Data and the MET
“What to measure and why”

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Overview

• Background to, and principles of MET

• The afferent limb
  – Cardiac arrests
  – Missed and delayed METS

• The efferent limb
  – Repeat MET calls

• The overall system
  – The MET and limitations of treatment
  – MET dose
  – Outcomes of MET patients
Background to the MET

• Serious adverse events common in hospitalized patients
• Events are preceded by warning signs
• Deterioration occurs slowly
• Junior ward staff may not recognize deterioration or adequately escalate care
• Early intervention improves outcome
1. Devita et al. CCM 2006
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

MET call made

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

Unwell patient

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

Respond blue call

- Basic life support commenced
- Advanced life support commenced
- Patient dies

Parent unit notified of MET call & outcome
The afferent limb

- **Cardiac arrests with warning signs**

  - Two questions
    - Are your cardiac arrests preceded by MET criteria
    - Was the MET called

  - Austin hospital
    - 28% of arrests follow an initial MET call \(^1\)

  - MERIT study \(^2\)
    - 50% of arrests preceded by MET criteria but MET was not called

1. Jones et al. CCF 2005  
The afferent limb

• Missed MET calls
  – RESCUE study (Tracey Bucknall)
  – 10 hospitals in Victoria
  – 48 Nursing students on a single day
    » did set of vitals and
    » assessed chart prior 24 hours
  – 2200 patients → 1688 seen
    » 5.3% of patients had MET criteria prior 24 hours
    » 3.3% of patients had MET criteria in single set vitals
  – Less than 20% of patients actually got MET call
The afferent limb ... contin ...

- Missed MET
  - Failure of crisis detection / failure to rescue
  - Failure of MET utilization rather than failure of MET concept
  - Similar to “intention to treat analysis” versus “as treated analysis”
  - Missed MET = “Absolute afferent limb failure”
• Delayed MET calls
  – Two studies of 200 MET calls at Austin hospital
  – Delayed MET = criteria present > 30 minutes
  – call criteria % delayed mean delay
    » GCS 35% (16hr)
    » Arrhythmia 24% (13hr)
    » Resp distress 50% (12hr)
    » Hypotension 39% (5hr)
  – Delayed MET = relative afferent limb failure

Delayed MET activation – Consequence

Timely MET call

Delayed MET call

Log Rank $P = .049$

Delayed MET activation increases death
The afferent limb … contin …

• Delayed and missed METs
  – Undermine and important principles of MET
  – “Early intervention improves outcome”

• Highlight the need for
  – Repeat audit
  – Repeat education of ward staff
The efferent limb

• Repeat METs
  – Patient has call for same reason
  – Patient has call for different reason
  – Patient has EOLC / LOMT issues

• Study Austin hospital (Resuscitation...In press)
  – ¾ single MET review
  – ¼ multiple METs
Single MET

1290

NFR status

417

- NFR (266/417 (63.8%))

- Not NFR (145/873 (16.6%))

ICU admit

873

- Admitted (58/171 (33.9%))

- Not admitted (353/1119 (32.2%))

1119

Multiple METs

374

NFR status

101

- NFR (67/101 (66.3%))

- Not NFR (93/273 (34.1%))

ICU admit

273

- Admitted (40/96 (41.6%))

- Not admitted (120/278 (43.2%))

96
The efferent limb … contin …

• Repeat METs
  – Increased risk of death
  – only 9.7% of deaths occurred < 48 hrs of initial MET review.

  – 50% longer hospital stay
• My concerns
  – When MET see a patient ward staff think
    » “All is well”
    » Should actually think “My patient is unwell”
  – ? Sub-optimal follow-up management plan
  – May lead to delays in definitive treatment
  – Lot of these MET calls associated with patients with limitations of medical care
The overall system

• The MET and end of life care
• MET dose
• Overall outcome of MET patients
The MET and end of life care

• Parr and co-workers\textsuperscript{1}
  – suggested that in 23\% of 713 MET calls over a 12 month period an NFR order would have been appropriate.

• Two separate studies\textsuperscript{2,3}
  – \approx{} 8\% of MET reviews resulted in new allocation of NFR status

1. Resuscitation, 2001
2. Buist BMJ 2002
3. Casamento CCR 2008
MET EOLC cont…

• 7 centre study
  – 652 MET calls in 518 patients over one month
  – 19.1% received repeat MET call
  – 31.1% of calls associated with a LOMT
    » 20.3% pre-existing before call
    » 10.8% newly implemented after MET calls
Hospital outcome

- Hospital LOS [days]
  - Median (IQR): 14 (6-30)
- Hospital mortality (% of patients): 12.3%

Overall cohort
N = 518

- No LOMT n (%) = 357 (68.9%)
- LOMT present n (%) = 161 (31.1%)
  - LOMT pre-MET n (%) = 105 (20.3%)
  - New LOMT post-MET n (%) = 56 (10.8%)
- 14 (6-23) 13 (4-24)
- 46.7% 51.8%
MET dose

• Definition = MET calls / 1000 admissions
• May take some time for “bedding in”
• Increasing dose reduces CAs
  – Pittsburgh (Foraida et al. JCC 2003)
  – Dandenong (Buist et al. BMJ 2007)
  – Austin (Jones et al. CCF 2005)
Outcome of MET patients

• In hospital mortality
  – Austin Hospital
    • One MET call (not NFR) $\rightarrow$ mortality = 16.6%
    • > one MET (not NFR) $\rightarrow$ mortality = 34.1%

• Mortality of other patients
  ▪ All ICU patients = 12%
  ▪ All hospital patients < 4%
• Goldhill & McNarry (BJA 2004) 🇬🇧
  – ↑ vital sign abnormalities = ↑ risk of death

• Bell et al (Resus. 2006) 🇸🇪
  – 1097 patients on 2 days
    » 4.5% had MET criteria
    » 30 day mortality = 25% vs 3.5%

• Buist et al (Resuscitation 2004) 🇦🇺
  – 6300 patients over 7 mo.
    » 8.9% had MET criteria = 6.8 fold ↑ mortality
• 7 hospital study
  – In hospital mortality of patients subject to MET review and no LOMT = 12.3%
  – Similar to mortality of patients admitted to ICU
Overall conclusions

• MET patients = sick patients
  – Increased mortality
  – Increased length of stay

• Hence MET audit = audit of your hospitals “at-risk” patients
Overall conclusions

• Things I think are important
  – Do your arrests have MET antecedents
  – How often are METs missed / delayed
  – How often do your MET patients have repeat MET calls
  – How frequent are EOLC issues in MET calls
  – What is the “MET dose” in your hospital
  – What is the in-hospital mortality of your MET calls