Medical Emergency Teams

International und Österreich

Sabine Schneider, Austrian Resuscitation Council
www.arc.or.at

Peter Safar, 1974:

„Critical Care is not a location, it is a process.

It can take place not only in the ICU, everywhere.“

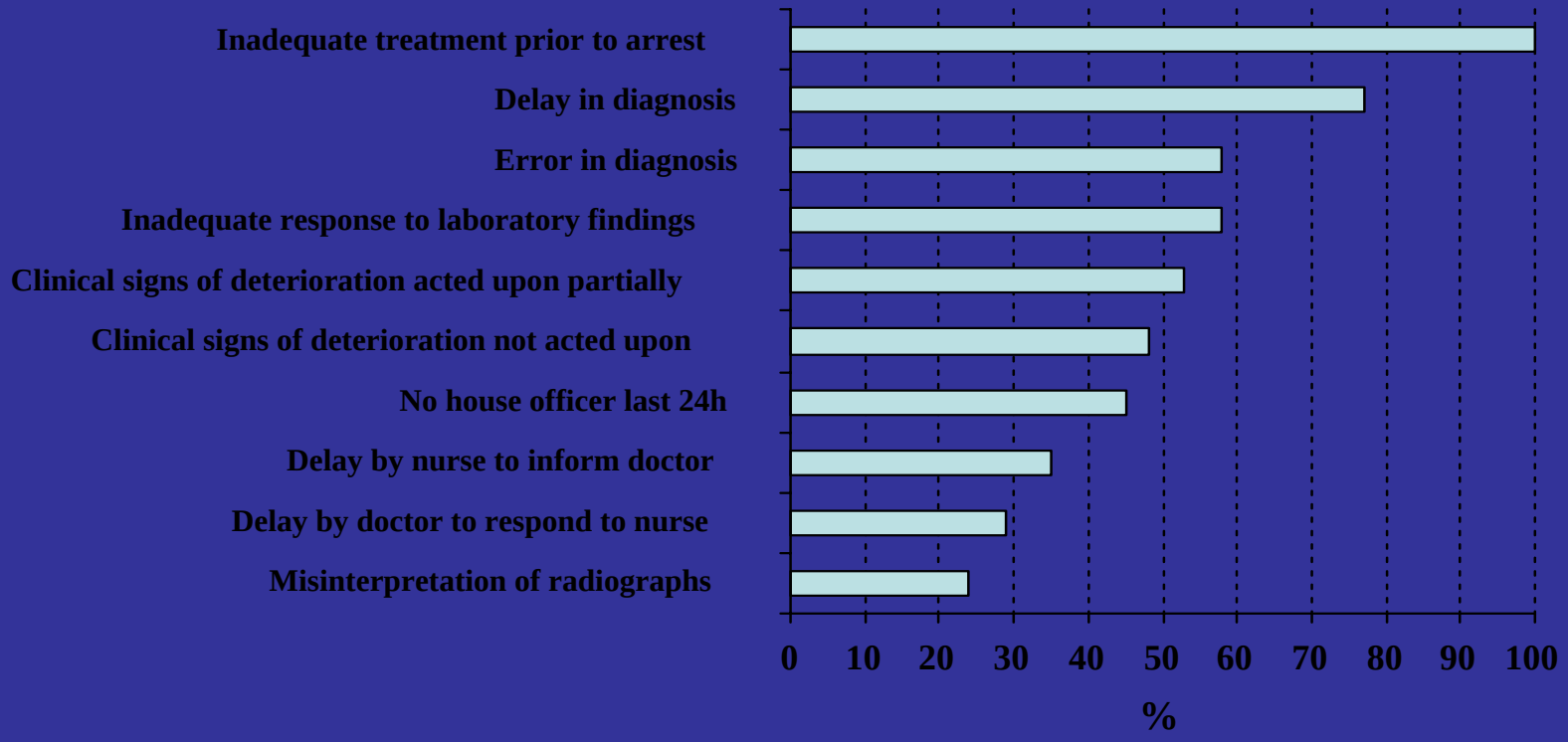
Critical care: A process not a location

- up to 84% of patients with in-hospital cardiac arrest have changes in vital signs within eight hours before arrest (Schein RM et al, Chest 1990; 98:1388-1392)
- 66% i-h-CA were potentially avoidable (Hodgetts T J et al, Resuscitation 54 (2002) 115-123)
- The 3 most common reasons for CA in adults were cardiac arrhythmia, acute respiratory insufficiency and hypotension; NRCPR i-h-resuscitation study (AHA-sponsored); 207 hospitals (14720 CA; 17 % alive at discharge) (Peberdy M A et al for the NRCPR Investigators, Resuscitation 58 (2003) 297-308
- 60% (383/638) of primary events (I-h-Death, CA, unanticipated ICU admissions) had a total of 1032 documented antecedents. Esp. hypotension, a fall in GCS, threatened airway; 68 hospitals (50 UK, 16 AUS, 2 NZ); (Kause J et al, ACADEMIA-Study, Resuscitation 62 (2004) 275-282)
- up to 41% of admissions to ICUs are potentially avoidable (McQuillan P. BMJ 1998;316:1853-1858)
- patients admitted from general wards have higher mortality than those from the OR, ED or Recovery (Goldhill DR, Critical Care Medicine 1998;26:1337-1345)

Hodgetts TJ et al. Incidence, location and reasons for avoidable in-hospital cardiac arrest in a district general hospital; Resuscitation 2002; 54:115-123

700 beds; 32348 admissions in 1999, 1023 deaths; CAT-activation in 139 times (118 primary events)
survival to discharge: 14%

Reasons for 78 avoidable CA



- *The majority of treated in-hospital CA are potentially avoidable*

- Multiple system failures include:
  - delays and errors in diagnosis
  - inadequate interpretation of investigations
  - incomplete treatment
  - inexperienced doctors
  - management in inappropriate clinical areas.

Hodgetts et al. Resuscitation 2002


Notfallmed.Qualitätskriterien:
Raten an „unerwarteten“
Todesfällen, CA, ICU-Transfer,
MET-Alarmierungen
DNAR
PRÄVENTION
MET Sicherheitsnetz
1. Frühzeitiges Erkennen
2. Frühzeitige Critical Care
Kritisch kranke Patienten
„Pre-Arrest-Patienten“

AUS

Bellomo R. et al. A prospective before-and-after trial of a medical emergency team. Med J Aus 2003; 179 (6): 283-287

- Prospective trial of intensive-care based MET in a single tertiary referral hospital (The Austin and Repatriation Medical Centre, University of Melbourne; 60000 admission/yr)
- 4 month before and after comparison periods, separated by 18 months (preparation and education period)
- Measured: Cardiac arrests
  Deaths after cardiac arrests
  Post cardiac arrest bed days
  Overall in-hospital mortality

A prospective before-and-after trial of a medical emergency team

99 MET calls in 4 months, significantly more calls during the evening

	Before MET	After MET	Relative Risk Reduction
Cardiac arrests	63	22	65%; p < 0,001
Cardiac arrest deaths	37	16	56%; p < 0,005
ICU days after cardiac arrest	163	33	80%; p < 0,001
Hospital days after cardiac arrest	1353	159	88%; p < 0,001
Inpatient deaths	302	222	26%; p < 0,004 3 lives/1000 admissions

Bellomo R et al. MJA 2003

Bellomo R. et al. (2003)

Conclusions:

The incidence of in-hospital cardiac arrest and death following cardiac arrest, bed occupancy related to cardiac arrest, and overall in-hospital mortality ***decreased*** after introducing an intensive care-based medical emergency team.

…. This suggests that a MET is associated with major cost savings and increased hospital efficiency.

AUS

Bellomo R. et al. Prospective controlled trial of effect of medical emergency team on postoperative morbidity and mortality rates. Crit Care Med, 2004; 32(4): 916-921

Patients admitted to hospital for major surgery during a 4-month control phase and during a 4-month intervention phase

	Before MET	After MET	Relative Risk Reduction
Adverse outcomes	336 in 190 patients	136 in 105 patients	57,8%; p < 0,0001

These changes were due to (significant*) decreases in:

- Respiratory failure RRR 79,1%, p<0,0001*
- Stroke RRR 78,2%, p<0,0026*
- Severe sepsis RRR 74,3%, p<0,0044*
- Acute renal failure requiring renal replacement therapy RRR 88,5%, p<0,0001*
- Emergency ICU admissions RRR 44,4%, p<0,001
- Nr of post-op deaths RRR 36,6%, p<0,0178*
- Duration of hospital stay after major surgery decreased from a mean of 23,8 days to 19,8 days (p=0,0092)

AUS

Buist M D et al, Effects of a medical emergency team on reduction of incidence of and mortality from unexpected Cardiac arrests in hospital: preliminary study. BMJ Volume 324 16 February 2002

- Non randomised, population based study before (1996) and after (1999) introduction of the medical emergency team
- 300 bed tertiary referral teaching hospital, Dandenong, VIC
- Participants: All patients admitted to the hospital in 1996 (n=19317) and 1999 (n=22847)
- Interventions: MET
- Main outcome measures: Incidence and outcome of unexpected CA

Incidence and Mortality

	Before intervention 1996	After intervention 1999
Nr of unexpected CA	73	47
Incidence/1000 patients	3.77	2.05*
Mortality	56 (77%)	26 (55%)*

*p < 0.001

After adjustment for case mix the intervention (MET) was associated with a 50% reduction in the incidence of unexpected cardiac arrests (odds ratio 0,5, 95% confidence interval 0,35 to 0,73)

Buist et al. BMJ 2002

Conclusion Buist et al:

Early intervention by a medical emergency team significantly reduced the incidence of and mortality from unexpected cardiac arrest in hospital

Studie wurde auf Grund verschiedener methodischer Mängel stark angegriffen. Trotz allem zeigt sie, dass klinisch instabile „kritisch kranke“ Patienten von der Implementierung des MET-Systems profitieren.

UK

Kenward G et al. Evaluation of a Medical Emergency Team one year after implementation. Resuscitation 2004; 61: 257-263

700-bed hospital, 53500 adult admissions, 136 MET activations (6 exclusions)

- One year after implementation of the MET a reduction in unexpected cardiac arrest rate (2,6/1000 admissions vs 2,4/1000) and overall mortality (20,0/1000 admissions vs 19,7/1000) noted but not statistically significant
- Common Factors leading to MET activation: fall in GCS, fall in oxygen saturation, increased respiratory rate, decreased SBP, increased pulse
- Often only simple interventions were required to reverse deterioration (e.g. increase of oxygen therapy or ventilatory support (80%), with or without the administration of intravenous fluids or medications. In 10 % of cases, oxygen therapy was the sole intervention)
- Potentially the 2 most important factors influencing survival are the use of critical care resources AND delay in MET activation!
- Initiating “do not attempt resuscitation” (DNAR) decisions is a key part of MET activity
- New systems need time to develop ('bed in”)

US

DeVita M A et al. Use of a medical emergency team responses to reduce hospital cardiopulmonary arrests. Qual Saf Health Care 2004; 13: 251-254

University of Pittsburgh Medical Center Presbyterian Hospital

- A retrospective analysis of 3269 MET responses and 1220 cardiopulmonary arrests over 6,8 years showed an **increase in MET responses** from 13,7 to 25,8 per 1000 admissions (p>0,0001) after instituting objective activation criteria.
- There was a **coincident 17% decrease** in the incidence of cardiopulmonary arrests from 6,5 to 5,4 per 1000 admissions (p=0,016)
- The proportion of fatal arrests was similar before and after the increase in use of MET.

Conclusion:

Increased use of MET may be associated with fewer cardiopulmonary arrests.

AUS

Bristow P J et al, Rates of in-hospital arrests, deaths and intensive care admissions: effect of a MET. Med J Aus, 2000 Sept; 173(5): 236-240

- 3 Hospitals (one with MET, two with Cardiac arrest teams)
- cohort comparison study after casemix adjustment
- 1510 adverse events identified among 50942 admissions
- Main outcome measures: Rates of unexpected CA, unanticipated admission to ICU, death (+ DNR-death subgroup)

Ergebnisse:

- Anzahl der ungeplanten Intensivzuweisungen war im MET-Spital signifikant geringer als in den beiden CAT-Spitälern
- Keine signifikanten Unterschiede gab es jedoch bei der Anzahl der unerwarteten CA und der Gesamtmortalitätsrate

AUS

M.E.R.I.T Study

Medical Early Response Intervention Therapy

- **Multi-centre, prospective, cluster randomised trial**
- **23 hospitals enrolled; 16000 adverse events, 700000 hospital admissions**
- Conducted by: Simpson Centre for Health Services Research, Australian and New Zealand Intensive Care Society Clinical Trials Group
  Funded by: NHMRC, Australian Quality and Safety in Health Care; $ 1,2 million

The primary aim of this study is to test the hypothesis that the implementation of the hospital-wide MET system will reduce the aggregate incidence of:

- **Unanticipated ICU admissions**
- **Cardiac Arrests**
- **Non NFR Deaths**

AUS

M.E.R.I.T Study

Medical Early Response Intervention Therapy

Michael Parr:

„Overall there was no statistically significant difference in unanticipated deaths, unanticipated ICU admissions and cardiac arrests between the MET hospitals and the control hospitals.

There was however a significant improvement during the study in both hospital groups (the advantages of being in a study), and the control hospitals were often acting as MET hospitals.

And the MET hospital teams often failed to be activated.“

Organisiertes Alarmteam

n = 114

Organisiertes HA/NF-Team?

Ja: 58,8 % (n = 67)

Personelle Besetzung (Mehrfachnennung mögl.): 49 x Anästhesisten, 37 x intern. Intensivmediziner (inkl. 2 pädiatrische), 33 x Intensiv-DGKP bzw. Anästhesie-DGKP, 29 x DGKP, etc.

HA/NF-Team zu Notfallpatient < 4 Minuten?

n = 67

Ja: 89,6 % (n = 60)

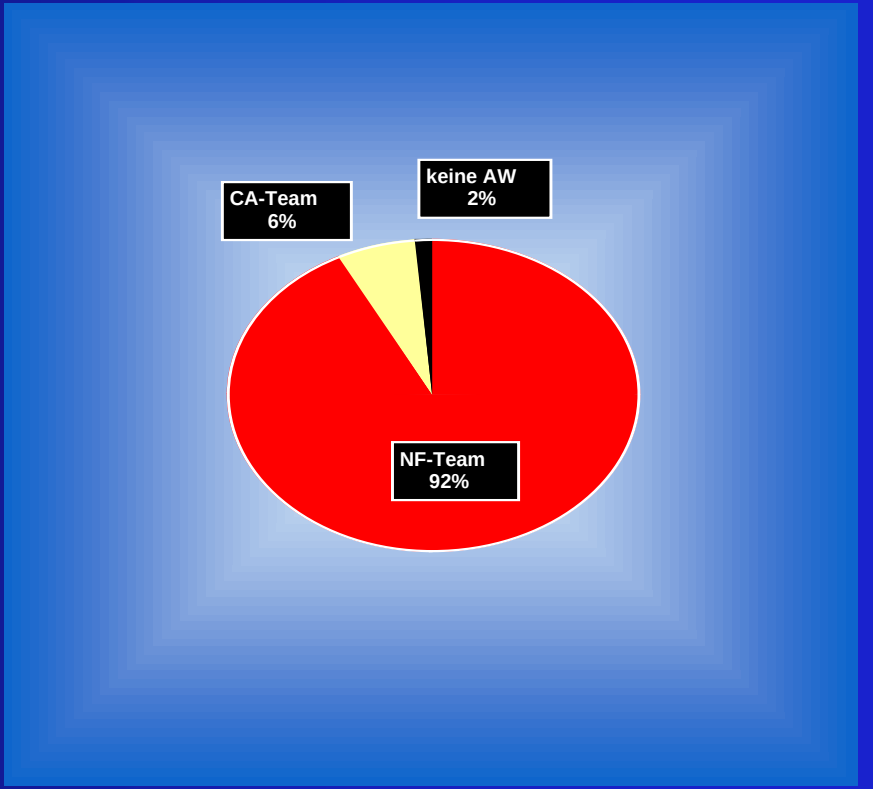
Nein: 10,4 % (n = 7; davon 6 Akutspitäler)

Eintreffzeiten liegen zwischen 30 Sek. bis 10 Minuten („Schätzung“ nach tel. Rückruf)

HA-Team oder NF-Team?

n = 67 KA mit organisiertem Alarmteam

- 6 % (n = 4*): Team wird nur bei Kreislaufstillstand (CA) alarmiert
  * alle AW stammen von Akut-Spitälern
- 92,5 % (n = 62): Team wird AUCH bei sonstigen Notfällen alarmiert
- 1,5 % (n = 1) keine Antwort



Einheitliche Alarmkriterien

JA: 52,6 % (n = 60) der 114 KA, obwohl nicht alle ein organisiertes NF-Team haben

Welche?

n = 60 KA mit Alarmkriterien

Medizinische:	58,3 % (n = 35)
Technische:	40 % (n = 24)
keine angegeb.:	1,7 % (n = 1)

n = 67 KA mit org. Alarmteam (58,8%)

Medizinische:	40,3 % (n = 27)
Technische:	22,4 % (n = 15)
keine angegeb.:	1,5 % (n = 1)
keine Kriterien:	35,8 % (n = 24)

Take home!

1. **Critical Care: A process not a location**

   CA sind ***NICHT*** unerwartete Ereignisse. Identifizierung von CA-Risikopatienten ist möglich. Bisherigen Herzalarmteams kommen zu spät. Es ist ***bewiesen*** - wenn auch nicht Level A -, dass frühzeitige notfallmedizinische Intervention einige unerwartete Tote, CA und ungeplante Intensivtransfers verhindern kann**.**

2. Es gibt ***KEINEN*** **auf** Evidenz beruhenden Grund das derzeitige hierarchische System in den Krankenanstalten beizubehalten. Vielmehr spricht die gesamte wissenschaftliche Evidenz dafür das System mit Hilfe von MET zu verbessern! Die, die nicht “willig” für eine Veränderung sind, müssen erst einmal Evidenz produzieren, die eine Nicht-Implementierung von MET rechtfertigt.

3. MET-System soll nicht den “erwarteten” Tod von terminal kranken Patienten verhindern.

   Ziel ist eine *FRÜHERKENNUNG* und *FRÜHZEITIGE* notfallmedizinische Intervention bei *“POTENTIELLEN”* Reanimationspatienten. Daher soll und muss das MET von jedem medizinischen Mitarbeiter/-in bei definierten akuten Veränderungen der Vitalitätszeichen angefordert werden können!

   Medical Emergency Teams sind notfallmedizinische Spezialisten!

Medizinisches Notfall Team

ALARMIERUNGSKRITERIEN

für Erwachsene

Bei akuten Veränderungen des klinischen Zustandsbildes:

Atemwege:	• Gefahr einer Atemwegsverlegung
Atmung:	• **Atemstillstand** • Atemfrequenz < 5 /min • Atemfrequenz > 36 /min
Kreislauf:	• **Kreislaufstillstand** • Pulsfrequenz < 40 /min • Pulsfrequenz > 140 /min • Systolischer Blutdruck < 90 mmHg
Neurologie:	• Plötzlich eintretende Bewusstseinseintrübung • Wiederholte oder länger dauernde zerebrale Krampfanfälle
Weiters:	• Jede(r) Patient(in), um den (die) Sie akut besorgt sind

NOTRUFNUMMER: .....

Melden Sie: WER ruft an
WO ist es passiert
WAS ist passiert

Begeben Sie sich zum Patienten und leisten Sie Erste Hilfe bis zum Eintreffen des Notfallteams!

Die kollegiale Führung (Stempel)

www.arc.or.at

- ARC Leitlinien
- Lokale NF-Nummer eintragbar! (Poster down-loaden und anschließend mit Adobe Acrobat Reader öffnen)
- MET-System:
  - MET-Alarmkriterien sind KEINE Diagnosen, sondern die Beurteilung eines klinischen Zustandsbildes
  - Zustimmung der Kollegialen Führung erforderlich!