hSR proceedings in Intensive Care & Cardiovascular Anesthesia

ORIGINAL ARTICLE

Activities of a medical emergency team twenty years after its introduction

L. Cabrini, G. Monti, G. Landoni, P. Silvani S. Colombo, S. Morero, M. Mucci, P.C. Bergonzi, D. Mamo, A. Zangrillo

Department of Anaesthesia and Intensive Care, Università Vita-Salute San Raffaele, Milan, Italy

ABSTRACT

Introduction: We describe and quantify the wide range of activities that a mature Medical Emergency Team can progressively perform.
Methods: The activities performed by a Medical Emergency Team 20 years after its introduction were prospectively collected during 105 consecutive days.
Results: the main activity was focused on the follow-up visits to previously treated critically ill patients (mean 7.5 visits/die in working days, 5.1 in the others). A large amount of other scheduled or unscheduled activities (like sedation or analgesia for diagnostic procedures, central venous line placement, phone consultation regarding critical care aspects of treatments) were performed: on average, 7.3 side-activities/die in working days and 5.2 in the others. First consultations in patients not previously seen were on average 3.1/die on working days, 2.4 in the others. Cardiac arrest accounted for 27 (9 %) of first time visits.
Conclusions: A Medical Emergency Team can progressively perform many kinds of activities. An evaluation limited to the reduction of in-hospital cardiac arrests or a too early assessment may underestimate its beneficial effects on the Hospital complexity.

Keywords: *medical emergency team, rapid response team, cardiac arrest, prevention, quality of care.*

INTRODUCTION

The incidence of in-hospital cardiac arrest (IHCA) ranges from 1 to 5 events/1000 admissions (1, 2), with a surviving rate of 20 % (3).
The number of patients suffering from severe adverse events is about 15-20 % of the admitted patients (4-6). Severe adverse events and IHCA are often preceded by worsening clinical conditions lasting hours or days (7-9).

Corresponding author:
Luca Cabrini
Department of Anesthesia and Intensive Care
Università Vita-Salute San Raffaele di Milano
Via Olgettina, 60 - 20132 Milan, Italy
e.mail: cabrini.luca@hsr.it

A timely treatment could avoid further worsening: Hodgetts reported that 60 % of IHCA could be prevented (2).
Medical Emergency Teams (MET) aim to reduce IHCA, deaths and unanticipated intensive care unit (ICU) admissions (10).
National and international authorities advocate the creation of rapid response systems (RRS) (11, 12). Nevertheless, a recent review reported a weak evidence in favour of RRS (13).
There is no study evaluating the enlargement of the activities performed by the MET.
Gradually, the competence and skills of its members may interact with the complex-

ity of the Hospital, filling the gap between patients' needs and wards (or Services, like Radiology or Endoscopy) resources.
A mature MET can carry out an heterogeneous array of activities and an assessment of its efficacy could give different results if performed at its introduction or after several years. The MET was introduced in our Hospital 20 years ago.
Rapidly, it began to perform different tasks such as sedations for diagnostic examinations, treatment of procedural pain, consults to other specialists on nutritional therapies, antibiotic therapies, haemodynamic or respiratory supports.
The MET also began to perform follow-up visits to critical patients not transferred to an ICU.
To describe and quantify the activities that a mature MET can perform, we present the prospectively collected data during 105 consecutive days in a single centre.

METHODS

The San Raffaele Hospital is a University Institute with 1100 beds. Data collection took place after Ethical Committee approval from December 2006 to March 2007, twenty years after MET introduction in the Hospital.
There are no strict criteria that state when to alert the MET.
The shift was covered by an anaesthesiologist.
Nurses were not included: the MET was assisted by nursing staff of the ward. The anaesthesiologist in charge of the MET shift was dedicated to the calls from the wards, the Emergency Department or the services, emergencies or scheduled procedures and follow-up visits to critically ill patients.
Not rarely, the MET visited at-risk patients just discharged from ICU or from operat-

Table 1 - *First visits (301), Follow up visit (707) and side-activities (696) performed by the MET during 105 consecutive days.*

	Working days (N = 72)			Non working days (N = 33)		
	Mornings (08 am - 02 pm)	**Afternoons** (02 pm - 08 pm)	**Nights** (08 pm - 08 am)	**Day time** (08 am - 08 pm)	**Night time** (08 pm - 08 am)	**Total**
First visits	78	63	80	43	37	301
Follow-up visits	207	174	156	108	62	707
Side-activities	192	184	148	114	58	696
						1704

Details of side activities						
- Central venous catheterisations	40	51	7	24	6	128
- Peripheral venous catheterisations	17	26	22	30	9	104
- Scheduled sedations	35	3	3	1	0	42
- Scheduled procedures	45	4	0	4	0	53
- Unscheduled sedations and procedures	32	52	27	27	14	152
- Post ICU discharge follow-up visits	2	3	10	2	0	17
- Post-operative follow-up visits	1	8	18	5	2	34
- Phone consultations	20	37	61	21	27	166
						696

ing theatre. To preserve the rapidity of the response, a second anaesthesiologist was available in case of emergency. Patients visits were divided into "First Visits" and "Follow-Up Visits".
Number of Follow-up visits to survivors was collected and divided into day and night visits and those performed in working-days or non-working-days (*Table 1*).
The MET (always present in the Hospital) planned the timing of his further visits. Taking into account patient's conditions and "do not attempt resuscitation" (DNAR) status, the MET evaluated if the patient could be safely treated in his ward.
Several side-activities, including sedation (e.g. for biopsy during fiberoptic bronchoscopy, for Magnetic Resonance in claustrophobic patients, for long lasting radiological procedures in anxious patients), analgesia for painful procedures, monitoring during high-risk procedures, or central venous catheterisation were performed.
Data are shown as mean and standard deviation or number and percentage.

RESULTS

During 105 consecutive days, 1704 visits were performed (*Table 1*).
First visits (301 in 301 patients) were followed by follow-up visits (707 in 212 survivors who were not transferred to the ICU or to other hospitals, mean 7.5 visits/die in working days, 5.1 in the others). Further 696 visits ("side-activities") were performed: on average, 7.3 side-activities/die in working days and 5.2 in the others.
First time visits (on average 3.1/die on working days, 2.4 in the others) were mostly performed in patients with acute respiratory failure (124 patients, 41%). Cardiac arrest accounted for 27 (9%) of first time visits (*Figure 1*).
During the 301 first time visits the MET performed 506 interventions (*Figure 2*), the most frequent (17%) being diagnostic examination such as transfer to the CT room.
More than half (77/124 = 62%) of the patients with acute respiratory failure re-

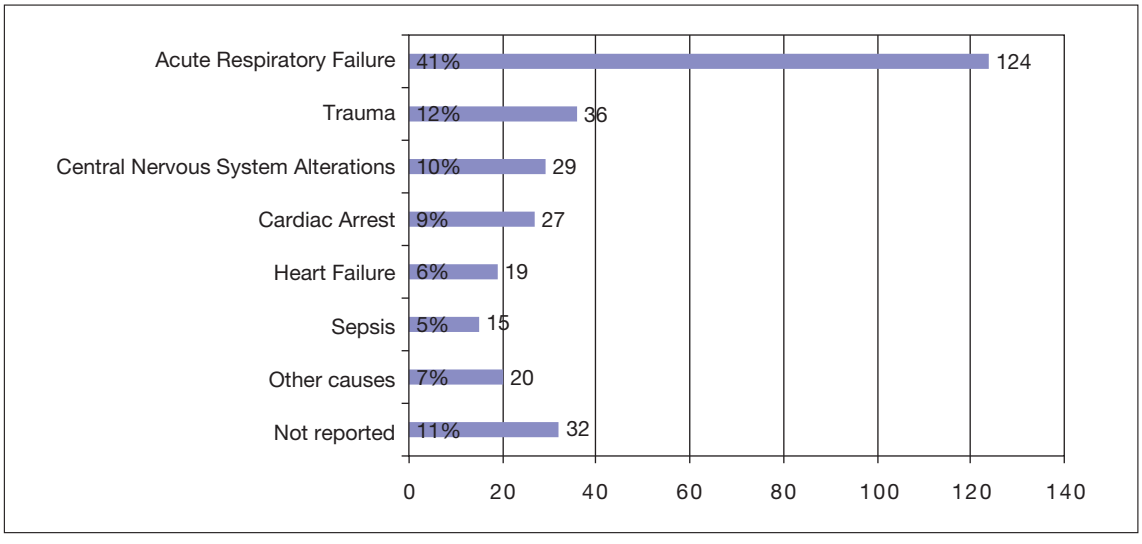

Figure 1
Causes of the first visit in 301 consecutive critically ill patients outside the ICU over 105 days.

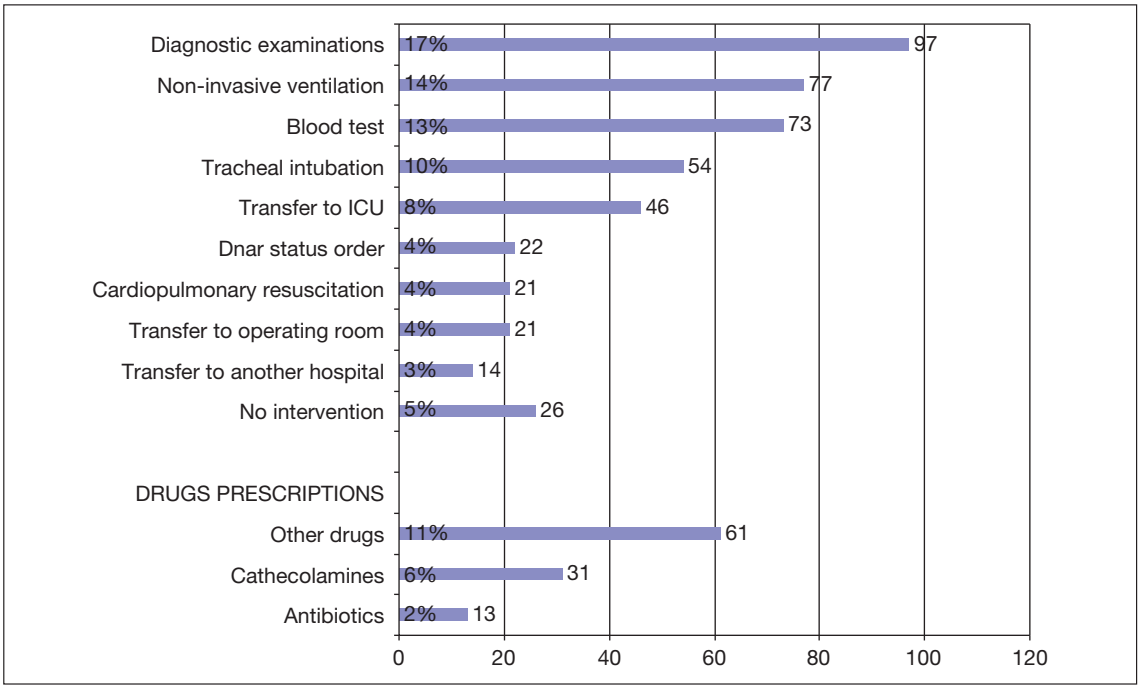

Figure 2
506 interventions performed during the first visit to 301 consecutive critically ill patients outside ICU over a 105 day-period.

ceived non-invasive ventilation. Patients with cardiac arrest received cardiopulmonary resuscitation (21/27 = 78 %) or had DNAR status (6/27 = 22 %).
Only 26 patients (9 % of the patients didn't undergo any intervention).
Less than once a day (82 times in the 105-days study period) the MET was facing a previous call or a scheduled procedure and a second anaesthesiologist was called to perform the task of the MET.

DISCUSSION

This is the first attempt to give a general picture of the activities performed by a MET several years after its introduction.
The demand for intensive care beds, at least in European Countries, exceeds their availability.
Many critically ill patients are managed outside ICU, but the required level of care for these patients may exceed the capability of general wards, increasing the rate of IHCA compared to similar patients admitted in ICU (2,14).
The MET is one of the possible efferent limbs of a RRS; when characterized by full critical care capabilities, it should minimize the gap between needs and resource (11).
However, Galhotra reported a relevant incidence of avoidable IHCA 16 years after the introduction of a MET (15).
A recent review found only a weak evidence in favour of RRS (13) focusing on the reduction of in hospital mortality and IHCA, but the potential benefits of MET, as stated by the same authors, may extend to other significant outcomes.
In this paper we report a wide spectrum

of side-activities. During twenty years the requests to the MET increased in number and heterogeneity; several organisational re-arrangements were adopted such as the the introduction of one anaesthesiologist dedicated to the Acute Pain Service and to the Endoscopy service. Anaesthesiologists were also forced to formulate local policies on several topics, like non-invasive ventilation outside ICU (16).

The most commonly performed MET activity in the study period was represented by follow up visits in critically ill patients. The best clinical criteria to identify at-risk patients are yet to be defined (17). Even in the absence of defined criteria to alert the MET in our hospital, only 26 out of 301 first calls did not require any intervention; a little percentage of inappropriate calls must be considered acceptable to preserve the easiness of access to the MET.

Limitations

An evaluation of the positive effect of the MET on the global performance of our hospital has never been performed: the efficiency of this model as compared to others remains unknown (13). The MET in the present study was composed by anaesthesiologists only. Likely, other specialists could have detected other mismatches in health care processes, and offered other kinds of activities.

Data collection took place in a single centre: our results cannot be generalized. We limited the data collection to 105 days: our study did not aim to report the activity of the MET from its introduction (or to document its progressive widening), but only to describe the heterogeneity of the activities and the potential work-load associated with the extending of the MET duties.

As the MET was already present in the Hospital, an evaluation of its efficacy in reducing unexpected ICU admissions was not possible.

CONCLUSIONS

A MET can progressively perform different kinds of activities. In our experience 40.8 % of interventions were represented by side-activities and 41.5 % by follow-up visits of critically ill patients. Cardiac arrest only accounted for 1.5 % of the activity.

The beneficial effects on the Hospital system provided by the MET can be grossly underestimated when evaluating only in-hospital cardiac arrest rates.

Acknowledgment: we are grateful to our MET Colleagues for their help in data collection.

No conflict of interest acknowledged by the authors.
This paper was supported in part by "Un cuore per la vita".

REFERENCES

1. Skogvoll E, Isern E, Sangolt GK, et al. In-hospital cardiopulmonary resuscitation. 5 years' incidence and survival according to the Utstein template. Acta Anaesthesiol Scand 1999; 43: 177-184.
2. Hodgetts TJ, Kenward G, Vlachonikolis IG, et al. Incidence, location and reasons for avoidable in-hospital cardiac arrest in a district general hospital. Resuscitation 2002; 54: 115-123.
3. Sandroni C, Nolan J, Cavallaro F, et al. In-hospital cardiac arrest: incidence, prognosis and possible measures to improve survival. Intensive Care Med 2007; 33: 237-245.
4. McGlynn EA, Asch SM, Adams J. The quality of health care delivered to adults in the United States. N Engl J Med 2003; 348: 2635-2645.
5. Brennan TA, Leape LL, Laird N, et al. Incidence of adverse events and negligence in hospitalized patients: results of the Harvard Medical Practice Study I. N Engl J Med 1991; 324: 370-376.
6. Bellomo R, Goldsmith D, Russell S, et al. Postoperative serious adverse events in a teaching hospital: a prospective study. Med J Aust 2002; 176: 216-218.
7. Buist MD, Jarmolowski E, Burton PR, et al. Recognizing clinical instability in hospital pa-

tients before cardiac arrest or unplanned admission to intensive care. Med J Aust 1999; 171: 22-25.
8. Franklin C, Mathew J. Developing strategies to prevent inhospital cardiac arrest: analyzing responses of physicians and nurses in the hours before the event. Crit Care Med 1994; 22: 244-247.
9. Schein RM, Hazday N, Pena M, et al. Clinical antecedents to in-hospital cardiopulmonary arrest. CHEST 1990; 98: 1388-1392.
10. Hillman K, Parr M, Flabouris A, et al. Redefining in-hospital resuscitation: the concept of the medical emergency team. Resuscitation 2001; 48: 105-110.
11. DeVita M, Bellomo R, Hillman K, et al. Findings of the first consensus conference on medical emergency teams. Crit Care Med 2006; 34: 2463-2478.
12. Savoia G, Bosco G, Cerchiari E, et al, for SIAARTI - IRC Working Group. SIAARTI - IRC recommendations for organizing responses to in-hospital emergencies. Minerva Anestesiologica 2007; 73: 533-553.
13. Winters BD, Pham JC, Hunt EA, et al. Rapid response systems: a systematic review. Crit Care Med 2007; 35: 1238-1243.
14. Simchen E, Sprung CL, Galai N, et al. Survival of critically ill patients hospitalized in and out of intensive care unit beds. Crit Care Med 2004; 32: 1654-1661.
15. Galhotra S, DeVita M, Simmons RL, et al. Mature rapid response system and potentially avoidable cardiopulmonary arrests in hospital. Qual Saf Health Care 2007; 16: 260-265.
16. Cabrini L, Idone C, Colombo S, et al. Medical Emergency Team and non-invasive ventilation outside ICU for acute respiratory failure. Intensive Care Medicine 2009; 35: 339-343.
17. Subbe CP, Gao H, Harrison DA. Reproducibility of physiological track-and-trigger warning systems for identifying at-risk patients on the ward. Intensive Care Med 2007; 33: 619-624.