol or standard	9%
Hand over	6%
Equipment failure	-----
Others	-----

Look-alike & Sound-alike Drugs

- Amrinone-Amiodarone
- Dopamin-Dobutamine
-



GENERICA ?



Same size, different scale

Color coded syringes

Gruppe nach ISO 26825		Farbmuster
Hypnotika	monochrom	Yellow
Benzodiazepine	monochrom	Orange
Muskelrelaxantien (Variante 1)	monochrom	Red
Muskelrelaxantien (Variante 2)	monochrom	Red
Ausnahme: Suxamethonium		
MR-Antagonisten	schraffiert	
Opiate/Opiode	monochrom	Cyan
Opiate-Anatgonisten	schraffiert	
Vasopressoren	monochrom	Purple
Ausnahme: Epinephrin		
Vasodilatoren	schraffiert	
Lokalanästhetika	monochrom	Grey
Anticholinergika	monochrom	Green
Antiemetika	monochrom	Yellow
Verschiedene Medikamente	monochrom	

Antiarrhythmika	▲ links unten	Red
	▼ rechts oben	Blue
Antikonvulsiva	▲ links unten	Grey
	▼ rechts oben	Magenta
Antikoagulantien Ausnahme: Heparin Sonderregelung: Protamin	monochrom	
	monochrom	
Bronchodilatatoren	▲ links unten	Dark Blue
	▼ rechts oben	Brown
Elektrolyte	▲ links unten	Green
	▼ rechts oben	Magenta
Ausnahme: Kalium	▲ links unten	Green
	▼ rechts oben	Blue
Ausnahme: NaCl 0.9%	monochrom	Green

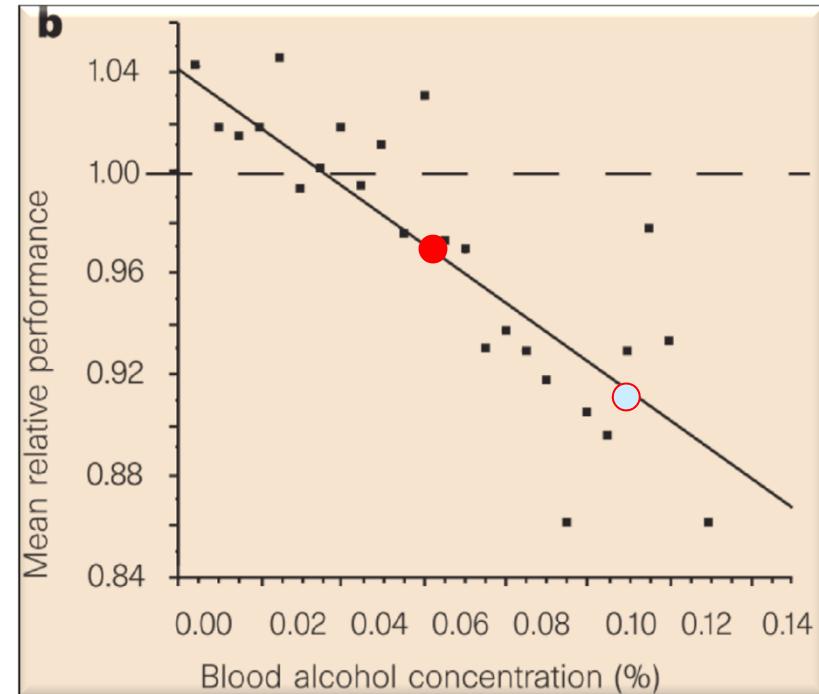
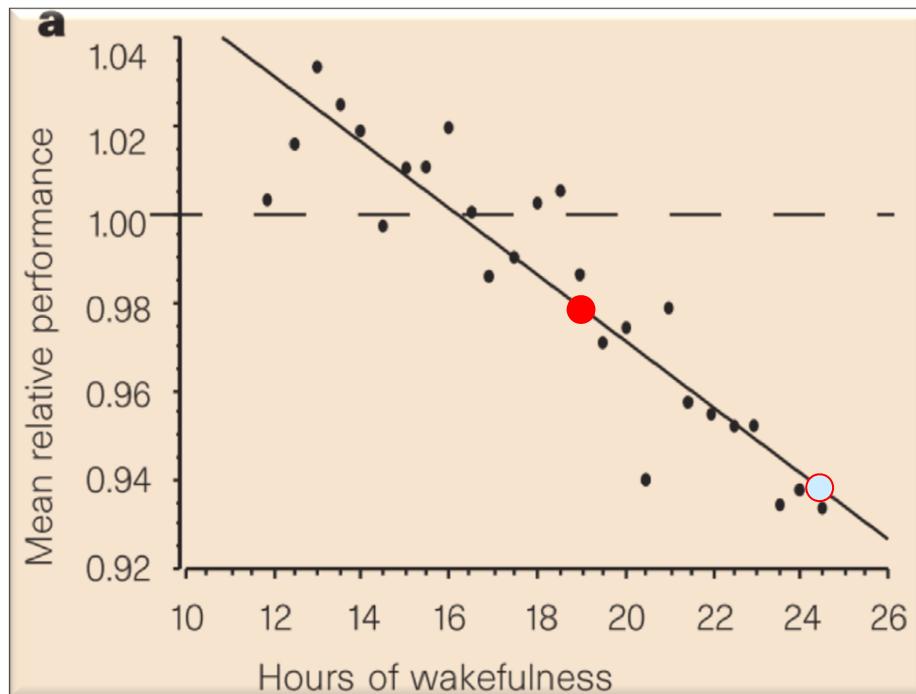
Hormone	▲ links unten	Brown
	▼ rechts oben	Yellow
Ausnahme: Insulin	▲ links unten	Brown
	▼ rechts oben	Yellow
Inodilatatoren	▲ links unten	Red
	▼ rechts oben	Green

Warum sieht eigentlich jede Blutkonserve gleich aus ?



Fatigue, alcohol and performance impairment

Dawson D, *Nature* 1997

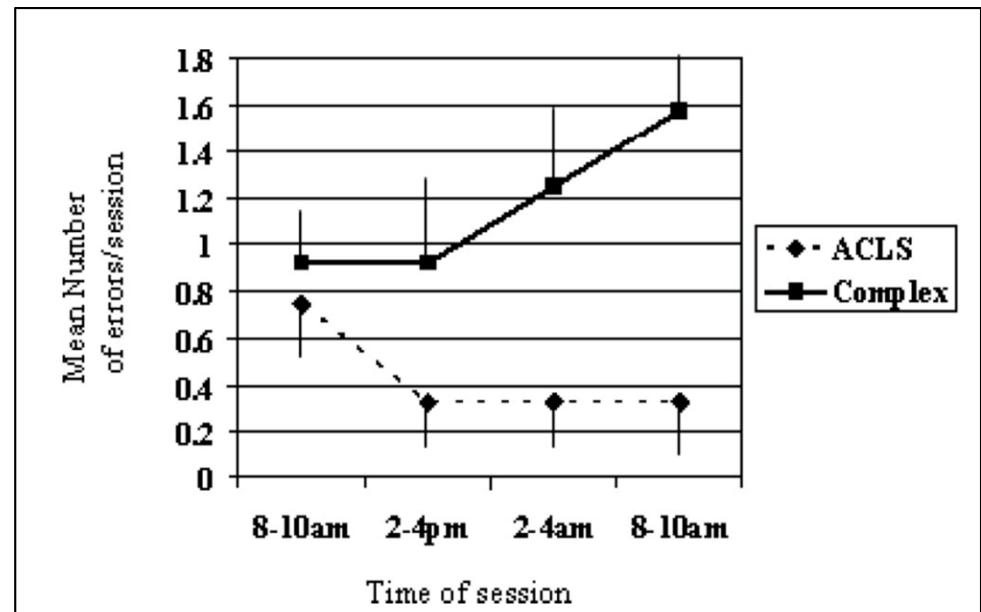
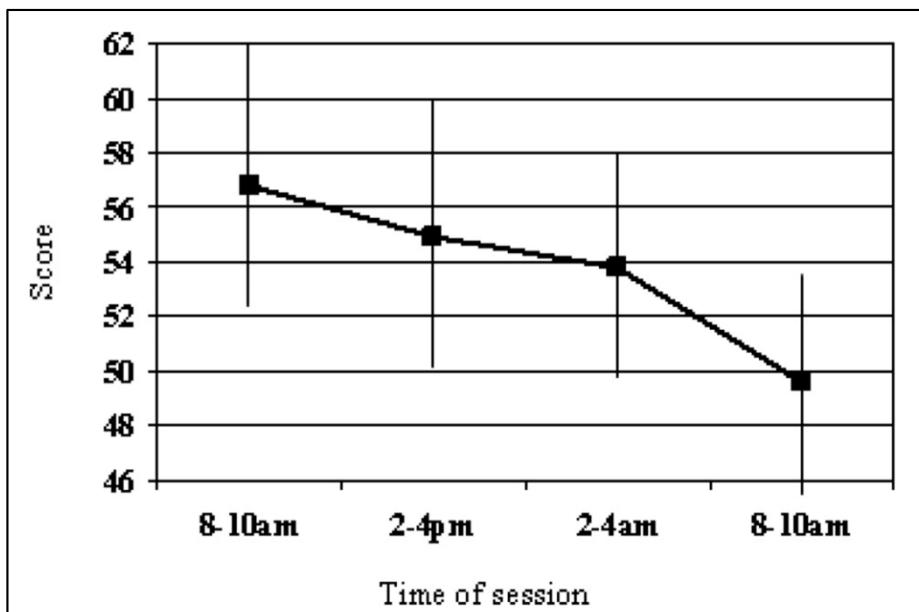


- 0.05g%
- 0.10g%

The impact of prolonged continuous wakefulness on resident clinical performance in the intensive care unit: a patient simulator study.

Sharpe R, Crit Care Med 2010

12 residents



Global performance score
for complex scenarios

Mean number of errors
per session

Effect of Reducing Interns' Work Hours on Serious Medical Errors in Intensive Care Units

CP Landrigan et al, NEJM 2004

	Traditional	Intervention
Average hours/week	77-81	60-63
Consecutive hours	up to 34	16
Patient days	1294	909
Errors/1000 pt days	136	100

- 26%

Wrong blood in tube

	Wrong blood in tube	
<i>Phlebotomy by</i>	<i>observed</i>	<i>estimated</i>
Nurse	0.8/1000	2.14/1000
Laboratory personnel	0.067/1000	0.18/1000

What will increase patient safety?

- Consider human limitations
 - Cognitive limits
 - Design of work environment, tools, etc.
 - Work load and staffing
- **Reduce complexity**
 - **Standardisation**
 - **Routine situations**
- Develop a culture of safety

SEE 2

Situation	
Routine	69%
Admission, Discharge	8%
Others	5%
Intrahospital transport	5%
Emergency	4%
Intervention	4%
Urgent crisis of another patient	3%



*Is critical information lost over 24 hours ?
Does a checklist prevent loss of information ?*

Patient Care Item	n	No. of Lost Observation	No. of Lost Study	p
Critical laboratory/ test results	150	22/61 (36.1%)	4/89 (4.5%)	<0.0001
Antibiotics/cultures/ meds	193	11/94 (11.7%)	1/99 (1%)	0.010
Nutrition/vent/other	177	12/80 (15%)	4/97 (4.1%)	0.043
Tubes/CVP/IVs	117	12/47 (25.6%)	4/70 (5.7%)	0.018
Consults	52	4/21 (19.1%)	1/31 (3.2%)	NS
Total	689	61/303 (20.1%)	14/386 (3.6%)	<0.0001

Handoff Protocol / Checklist

- Administrative data
- Problem list
- Current status
- Medications
- Lines and invasive devices
- Results
- Events during the last shift
- Hands-on checking
- Tasks expected to be done

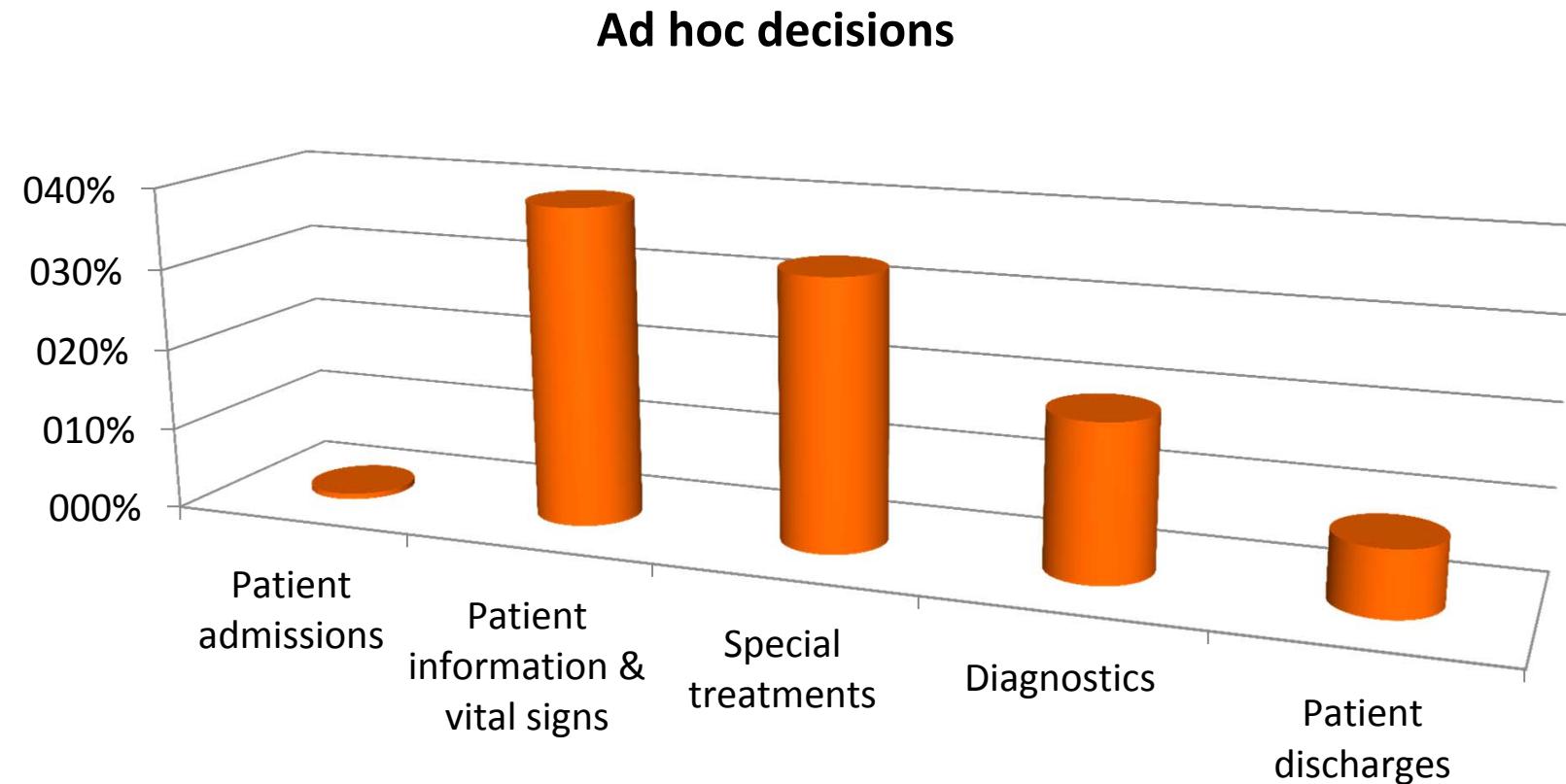
Adapted from Berkenstadt H, Chest 2008

A surgical safety checklist to reduce morbidity and mortality in a global population

Haynes AB, NEJM 2009

	BEFORE	AFTER	p
Objective Airway Evaluation performed	64.0	77.2	< 0.001
Pulse Oximeter used	93.6	96.8	< 0.001
2 Peripheral or 1 Central IV Catheter Present at Incision When EBL \geq 500ml	58.1	63.2	0.32
Prophylactic Antibiotics Given Appropriately	56.1	82.6	< 0.001
Oral Confirmation of Pts Identity and Operative Site	54.4	92.3	< 0.001
Sponge Count Completed	84.6	94.6	< 0.001
All 6 Safety Indicators Performed	34.2	56.7	< 0.001
Any Complication	11.0	7.0	< 0.001
In Hospital Death	1.5	0.8	< 0.003

Ad hoc decision-making of intensivists



46 ICU beds: 14.8 ad hoc decisions/hour

Aufnahmedatum: 11.09.2009 15:45:00 Behandlungstage: 3T 23h 48Min.

Medikation/Aufg./Bilanz Medikat. Monit. Metabolik Bilanzblatt Monitoring Beatmung / Astrup 12A Labor 12A HDF ZUGÄNGE PLANUNGEN BEOBSCHAUEREN KONTROLLEN Ärzteübergabe Pflegeübergabe Dekurse Scoring

24 Stunden Zusammenfassung Infusionstag

K 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 00:00 01:00 02:00

15.09.2009 16.09.2009 Aktueller Infusionstag

MEDIKAMENTENINFUSIONEN

ZIEL

- + ARTERENOL INJLSG 1MG/M... [0,2 mg/ml]
- + ARTERENOL INJLSG 1MG/M... [0,2 mg/ml]
- + ARTERENOL INJLSG 1MG/M... [0,5 mg/ml]
- + ARTERENOL INJLSG 1MG/M... [0,5 mg/ml]
- + PITRESSIN INJLSG 20IE/ML ... [0,4 I.E./ml]
- + ACTRAPID INJLSG 100IE/ML ... [1 I.E./ml]
- + KALIUM-L-MALAT 1MMOL/ML [1 mmol/ml]
- + NORCURON TRSTAMP 10MG ... [1 mg/ml]
- + NORCURON TRSTAMP 10MG ... [2 mg/ml]
- + SOLU CORTEF + NaCl 0,9% [6 mg/ml]
- + MIDAZOLAM IJLSG 5MG/ML <... [5 mg/ml]
- + SUFENTA AMP [50 µg/ml]
- + SUFENTA AMP + NaCl 0,9% [20 µg/ml]

BEI BEDARF

MEDIKAMENTE

REGELMÄSSIG

- LOVENOX SPRAMP 20MG [100 mg/ml]
- PANTOLOC TRSTAMP 40MG ... [4 mg/ml]
- PASPERTIN AMP 10MG + ... [0,098 mg/ml]
- SOLU CORTEF + NaCl 0,9% [0,98 mg/ml]
- CEFUROXIM TRSTAMP «AS... [15 mg/ml]
- MAXIPIME TRSTAMP 2G + A... [0,02 g/ml]

ZIEL

BEI BEDARF

EINMALIG VERABREICHTES

- NOVALGIN AMP 1G + NaCl 0 ... [9,8 mg/ml]

INFUSIONEN

BASIS

- NA-CHLORAT-PHYS ILSG «MP... [1 ml/ml]
- NA-CHLORAT-PHYS ILSG «MP... [1 ml/ml]
- RINGER-LACT IFL «FRE» [1 ml/ml]
- RINGER-LACT IFL «FRE» [1 ml/ml]
- STRUCTOKABIVEN EMU I [0,997 ml/ml]
- STRUCTOKABIVEN EMU I [0,997 ml/ml]
- STRUCTOKABIVEN EMU I [0,997 ml/ml]
- VOLULYT 6% IFLSG [1 ml/ml]
- VOLULYT 6% IFLSG [1 ml/ml]
- ISOSOURCE FASER [1 ml/ml]
- ISOSOURCE FASER [1 ml/ml]

15.09.2009 16.09.2009 Aktueller Infusionstag

5,07 mg
4,6 mg
4,73 I.E.
46,2 I.E.
6,55 mmol

58,8 mg
143 mg
284 mg
2841 µg

20 mg
40 mg
10 mg

1500 mg
0 g

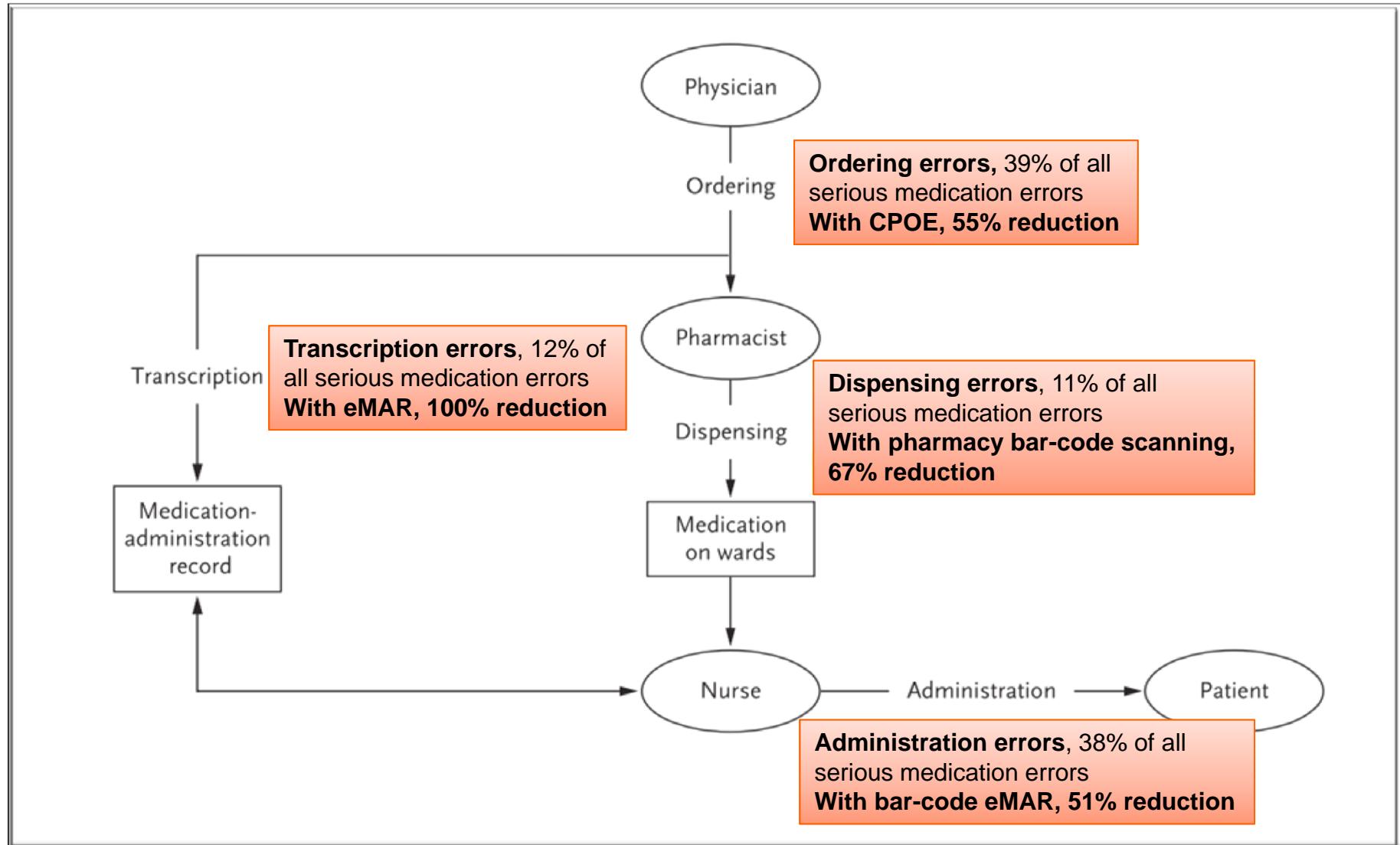
1045 ml
150 ml

469 ml
90,2 ml

39,5 ml

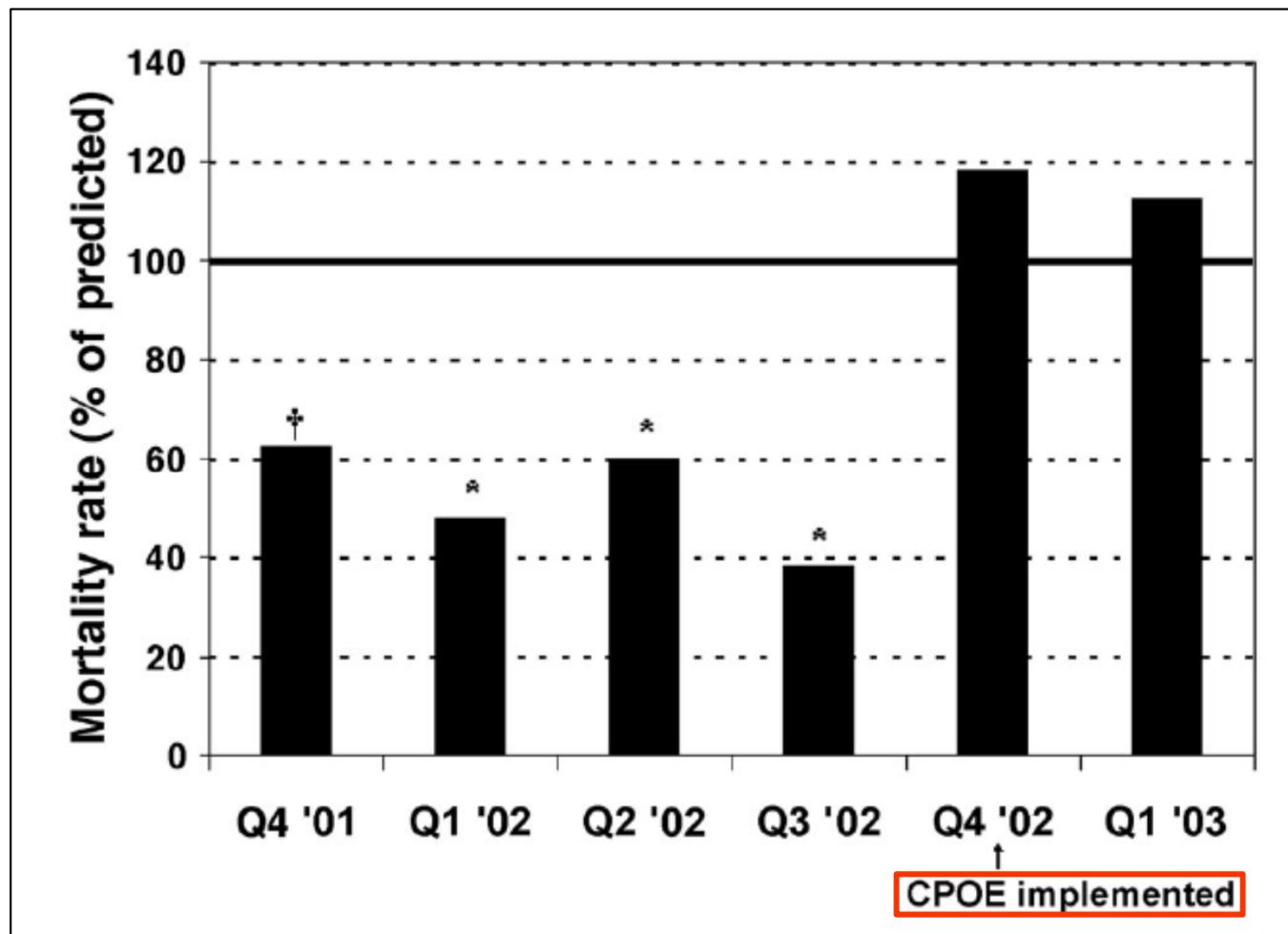
• Kalkulationshilfe
 • Definierter Dosisbereich
 • Definierter Zugangsweg
 • Definierte Zeitintervalle
 • Ausschluss bestimmter Medikamentenkombinationen
 • Check auf Allergie etc.
 • Gegencheck mit Labor (z.B. Krea)

Effect of Health Information Technology at Key Stages in the Process of Medication Use



Unexpected increased mortality after implementation of a commercially sold computerized physician order entry system

Han YY, Pediatrics 2005



Reduction of medication errors does not necessarily improve outcome

What will increase patient safety?

- Consider human limitations
 - Cognitive limits
 - Design of work environment, tools, etc.
 - Work load and staffing
- Reduce complexity
 - Standardisation
 - Routine situations
- Develop a culture of safety

Die falsche Strategie



Sicherheitskultur & Fehlerprävention

- Sicherheitskultur im Krankenhaus
 - Prädiktor für Medikamentensicherheit
 - Prädiktor für Sicherheit bei med. Notfällen
- Positive Stationskultur kann gering ausgeprägte Kultur im Krankenhaus kompensieren

Zohar D, Crit Care Med 2007

- Wahrnehmung von Sicherheitsproblemen in Notfallbereichen häufiger
- Ärzte geben häufiger Angst vor Schuldzuweisung an als Pflegepersonen

Singer SJ, Med Care 2009

A background image showing a close-up of a stethoscope and a clipboard. The clipboard has a white sheet of paper with a black and white checklist. The checklist includes items such as 'Sicherheitskultur', 'Fehlerprävention', 'Prozessoptimierung', and 'Risikomanagement'.

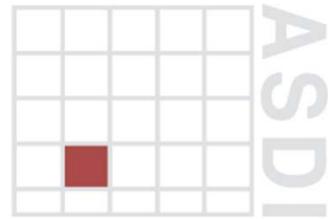
SICHERHEITSKULTUR

=

FEHLERPRÄVENTION

Sicherheitskultur und Fehler in der Intensivmedizin (SIFIM)

- 48h Observation von Fehlern
- 769 patients
- 59 ICUs in A, D, CH
- Fragebogen zur Sicherheitskultur



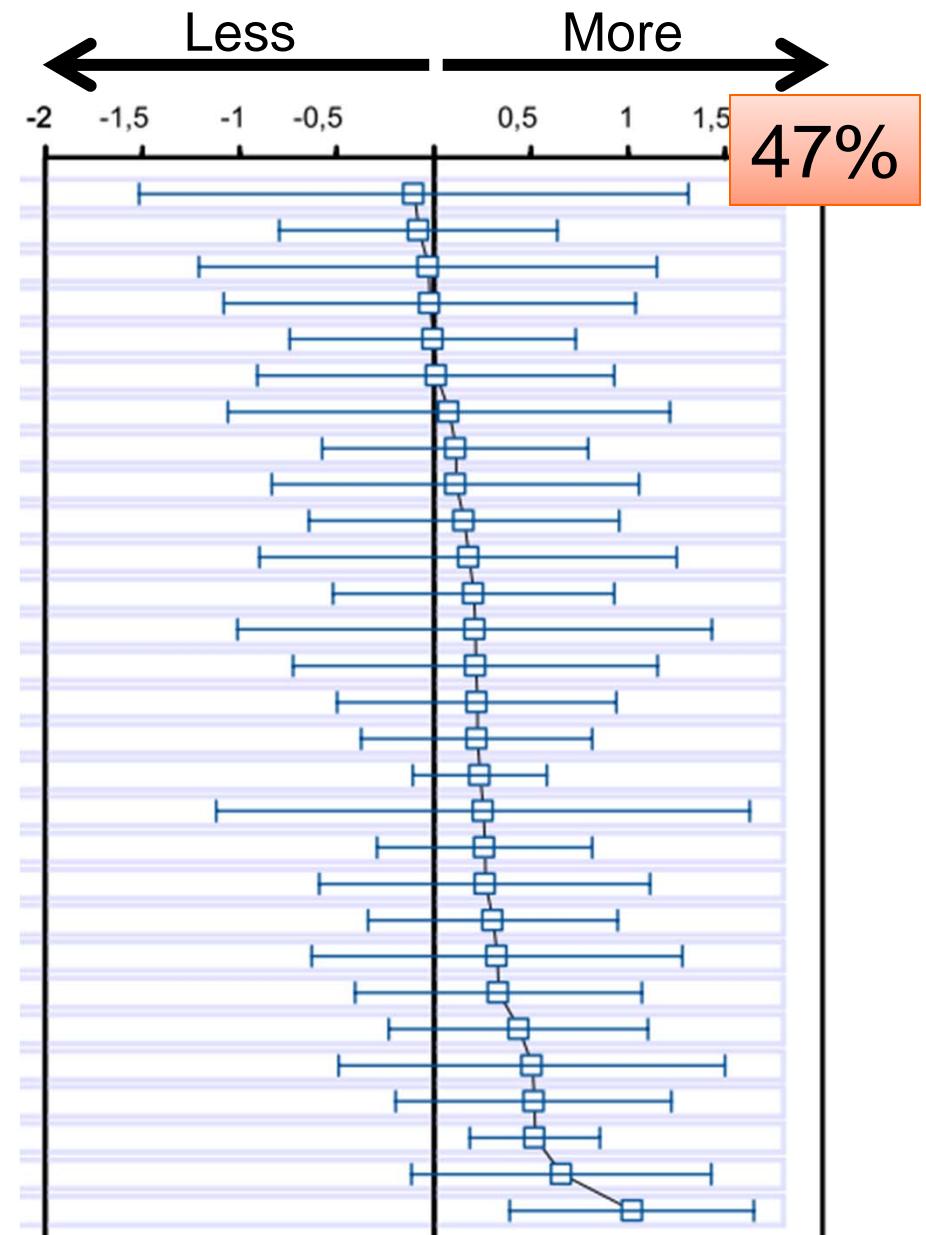
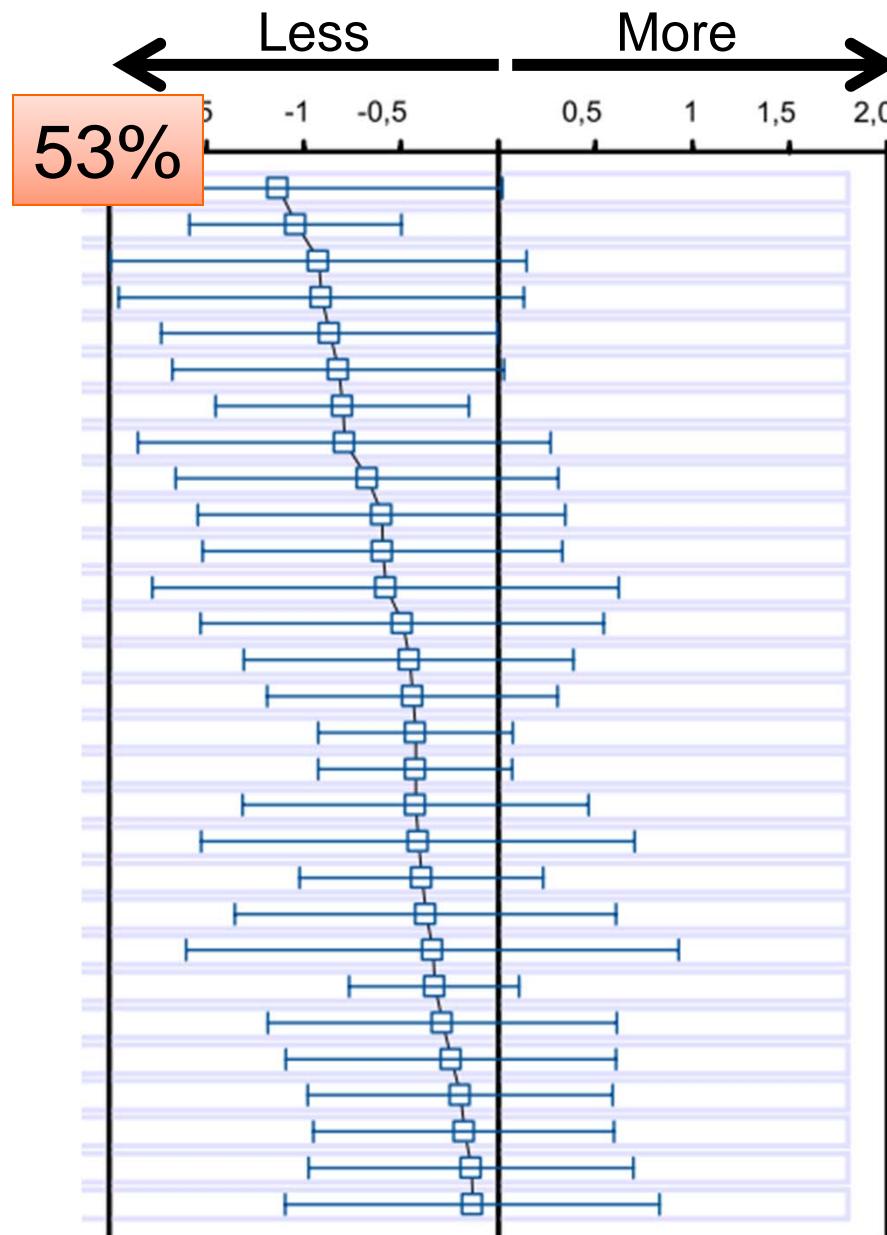
SEE 2 versus SIFIM study

Medication errors per 100 patient days

	SEE 2	SIFIM
Wrong time	33.4	34.0
Missed Medication	22.4	12.3
Wrong dose	10.2	4.4
Wrong drug	5.3	1.2
Wrong route	3.2	2.0
Total	74.5	53.9

Preliminary results

Open discussion and communication of problems



SIFIM study

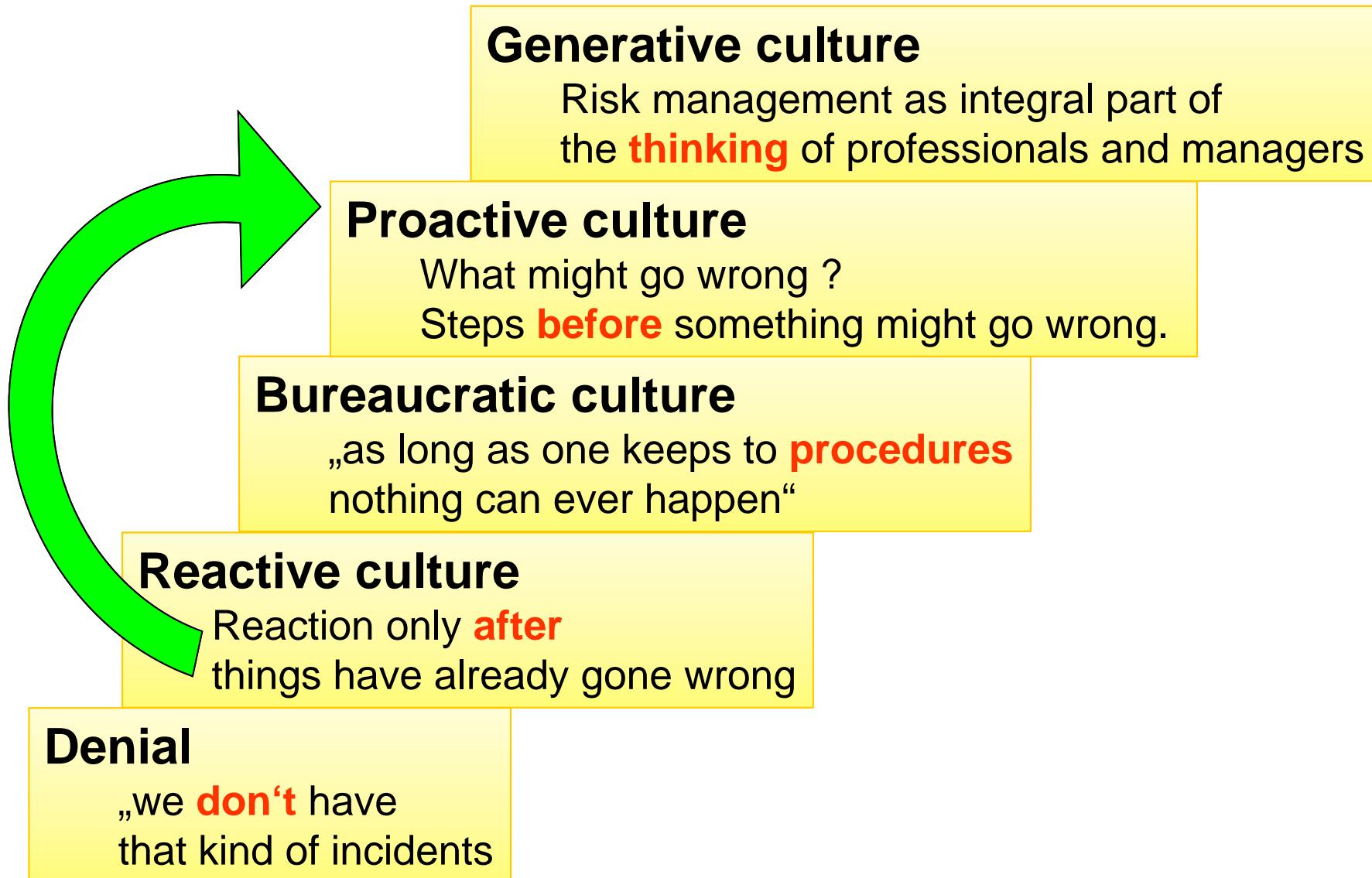
Predictors of error

Valentin et al, unpublished data

	OR	95% CI	p
Patient level			
Observation time	1.01	1.00 – 1.02	<0.05
Nr of Medications	1.02	1.01 – 1.03	<0.01
ICU level			
Safety culture total score	0.98	0.97 – 0.99	<0.01

Open discussion & communication
of problems

Evolutional steps of a safety culture





Association with
risk reduction of

-
- Routine check at shift change -32%
 - Critical incident reporting -31%

One step ahead: ask - what might go wrong?



Fazit

- Fehler in der Intensivmedizin sind ein relevantes Problem in einem sehr komplexen System.
- Als präventive Faktoren können gelten:
 - Problembewusstsein
 - Erfassung und Analyse von Fehlern
 - Standardisierte Prozesse
 - Vermeidung übermäßiger Arbeitsbelastung
 - Systemdesign
(EDV, Medizintechnik, Arbeitsplätze....)
- Patientensicherheit erfordert Teamarbeit und eine neue Kultur der Offenheit und Voraussicht.