The MET reduces cardiac arrests

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Overview

- Epidemiology of in-hospital arrests
- Failings of traditional model of care
- Principles of the MET
- Evidence from single centre studies
- Meta-analysis of RRTs and cardiac arrests
- Biological mechanism and plausibility
- Conclusions
Epidemiology of in-hospital arrests

• Incidence varies substantially
  – Buist et al. 0.66 / 1000 admissions (Post MET)¹
  – Chan et al. 11.2 / 1000 admissions (Pre RRT)²

• Differ substantially to out of hospital cardiac arrests
  – Are rarely sudden or unexpected

¹ Buist et al BMJ 2007
² Chan et al JAMA 2008
Epidemiology of in-hospital arrests

• Many follow iatrogenic complications \(^1\)
• Up to 84% have deterioration prior to event (Resp > multiple > cardiac > neurological) \(^1-4\)
• Median duration instability 6.5 hours \(^3\)
• Many receive sub-optimal care \(^4\)

3. Buist et al. MJA 1999
Failings of traditional model of care

Unwell patient → Deranged vitals → Vitals measured → Doctor called → Timely & definitive Rx

- Manual and intermittent vitals
- Frequency up to 8 hrly
- Incomplete vitals (esp RR)

- Discretion to call doctor
- Doctor availability
- Escalation of problems up hierarchical chain
- Dr intervention varies
Principles of the MET

• MET = Specialized team
• Similar to cardiac arrest team
  – Called when patient has
    » HR = zero
    » BP = zero
    » RR = zero
    » Level of consciousness = zero
At risk patient

- Staff member worried about the patient
  - HR < 40 or > 130 beats/min
  - Systolic blood pressure < 90 mmHg
  - Respiratory rate < 8 or > 30 breaths/min
  - Pulse oximetry saturation < 90%
  - Acute change in conscious state
  - Urinary output < 50mL in 4 hours

Unwell patient

- No palpable pulse
- No detectable blood pressure
- Unresponsive; and
- Not breathing

Parent unit notified of MET call & outcome

MET call made

- Treated and remain on ward
- Patient made not for resuscitation
- Unplanned ICU admission
- Patient dies

Respond blue call

Basic life support commenced

Advanced life support commenced
Principles of the MET... Cont...

• Deterioration has warning signs
• Deterioration occurs slowly
• Junior ward staff may not recognize deterioration or adequately escalate care
• ICU staff exist in the same building
• Early intervention improves outcome
• take critical care expertise to the patient before, rather than after, multiple organ failure or cardiac arrest occurs \(^1\).
Evidence from single centre studies

• Dandenong
  – before and after study
  – Unexpected cardiac arrest
    » 3.77 / 1000 in 1996 (before intervention)
    » 2.05 / 1000 in 1999 (after intervention)
  – After adjustment for case mix
    - MET associated with a ↓ cardiac arrest
      OR 0.50, (95% CI 0.35 to 0.73)

– Staff fail to call the MET
– To improve use of MET
  » orientation programme for first year doctors,
  » professional development course for medical registrars,
  » evolving role of liaison ICU nurses.
– Between 2000 and 2005 cardiac arrests
  ↓ 24% per year (2.4/1000 to 0.66/1000)
- **Austin Hospital**
  - Cardiac arrests and hospital mortality
    - ↓ CAs (65%)
    - ↓ deaths due to CA (56%)

Bellomo et al. MJA 2003
• Long term
  – 500% increased use of the MET
With ↑ MET calls there are ↓ arrests
Pittsburgh

– retrospective analysis over 6.8 yr

» 3269 MET responses

» 1220 cardiopulmonary arrests

» ↑ MET responses

» 13.7 to 25.8/1000; p < 0.0001.

» 17% ↓ arrests (6.5 to 5.4/1000 p = 0.016).
• Royal Children's Hospital
  – Before (41 mo.) and after (12mo.) study
  – ↓ CA 0.19/1000 to 0.11/1000 (NS)
  – ↓ CA deaths 0.12/1000 to 0.06/1000 (NS)
  – In CAs with antecedent MET criteria
    » ↓ CAs 17 to 0 (risk difference 0.16/1000, p = 0.0158)
    » ↓ CA deaths from 12 to 0 (risk diff 0.11/1000, p = 0.0426)
Results of meta-analysis

34% ↓ cardiac arrests

Chan et al Arch. Int. Med 2010
Biological mechanism and plausibility

• Up to 84% of CAs are preceded by signs of instability
• MET decreases CAs by 12-65%
• Biologically plausible
• For every 17 MET calls, might prevent one cardiac arrest \(^1\)

• Mechanism of effect
  – Stopping deterioration
  – Advanced care planning

1. Jones et al. CCF 2005
• Stopping deterioration

• MET performs “ICU-type interventions” to stabilize and prevent arrest

  – MERIT study \(^1\)

    » Immature RRS \(\rightarrow\) high proportion (>90%) of critical care type interventions (airway, ventilation, inotropes)

  – Study at Austin \(^2\)

    » 38/99 (38.4%) needed such interventions

1. Flabouris et al. Resuscitation 2010
2. Bellomo et al. MJA 2003
• MET assists with EOLC planning
  – Liverpool 713 (3.8%) METs over 12 mo \(^1\)
    » 27/ 713 (3.8%) made NFR during MET\(^1\)
  – Study of 900 patients at Austin Hospital \(^2\)
    » 7.3% new designation of NFR after

1. Parr et al. Resus 2001
2. Calzavacca et al. ICM 2008
- Dandenong = 152 METs in 124 patients \(^1\)
  - 13 (10.4%) NFR during MET
- TNH = 195 calls over 12 months \(^2\)
  - 8.2% had new LOMT after MET review

- Hence 1/26 (3.8%) to 1/10 (10.4%) of MET calls might \(\rightarrow\) new LOMT
- Similar in magnitude of 1/17

1. Buist BMJ 2002
2. Casamento CCR 2008
Conclusions

- In-hospital cardiac arrests preceded by warning signs
- Intervention by MET during this period reduces cardiac arrests
- Likely to be a combination of two mechanisms
  - Stabilisation and prevention of further deterioration
  - Improved EOLC planning and NFR designation
• Future research
  – Optimizing use of MET for those most likely to benefit from it
  – Whether CAs in MET-equipped hospitals still have antecedents → ? Missed METs