METs Around the World: Australia

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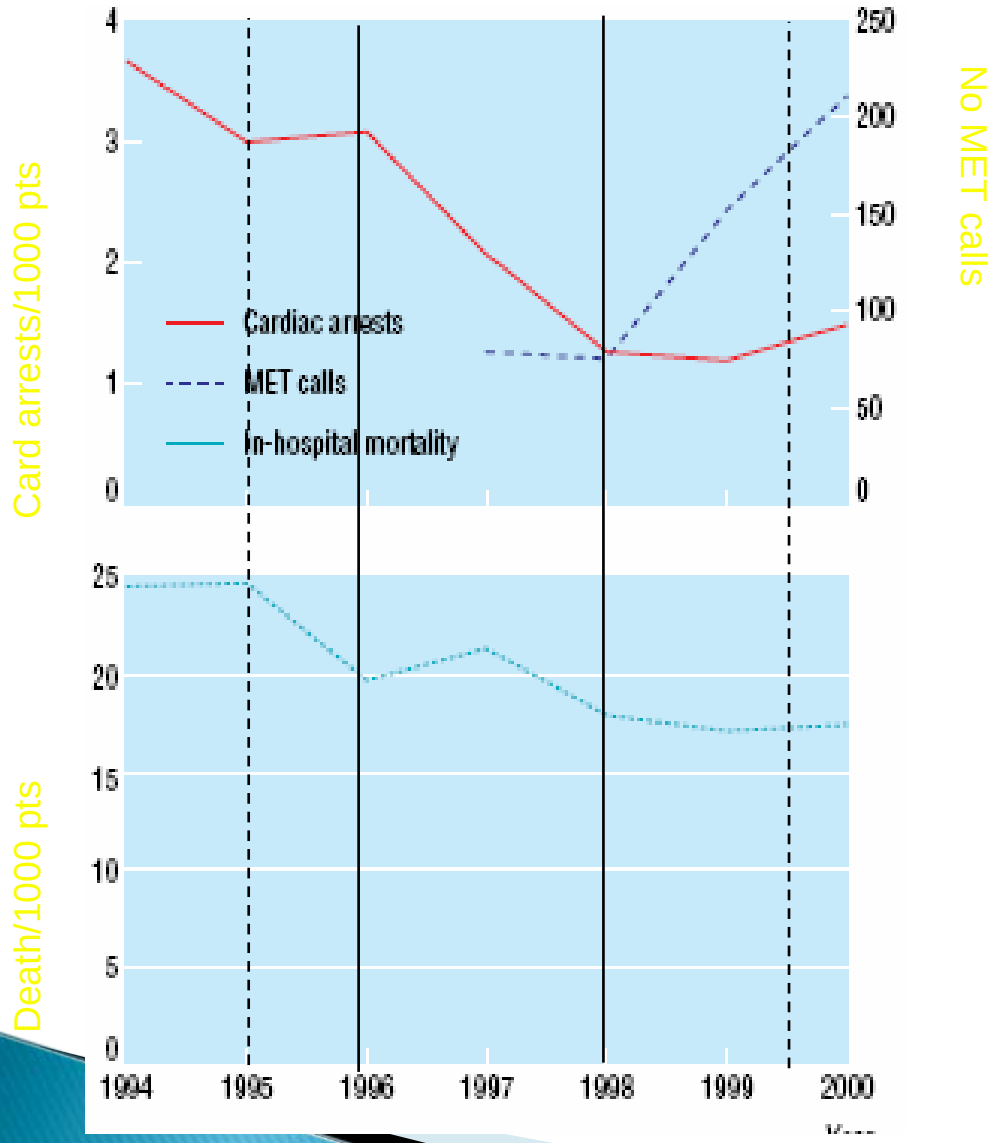
Australia and METs

- First report of MET by Hillman et al. (Anaesthesia and Intensive Care 1995)
- First retrospective comparative study by M. Buist in (BMJ 2002)



But even Buist had already introduced MET in 1997

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

Rinaldo Bellomo, Donna Goldsmith, Shigehiko Uchino, Jonathan Buckmaster, Graeme K Hart, Helen Opdam, William Silvester, Laurie Doolan and Geoffrey Gutteridge

ABSTRACT

Objective: To determine the effect on cardiac arrests and overall hospital mortality of an intensive care-based medical emergency team.

Design and setting: Prospective before-and-after trial in a tertiary referral hospital.

Patients: Consecutive patients admitted to hospital during a 4-month "before" period (May–August 1999) ($n = 21\,090$) and a 4-month intervention period (November 2000 – February 2001) ($n = 20\,921$).

Main outcome measures: Number of cardiac arrests, number of patients dying after cardiac arrest, number of postcardiac-arrest bed-days and overall number of in-hospital deaths.

Results: There were 63 cardiac arrests in the "before" period and 22 in the intervention period (relative risk reduction, RRR: 65%; $P < 0.001$). Thirty-seven deaths were attributed to cardiac arrests in the "before" period and 16 in the intervention period (RRR: 56%; $P = 0.005$). Survivors of cardiac arrest in the "before" period required 163 ICU bed-days versus 33 in the intervention period (RRR: 80%; $P < 0.001$), and 1353 hospital bed-days versus 159 in the intervention period (RRR: 88%; $P < 0.001$). There were 302 deaths in the "before" period and 222 in the intervention period (RRR: 26%; $P = 0.004$).

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.

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MOST HOSPITALS have cardiac arrest teams that respond to in-hospital cardiac arrests using modern technology and standardised protocols. However, survival to hospital discharge in patients with in-hospital cardiac arrests has remained stable at between 14.7% (United States) and 16.7% (United Kingdom) for 30 years.[1] As several studies of in-hospital cardiac arrests suggest that signs of clinical and physiological instability may precede the arrest,[2-4] introducing an intensive care-based hospital-wide preventive approach (a medical emergency team [MET]) might decrease the incidence of cardiac arrests and, consequently, hospital mortality. We tested this hypothesis by conducting a prospective trial comparing these outcome measures before and after introducing a MET.

METHODS

Hospital

Prospective controlled trial of effect of medical emergency team on postoperative morbidity and mortality rates*

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Objective: To determine whether the introduction of an intensive care unit-based medical emergency team, responding to hospital-wide preset criteria of physiologic instability, would decrease the rate of predefined adverse outcomes in patients having major surgery.

Design: Prospective, controlled before-and-after trial.

Setting: University-affiliated hospital.

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

Interventions: Introduction of a hospital-wide intensive care unit-based medical emergency team to evaluate and treat inpatients deemed at risk of developing an adverse outcome by nursing, paramedical, and/or medical staff.

Measurements and Main Results: We measured incidence of serious adverse events, mortality after major surgery, and mean duration of hospital stay. There were 1,369 operations in 1,116 patients during the control period and 1,313 in 1,067 patients during the medical emergency team intervention period. In the control period, there were 336 adverse outcomes in 190 patients (301 outcomes/1,000 surgical admissions), which decreased to 136 in 105 patients (127 outcomes/1,000 surgical admissions) during the intervention period (relative risk reduction, 57.8%; $p < .0001$). These changes were due to significant decreases in the number of cases of respiratory failure (relative risk reduction, 79.1%; $p < .0001$), stroke (relative risk reduction, 78.2%; $p = .0026$), severe sepsis (relative risk reduction, 74.3%; $p = .0044$), and acute renal failure requiring renal replacement therapy (relative risk reduction, 88.5%; $p < .0001$). Emergency intensive care unit admissions were also reduced (relative risk reduction, 44.4%; $p = .001$). The introduction of the medical emergency team was also associated with a significant decrease in the number of postoperative deaths (relative risk reduction, 36.6%; $p = .0178$). Duration of hospital stay after major surgery decreased from a mean of 23.8 days to 19.8 days ($p = .0092$).

Conclusions: The introduction of an intensive care unit-based medical emergency team in a teaching hospital was associated with a reduced incidence of postoperative adverse outcomes, postoperative mortality rate, and mean duration of hospital stay.
(Crit Care Med 2004; 32:916–921)

Reduction of paediatric in-patient cardiac arrest and death with a medical emergency team: preliminary results

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Aims: To determine the impact of a paediatric medical emergency team (MET) on cardiac arrest, mortality, and unplanned admission to intensive care in a paediatric tertiary care hospital.

Methods: Comparison of the retrospective incidence of cardiac arrest and death during 41 months before introduction of a MET service with the prospective incidence of these events during 12 months after its introduction. Comparison of transgression of MET call criteria in patients who arrested and died before and after introduction of MET.

Results: Cardiac arrest decreased from 20 among 104 780 admissions (0.19/1000) to 4 among 35 892 admissions (0.11/1000) (risk ratio 1.71, 95% CI 0.59 to 5.01), while death decreased from 13 (0.12/1000) to 2 (0.06/1000) during these periods (risk ratio 2.22, 95% CI 0.50 to 9.87). Unplanned admissions to intensive care increased from 20 (SD 6) to 24 (SD 9) per month. The incidence of transgression of MET call criteria in patients who arrested decreased from 17 to 0 (risk difference 0.16/1000, 95% CI 0.09 to 0.24), and in those who died, decreased from 12 to 0 (risk difference 0.11/1000, 95% CI 0.05 to 0.18) after introduction of MET.

Conclusions: Introduction of a medical emergency team service was coincident with a reduction of cardiac arrest and mortality and a slight increase in admissions to intensive care.

Introduction of the medical emergency team (MET) system: a cluster-randomised controlled trial

*MERIT study investigators**

Summary

Background Patients with cardiac arrests or who die in general wards have often received delayed or inadequate care. We investigated whether the medical emergency team (MET) system could reduce the incidence of cardiac arrests, unplanned admissions to intensive care units (ICU), and deaths.

Methods We randomised 23 hospitals in Australia to continue functioning as usual (n=11) or to introduce a MET system (n=12). The primary outcome was the composite of cardiac arrest, unexpected death, or unplanned ICU admission during the 6-month study period after MET activation. Analysis was by intention to treat.

Findings Introduction of the MET increased the overall calling incidence for an emergency team (3·1 *vs* 8·7 per 1000 admissions, p=0·0001). The MET was called to 30% of patients who fulfilled the calling criteria and who were subsequently admitted to the ICU. During the study, we recorded similar incidence of the composite primary outcome in the control and MET hospitals (5·86 *vs* 5·31 per 1000 admissions, p=0·640), as well as of the individual secondary outcomes (cardiac arrests, 1·64 *vs* 1·31, p=0·736; unplanned ICU admissions, 4·68 *vs* 4·19, p=0·599; and unexpected deaths, 1·18 *vs* 1·06, p=0·752). A reduction in the rate of cardiac arrests (p=0·003) and unexpected deaths (p=0·01) was seen from baseline to the study period for both groups combined.

Interpretation The MET system greatly increases emergency team calling, but does not substantially affect the incidence of cardiac arrest, unplanned ICU admissions, or unexpected death.

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Research

Open Access

Introduction of Medical Emergency Teams in Australia and New Zealand: a multi-centre study

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Table 1

Medical Emergency Team (MET) service status in 172 hospitals in Australia and New Zealand

Hospital category	MET service commencement date known	MET service commencement date unknown	No MET service	MET status unknown, number (percentage of total[a])	Total
All hospitals	79	5	47	41 (23.8)	172
Metropolitan	18	1	13	3 (8.6)	35
Private	28	1	11	20 (33.3)	60
Regional	18	3	14	17 (32.7)	52
Tertiary	15	0	9	1 (4)	25

Hospitals participating in the Medical Emergency Response and Intervention Trial are not included in the data above. [a]'Total' refers to the total number of hospitals in each hospital category.

Figure 1

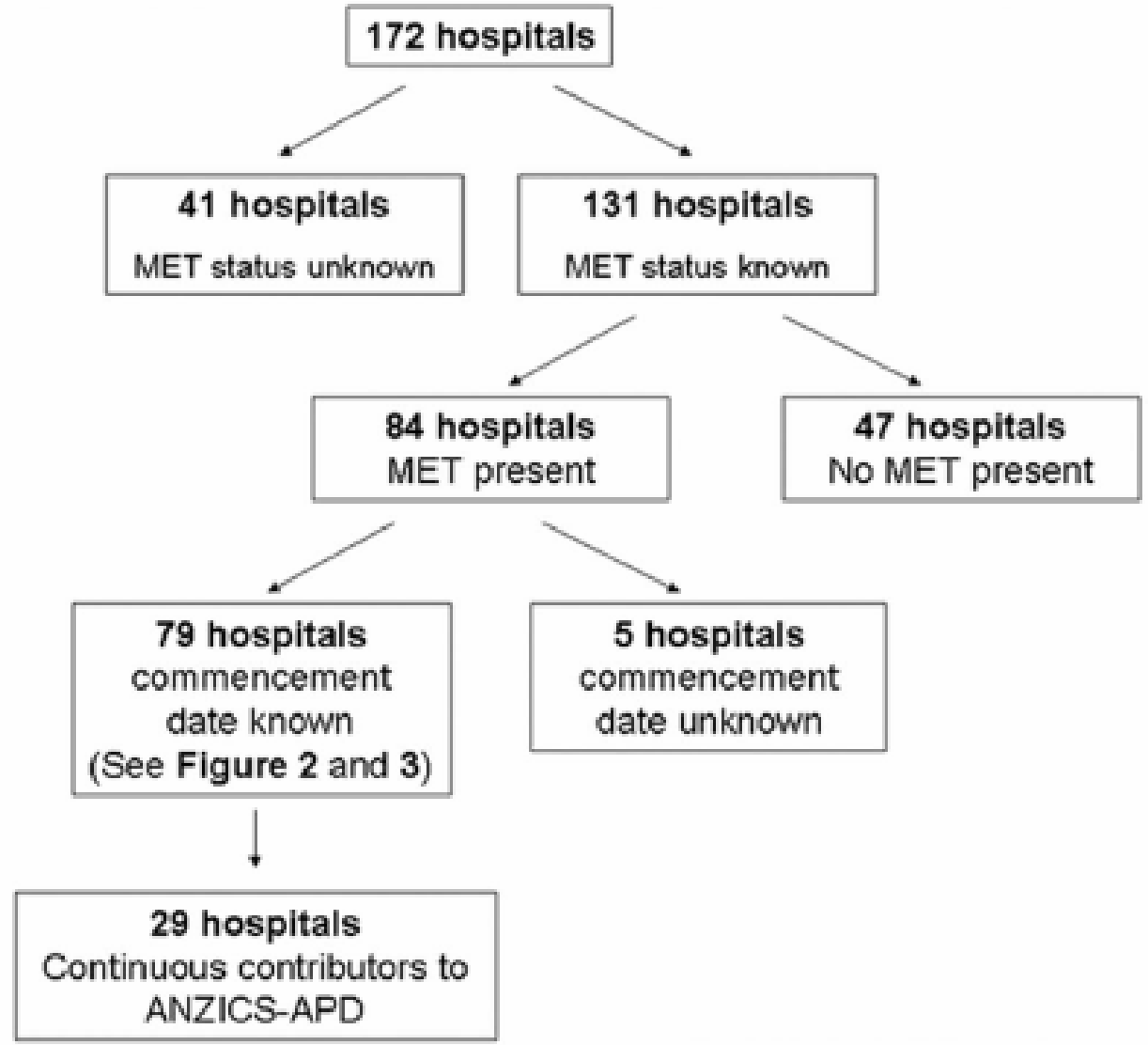
172 hospitals
41 hospitals
MET status unknown
131 hospitals
MET status known
84 hospitals
MET present
47 hospitals
No MET present
79 hospitals
commencement
date known
(See Figure 2 and 3)
5 hospitals
commencement
date unknown
29 hospitals
Continuous contributors to
ANZICS-APD

Table 2

Proportion with and without a Medical Emergency Team (MET) amongst hospitals with information on MET status

Hospital category	MET service present	No MET service	Percentage with MET service[a]
All hospitals	84	47	64.1
Metropolitan	19	13	59.4
Private	29	11	72.5
Regional	21	14	62.5
Tertiary	15	9	64.1

[a]Indicates the percentage with MET service only for 131 'non-MERIT' hospitals in which the MET status of the hospital is known. MERIT, Medical Emergency Response and Intervention Trial.

Figure 2

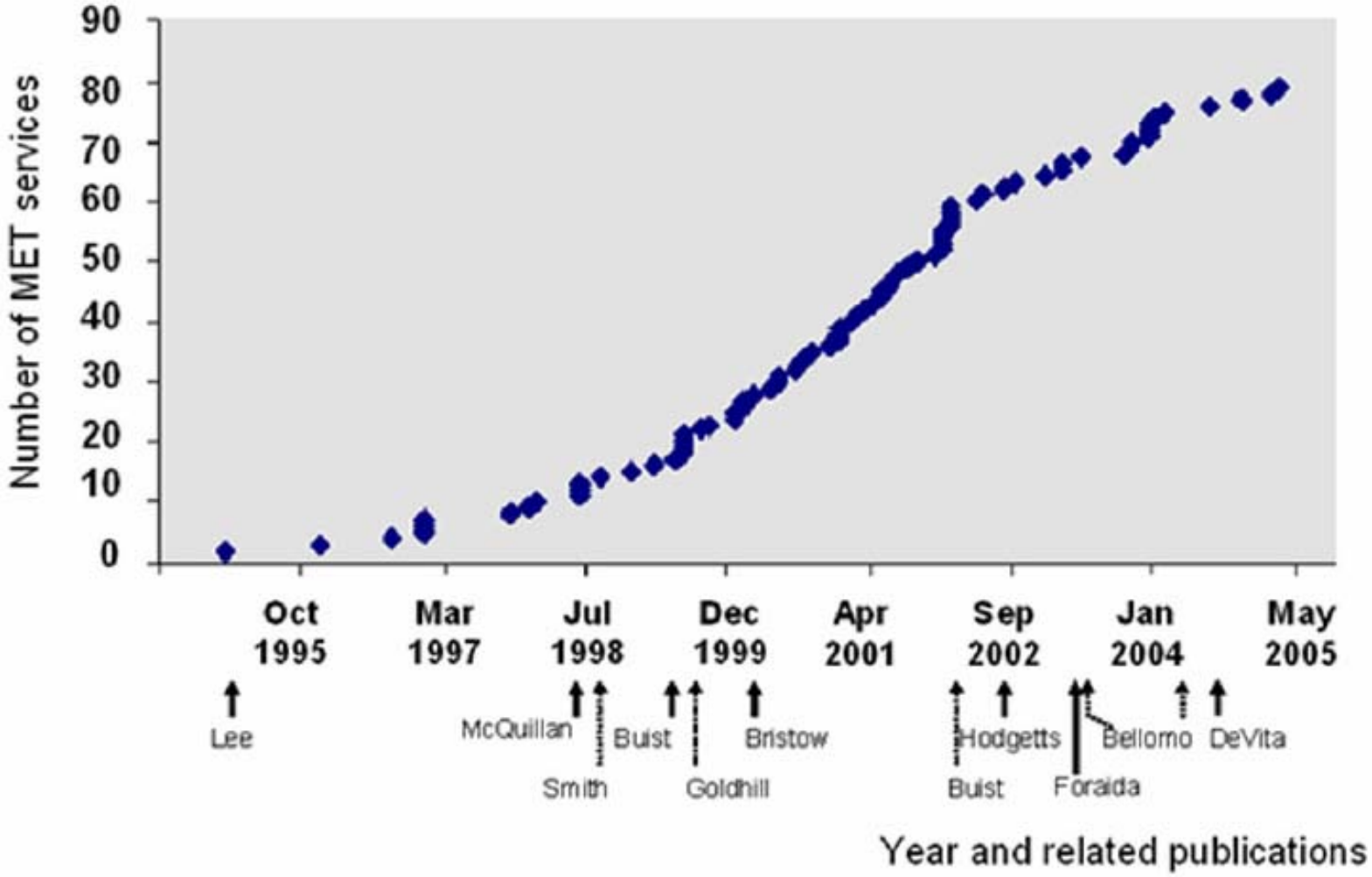
Number of MET services
90
80
70
60
50
40
30
20
10
0
Oct 1995
Mar 1997
Jul 1998
Dec 1999
Apr 2001
Sep 2002
Jan 2004
May 2005
Lee
McQuillan
Smith
Buist
Goldhill
Bristow
Buist
Hodgetts
Foraida
Bellomo
DeVita
Year and related publications

Figure 3

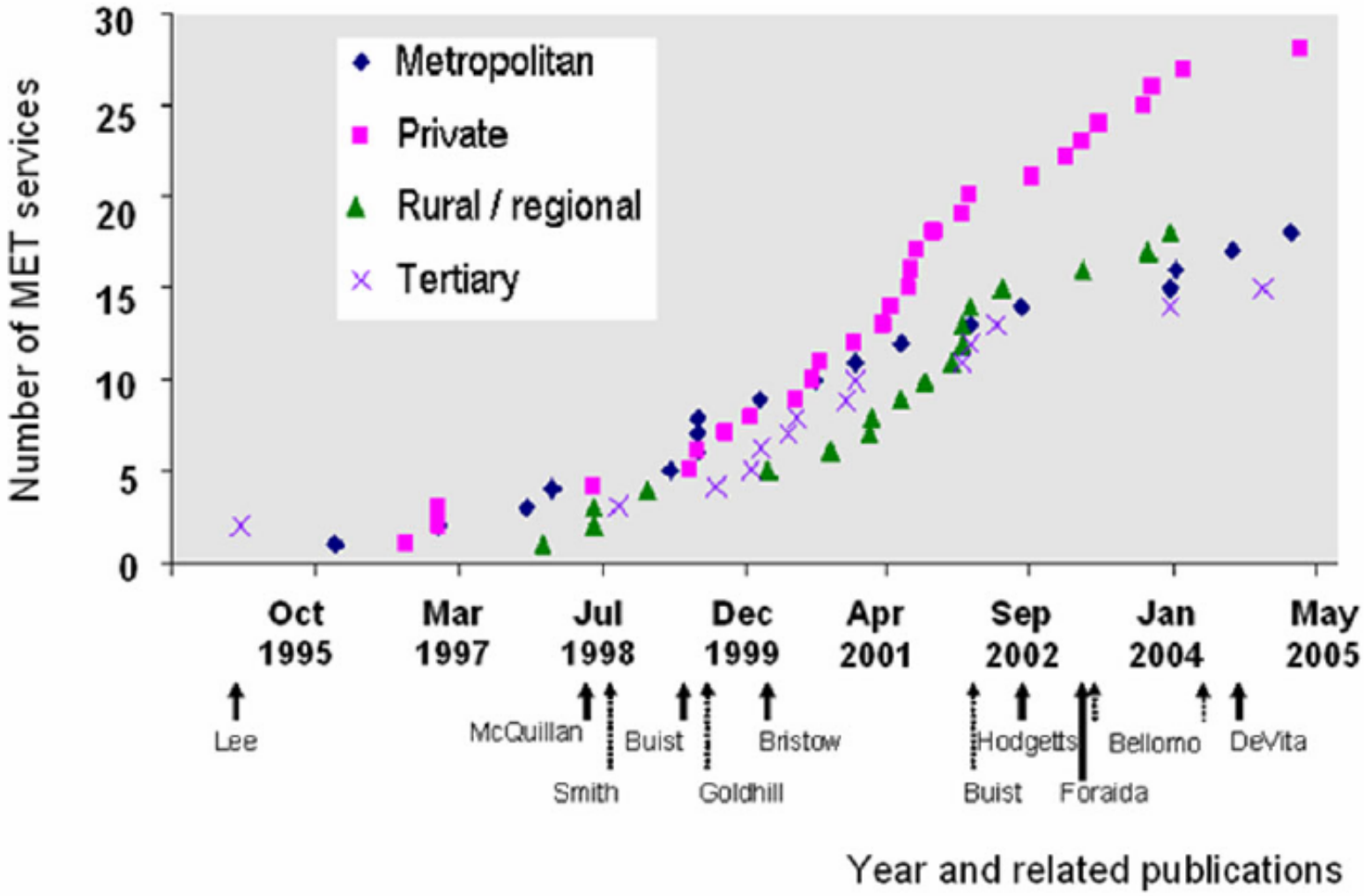
Number of MET services
30
25
20
15
10
5
0
Metropolitan
Private
Rural / regional
Tertiary
Oct 1995
Mar 1997
Jul 1998
Dec 1999
Apr 2001
Sep 2002
Jan 2004
May 2005
Lee
McQuillan
Smith
Buist
Goldhill
Bristow
Buist
Hodgetts
Foraida
Bellomo
DeVita
Year and related publications

Table 3

Number and frequency of ICU admissions due to cardiac arrest and ICU readmissions

Outcome measure	Year before MET introduction, mean (SD)	Year after MET introduction, mean (SD)	*P* value
Cardiac arrests admitted from ward to ICU per year	6.33 (5.29)	5.04 (5.52)	0.024
Rate of admitted ward cardiac arrests (events per 1,000 ICU admissions)	8.66 (4.45)	6.13 (4.70)	0.016
ICU readmissions per year following ICU discharge	28.22 (32.05)	29.18 (36)	0.91
ICU readmission rate (events per 1,000 ICU admissions)	36.00 (19.08)	34.98 (21.68)	0.74

ICU, intensive care unit; MET, Medical Emergency Team; SD, standard deviation.
Data from 29 hospitals in Australia and New Zealand for 12 months before and 12 months after MET service introduction.

Key messages

- A majority of hospitals in Australia and New Zealand (ANZ) appear to have introduced a Medical Emergency Team (MET) system.
- The introduction of such systems in ANZ occurred mostly before any publications reporting the possible effectiveness of such systems.
- The introduction of MET systems in ANZ appeared to be a response to publications highlighting the incidence of adverse events in hospitals.

Further Evolution

- Department of Health in New South Wales (most populous state) to implement an RRT in every hospital
- Australian National Safety and Quality Organization planning to implement an RRT in every hospital Australia wide
- RRTs (or METs as we call them) are continuing to spread across Australia and it is likely that every suitably sized hospital will have one in the next 5 years

Conclusions

- In Australia METs were first considered in 1995
- Seminal work was done in the late 1990's
- First publications began to emerge from 2000-2003
- As publications highlighted potential benefits several hospital introduced METs
- Introduction has been progressive
- Now the majority of Australian hospitals have METs
- More will follow