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Results: A total of 1812/2279 (79.6%) staff members completed the survey. The vast majority of respondents valued the MET. Working in a surgical vs. medical ward and having participated to either the MET educational programme (METal course) or MET interventions were associated with better acceptance of the MET system. Reluctance by nurses to call the covering doctor first instead of the MET for deteriorating patients (62%) was significantly less likely in those working in surgical vs. medical wards or having a higher seniority or a METal certification (OR 0.51 [0.4-0.65], 0.69 [0.47-0.99], and 0.6 [0.46-0.79], respectively). Reluctance to call the MET in a patient fulfilling calling criteria (21%), was less likely to occur in medical doctors vs. nurses and in surgical vs. medical ward staff, and it was unaffected by METal certification.

Conclusions: MET was well accepted in participating hospitals. Nurse referral to the covering physician was the major barrier to MET activation. Medical status, working in surgical vs. medical wards, seniority and participation to the MET educational programme were associated with lower likelihood of showing barriers to MET activation.

Factors affecting attitudes and barriers towards a medical emergency team among nurses and medical doctors: a multi-centre survey

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Abstract

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Introduction

Despite the immediate availability of qualified life support, the outcome of in-hospital cardiac arrest remains poor, with survival to discharge rarely exceeding 20%.^{1,2} Rapid response systems (RRS) have been established to manage unstable patients in general wards with the aim of preventing further deterioration leading to cardiac arrest.³ Implementation of a RRS includes education of the ward staff (the afferent limb of the system) to identify deteriorating patients needing urgent evaluation by a medical emergency team (MET).⁴ MET (the efferent limb of the system) is activated by the ward staff in patients fulfilling specific criteria of physiological instability, and its roles include stabilising the patient in the ward or transferring the patient to a higher level of care.

Although the theory underlying RRS is compelling, there is no definite evidence that RRS implementation decreases hospital mortality.⁵ One of the main reasons advocated to explain this unsatisfactory result is an absent or delayed MET activation by the ward staff in patients fulfilling MET calling criteria (afferent limb failure).^{6,7} A series of single-centre surveys⁸⁻¹² showed that, although METs are generally well accepted in hospitals, cultural barriers prevent their full implementation. Recognised barriers for nurses or junior doctors activating the MET include adherence to the traditional system of calling the covering medical staff or a fear of criticism in case an inappropriate call is made; however, although a positive correlation between having attended a MET education seminar and the likelihood of MET activation has been found,¹³ none of existing studies directly investigated whether education of the ward staff may change their attitudes towards the MET. Moreover, the attitudes of the ward staff towards the MET have never been investigated in European hospitals.

We conducted a multicentre survey in a group of Italian hospitals to identify the attitudes and barriers towards MET utilisation among both ward nurses and physicians and to investigate on whether these attitudes and barriers are influenced by participation to a specific educational programme on MET, previous MET activation, or by the characteristics of the ward staff, such as

professional role, seniority, and type of ward.

Methods

MET implementation in the Piedmont Region

The survey has been conducted among hospitals in the Piedmont Region (www.regione.piemonte.it), an area of 25,402 square kilometres in northwest Italy including a population of 4,6 million people. Since 2008, the Regional Health Service of the Piedmont Region has been implementing a program for continuous quality improvement of in-hospital emergency systems, in agreement with the Recommendations from the Italian Society of Anaesthesia, Analgesia, Resuscitation and Intensive Care (SIAARTI) and the Italian Resuscitation Council (IRC)¹⁴. This program consisted in the implementation of a MET in regional hospitals, preceded by a hospital awareness and training campaign and followed by a monitoring and reporting phase, aimed to document the epidemiology of cardiac arrests in participating hospitals, according to the Utstein style¹⁵. Hospitals participating in the program adopted uniform MET calling criteria (see ESM Appendix 1). Composition of the MET staff (one intensive care physician and one intensive care nurse) was equal in all hospitals.

The METal course

The Piedmont Region adopted the METal (Medical Emergency Team alert) course¹⁶ to educate the ward staff. METal is a one-day course specifically developed by IRC to teach the medical and nursing staff of hospital non-critical care areas how to properly accomplish the tasks of afferent arm members. Course topics include:

1. Characteristics of the patient at risk of cardiac arrest
2. The ABCDE approach for rapid patient assessment
3. Criteria for MET activation

4. MET calling procedure
5. Early actions to perform before MET arrival
6. Teamwork during MET interventions and handover

The course is deployed over eight hours and it includes lectures, skill stations and simulated scenarios. *METal* course faculty includes specifically trained, board-certified advanced life support (ALS) instructors.

Target population and recruitment criteria

The hospitals for this study were selected among those participating to the regional quality improvement programme, using the following inclusion criteria:

1. General hospital including both medical and surgical wards
2. At least two years of established RRS
3. 24/7 MET availability

The target population of the survey were all medical and nursing staff of medical and surgical wards caring adult inpatients. Personnel of emergency departments, intensive care units, operating rooms and outpatient areas were excluded.

Study questionnaire

The survey instrument was a modified version of a previously published questionnaire¹⁰ and it included two sections (see ESM Appendix 2). The first section was aimed to record the characteristics of the study population (physician/nurse, seniority, clinical/surgical area, previous participation to the *METal* course, number of activated MET interventions in the last year). The second section included 22 questions and it was aimed to assess the attitudes and barriers of the ward staff towards the MET.

The questions covered the following subjects:

- a) Perceived usefulness of MET for managing critical patients (questions 1, 8 and 9); benefits of MET for improving both patient safety (questions 3, 4, 5, 12, 13) and the confidence of the ward staff (questions 21 and 22); MET interventions as an opportunity for the ward staff to learn new skills and have their work appraised (questions 14 and 17).
- b) Perceived unfavourable effects of MET: interference with the work of the ward staff (questions 15 and 18), increased workload (question 16) and costs (question 20) associated with MET implementation.
- c) Issues in MET utilization: barriers which prevent ward staff from calling the MET (questions 6, 7 and 10); difficulties in applying the MET calling criteria (question 11).
- d) Perceived usefulness of the MET*al* educational programme (questions 2 and 19).

Question 6 asked the respondents who they would call first between the covering doctor or the MET for deteriorating patients. Since the ward staff of the participating hospitals did not include junior doctors or residents, this question was directed only to nurses.

Response to questions were scored on a Likert-type agreement scale (1 = strongly disagree; 2 = disagree; 3 = uncertain; 4 = agree; 5 = strongly agree).

Before being distributed, the draft version of the questionnaire was submitted to a panel of six experts (three physicians, two senior nurses, and a nurse educator), who evaluated the clarity and the completeness of the survey items. The expert panel suggested changes in the text of eight items, which were reworded. The modified version of the questionnaire was pilot tested on a sample of 45 medical doctors and 45 nurses from five hospitals. The results of the pilot sample did not suggest further changes, and the questionnaire was approved in its definitive format.

Study approval, consent, and data collection

The study was approved by the Scientific Committee of the Regional Board for In-hospital Emergencies of Piedmont Region. Before being distributed, the survey was also submitted for approval to the general management and to the nursing administration of each selected hospital.

Before participation, every respondent was informed with a letter about the objectives of the survey. Participation to the survey was voluntary and anonymous. Consent for participation was implicit by completion of the questionnaire.

Paper questionnaires were deployed by the resuscitation training officer of each participating hospital to the medical and nursing staff of previously identified wards. Completed questionnaires were collected within 15 days from delivery.

Statistical analysis

Data about participants to the survey were described as counts and percentages. Differences between physicians and nurses in baseline characteristics were evaluated using the chi-square test. Data about the 22 items were presented as proportion of responses to each question. As a further summary measure, mean and standard deviation (SD) were also computed. For each question, a logistic regression model was constructed adjusting for profession (medical doctor vs. nurse), seniority, participation to the MET *al* course, previous MET activation, and type of ward (medical, surgical). In order to perform the logistic regression analysis, the responses to the 5-point Likert scale were dichotomized (Agree/Strongly agree vs Strongly Disagree /Disagree/ Uncertain). Odds ratios (ORs) along with 95% confidence intervals (95%CI) were reported. Statistical significant level was set at $p < 0.05$.

Analyses were carried out using R version 3 (<http://www.r-project.org/>).

3. Results

Ten hospitals (see ESM Table 1) fulfilled the inclusion criteria. A total of 2279 staff members were contacted (92% of eligible subjects), of whom 1812 (79.6%) completed the survey. The characteristics of the 1812 responders (1278 registered nurses, 534 medical doctors) are reported on Table 1. MET interventions had been activated at least once by 336/534 (62.9%) doctors and

683/1278 (53.4%) nurses. Of them, 80/336 (23.8%) doctors and 109/683 (15.9%) nurses had activated the MET more than five times. Nurses had a significantly higher rate of MET *al* course certification than doctors (859/1278 vs. 194/534; $p < 0.001$).

Table 2 shows the ratings of the 22 questions of the survey for the global population. For each question, the percentages of the five Likert scores assigned by the respondents, along with the relevant mean (SD) scores, are reported.

The vast majority of the responders valued the MET. Most of them (82%) agreed or strongly agreed that MET was helpful in preventing cardiac arrest in deteriorating patients. They agreed or strongly agreed that MET interventions did not increase their workload (77%), were useful to improve their skills in managing unwell patients (85%) and added value to their own professional roles, making them feel part of the hospital emergency system (75%). Moreover, the majority (67%) of the respondents felt safer because of the presence of the MET in their hospital.

Almost 60% of respondents agreed or strongly agreed that MET was necessary because the clinical management of deteriorating patients was too complex for the ward staff, and 74% of them agreed or strongly agreed that a specific training was necessary to interact appropriately with MET during hospital emergencies. Finally, 54% of responders agreed that the MET *al* course significantly improved their skills in managing unstable patients in the ward.

As far as the barriers to calling the MET were concerned, only a few of the respondents were reluctant to call the MET because of fear of being criticised for not caring their patients well enough (5%) or for having made an inappropriate call (12%), while 21% of respondents would had not called the MET in a patient fulfilling the MET calling criteria but not looking unwell. Finally, the majority (62%) of nurses would had called the covering doctor before calling a MET for a deteriorating patient in the ward.

Multivariate analysis

Tables 3a-b report the results of multivariate logistic regression analysis. Questions concerning the perceived usefulness of the MET or the MET*al* course are included in Table 3a, while those concerning the perceived unfavourable effects the MET or the barriers to activating the MET are included in Table 3b. In both tables, the odds ratios (OR) for agreeing/strongly agreeing to a given statement of the survey according to profession, seniority (>20 years vs <5 years), surgical vs. medical ward, number of MET calls (>5 vs. none) and MET*al* course certification are reported. Respondents from surgical wards, either doctors or nurses, were significantly more likely to agree that when patients in their wards deteriorate they overwhelm the management capabilities of both ward doctors and nurses (questions 8 and 9, respectively), and that MET can provide a timely and effective response (questions 4, 12 and 13) and prevent cardiac arrest (question 3) in these patients. Accordingly, they were more reassured by the presence of the MET in their hospitals (questions 21 and 22) (Table 3a).

Respondents who had participated to MET interventions were significantly more aware of the complexity of medical problems affecting ward patients (question 1) than those who did not, and valued significantly more the benefits of the MET for increasing both patients' safety (questions 12 and 13) and the self-esteem and confidence of the ward personnel (questions 17, 21, and 22).

As far as the barriers to activating MET are concerned (Table 3b), nurses from surgical wards were significantly less prone to call the covering doctor before calling the MET in unstable patients (question 6). Respondents from surgical wards were also significantly less reluctant to call a MET in patients fulfilling the MET calling criteria but not looking unwell (question 11).

In general, doctors were significantly less likely to agree on the utility of MET (questions 4, 12, and 13) but more likely to agree on the utility of the MET*al* course (questions 2 and 19). Moreover, they were less reluctant than nurses to activate the MET in patients fulfilling MET calling criteria but not looking unwell (question 11).

Responders who participated to the *METal* course valued the MET system significantly more than those who did not (questions 3, 13 and 17) and were significantly less worried about the risk that MET interventions would have increased their workload (question 16). They agreed more on the need of a MET educational programme (questions 2 and 19) and this appreciation increased in those who had initiated a MET intervention. Finally, *METal*-certified nurses were significantly less prone to call the covering doctor instead of the MET for deteriorating patients.

Seniority had a limited influence on the attitude of responders. Ward staff members with more than twenty years of work were less likely to agree on the utility of both the MET and the *METal* course. Senior nurses were also less prone to refer to the covering doctor instead of the MET (question 6).

4. Discussion

This is the largest survey ever made on attitudes and barriers to the MET system in both medical and nursing staff, and the first one to be made as a multicentre study. Its results showed that the vast majority of the ward staff of participating hospitals valued the MET system. The attitude of the ward staff towards the MET was significantly more favourable if they had already taken part to a MET intervention or had participated to the MET educational programme.

In accordance with the findings of other authors,^{8,9} our survey showed that fear of criticism was only uncommonly a barrier to calling the MET for nurses. In addition, we found that this did not represent an important issue for ward doctors, either. The most common barrier (62% of respondents) to activating the MET was rather the priority given by ward nurses to calling the covering doctor instead of the MET for deteriorating patients. This attitude was significantly more common in junior nurses, and it likely reflected the persistence of a hierarchical model for delivery of patient care. Although informing the covering doctor about the deterioration of a patient's conditions is *per se* appropriate and might facilitate the collaboration between MET and the ward staff, calling the covering doctor before the MET may result in delayed MET activation⁸, which in

turn is associated to an increased risk of hospital death.¹⁷ However, as our study shows, a focused educational programme can significantly reduce this attitude and restore the priority of MET activation.

In our study, about one fifth of respondents declared they would not make a MET call in a patient fulfilling MET calling criteria but not looking unwell, a lower percentage than that reported in other studies⁸. Nurses and those working in a medical rather than in a surgical ward were significantly more likely to give this response. Apparently, these subjects preferred to rely on their own clinical judgement (or on that of the covering doctor) for deciding when to call the MET, rather than to use the objective criteria included in the MET activation procedure. Unfortunately, this attitude was not significantly affected by a previous participation in the MET educational programme.

In general, both doctors and nurses from surgical areas showed a better compliance with the MET system than those of medical areas. This finding is indirectly confirmed by the results of a study from Jones et al¹⁸ which showed a significantly greater increase in MET utilisation in surgical vs. medical wards after the implementation of a RRS in a teaching hospital. The reason for this is probably that surgeons are accustomed to rely on external consultants for managing medical problems in their patients, while nurses are aware that surgeons are often busy in the operating room and therefore may not be immediately available to evaluate deteriorating patients in their parent ward. Besides, the results of our survey showed that the majority of doctors and nurses of surgical wards felt inadequate to manage critical patients. This suggests that implementation of a MET system in surgical areas can be particularly beneficial, as confirmed by results of interventional studies.¹⁹

Our survey is the first to specifically investigate the impact of an educational process on the attitudes of the ward staff towards the MET system. Its results are encouraging and show that those who had participated to the MET*al* course were significantly more likely to value the benefits of the

MET, were significantly less worried by its potential disadvantages, and were significantly more likely to give correct priority to MET activation.

However, not all the attitudes of the ward staff towards the MET system were positively affected by the educational process. For example, reluctance to call the MET because the patient did not look unwell despite fulfilling the MET calling criteria was not significantly reduced in those who participated to a *METal* course. Despite being present only in a minority of respondents (21%), this last attitude may reflect a limited confidence in the appropriateness of the MET calling criteria which had not been effectively addressed by the *METal* course. This potential issue deserves further investigations using focused open-ended questions and contacts with members of the ward staff, and, if confirmed, it will suggest an update of the course content.

Attitudes of physicians towards the MET system differed significantly from those of nurses in our population. Ward doctors valued the *METal* educational programme more than nurses, but valued less the MET system. However, medical doctors had participated significantly less than nurses to the *METal* course, a factor which was associated with a higher appreciation of the advantages of the MET. Moreover, the perceived utility of the MET system by the ward doctors increased significantly with the number of MET interventions they activated (OR 3.67 [1.63-9.6] and 7.59 [3.26-21.41], for 1-5 MET calls vs.0 and >5 vs. 0, respectively), which is consistent with the finding that medical doctors valued their involvement MET interventions even more than nurses (OR 1.47 [1.15-1.89]; question 17). In summary, the medical doctors in our population may have a sceptical attitude towards the RRS, which is however significantly attenuated after having participated to the *METal* course or to MET interventions. This suggests that the compliance with the MET of the medical component of the afferent limb in our population could further improve after full completion of the RRS implementation process. Previous experiences in mature RRS suggest that continuous education and monitoring are associated with an increase of RRS effectiveness over time.²⁰

Study limitations

Our study has several limitations. Firstly, although almost 80% of the healthcare providers who were contacted completed the survey, we cannot exclude that a nonresponse bias²¹ may have occurred and led to an overestimation of the positive opinion the individuals showed towards the MET. Secondly, the rate of participation of medical doctors to the MET *al* course was significantly lower than those of nurses, so that the effects of the MET educational process in the medical subpopulation could not have been completely evaluated. Finally, this study is a survey made using a multiple-choice questionnaire. Its results report the attitudes and opinions of healthcare providers who were interviewed, which may not completely reflect their actual behaviour in everyday practice. Audits and reports of clinical cases of MET activation²² are warranted to evaluate how the attitudes and mental barriers of healthcare providers towards the MET system may affect the effectiveness of the afferent limb of a RRS.

5. Conclusions

Our survey showed that both nurses and medical doctors of the wards in hospitals where the RRS had been implemented valued the MET. Working in a surgical vs. a medical ward, and having participated either to the MET educational programme or to the MET interventions were associated with better acceptance of the MET system. The major barrier to MET activation was the priority given by nurses, especially those of medical wards, to calling the covering doctor instead of the MET for deteriorating patients. This attitude was significantly reduced in those who were certified in the MET educational programme, which confirms its key importance in the process of RRS implementation. However, other important barriers, such as reluctance to call the MET in a patient fulfilling the calling criteria, were unaffected by the MET *al* course. Further investigations and possibly changes in the MET educational programme will be necessary to effectively address these barriers.

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Conflict of Interest

Giulio Radeschi and Roberto Penso are authors (unpaid) of the *METal* course manual, edited by the Italian Resuscitation Council. The remaining authors declare they have no financial or personal conflicts of interest.

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None.

Figure legends

Table 1

Characteristics of the respondents completing the survey (n= 1812).

Table 2

Ratings of the 22 survey questions for the global population. For each question the five Likert scores assigned by the respondents are expressed as percentages of the total responses along with the relevant mean (SD) scores.

Tables 3a-b

Results of logistic regression analysis (ORs and 95% CI) for questions concerning the perceived usefulness of the MET or the METal course (*a*) and questions concerning the perceived unfavourable effects the MET or the barriers to activating the MET (*b*). Responses were dichotomized (Agree/Strongly agree vs Strongly disagree/Disagree/Uncertain).

(*) = $0.05 > p > 0.01$; (**) = $0.01 > p > 0.001$; (***) = $p \leq 0.001$.

References

1. Goldberger Z D, Chan P S, Berg R A, Kronick S L, Cooke C R, Lu M, et al. Duration of resuscitation efforts and survival after in-hospital cardiac arrest: an observational study. *Lancet* 2012; 380:1473-81.
2. Sandroni C, Nolan J, Cavallaro F, Antonelli M. In-hospital cardiac arrest: incidence, prognosis and possible measures to improve survival. *Intensive Care Med* 2007; 33:237-45.
3. DeVita M A, Smith G B, Adam S K, Adams-Pizarro I, Buist M, Bellomo R, et al. "Identifying the hospitalised patient in crisis"--a consensus conference on the afferent limb of rapid response systems. *Resuscitation* 2010; 81:375-82.
4. Jones D A, DeVita M A, Bellomo R. Rapid-response teams. *N Engl J Med* 2011; 365:139-46.
5. Chan P S, Jain R, Nallmothu B K, Berg R A, Sasson C. Rapid Response Teams: A Systematic Review and Meta-analysis. *Arch Intern Med* 2010; 170:18-26.
6. Sandroni C, Cavallaro F. Failure of the afferent limb: a persistent problem in rapid response systems. *Resuscitation* 2011; 82:797-8.
7. Trinkle R M, Flabouris A. Documenting Rapid Response System afferent limb failure and associated patient outcomes. *Resuscitation* 2011; 82:810-4.
8. Azzopardi P, Kinney S, Moulden A, Tibballs J. Attitudes and barriers to a Medical Emergency Team system at a tertiary paediatric hospital. *Resuscitation* 2011; 82:167-74.
9. Bagshaw S M, Mondor E E, Scouten C, Montgomery C, Slater-MacLean L, Jones D A, et al. A survey of nurses' beliefs about the medical emergency team system in a canadian tertiary hospital. *Am J Crit Care* 2010; 19:74-83.
10. Jones D, Baldwin I, McIntyre T, Story D, Mercer I, Miglic A, et al. Nurses' attitudes to a medical emergency team service in a teaching hospital. *Qual Saf Health Care* 2006; 15:427-32.

11. Salamonson Y, van Heere B, Everett B, Davidson P. Voices from the floor: Nurses' perceptions of the medical emergency team. *Intensive Crit Care Nurs* 2006; 22:138-43.
12. Sarani B, Sonnad S, Bergey M R, Phillips J, Fitzpatrick M K, Chalian A A, et al. Resident and RN perceptions of the impact of a medical emergency team on education and patient safety in an academic medical center. *Crit Care Med* 2009; 37:3091-6.
13. Cretikos M A, Chen J, Hillman K M, Bellomo R, Finfer S R, Flabouris A. The effectiveness of implementation of the medical emergency team (MET) system and factors associated with use during the MERIT study. *Crit Care Resusc* 2007; 9:205-12.
14. Savoia G, Bosco G, Cerchiari E, De Blasio E, Della Corte F, Gordini G, et al. SIAARTI - IRC recommendations for organizing responses to In-Hospital emergencies. *Minerva Anestesiol* 2007; 73:533-53.
15. Cummins R O, Chamberlain D, Hazinski M F, Nadkarni V, Kloeck W, Kramer E, et al. Recommended guidelines for reviewing, reporting, and conducting research on in-hospital resuscitation: the in-hospital 'Utstein style'. A statement for healthcare professionals from the American Heart Association, the European Resuscitation Council, the Heart and Stroke Foundation of Canada, the Australian Resuscitation Council, and the Resuscitation Councils of Southern Africa. *Resuscitation* 1997; 34:151-83.
16. Redeschi G, Penso R, Odetto L: *METal Provider Course Manual*. IRC Edizioni, Bologna. 2008.
17. Calzavacca P, Licari E, Tee A, Egi M, Downey A, Quach J, et al. The impact of Rapid Response System on delayed emergency team activation patient characteristics and outcomes--a follow-up study. *Resuscitation* 2010; 81:31-5.
18. Jones D, Bates S, Warrillow S, Goldsmith D, Kattula A, Way M, et al. Effect of an education programme on the utilization of a medical emergency team in a teaching hospital. *Intern Med J* 2006; 36:231-6.

19. Bellomo R, Goldsmith D, Uchino S, Buckmaster J, Hart G, Opdam H, et al. Prospective controlled trial of effect of medical emergency team on postoperative morbidity and mortality rates. *Crit Care Med* 2004; 32:916-21.
20. Santamaria J, Tobin A, Holmes J. Changing cardiac arrest and hospital mortality rates through a medical emergency team takes time and constant review. *Crit Care Med* 2010; 38:445-50.
21. Groves R M, Peytcheva E. The impact of nonresponse rates on nonresponse bias. *Public Opinion Quarterly* 2008; 72:167-189.
22. Devita M A, Bellomo R, Hillman K, Kellum J, Rotondi A, Teres D, et al. Findings of the first consensus conference on medical emergency teams. *Crit Care Med* 2006; 34:2463-78.

Table 1

Characteristics of the respondents completing the survey (n= 1812)

	Nurses	Physicians	p-value
	(n=1278)	(n=534)	
	n (%)	n (%)	
Seniority			<0.001
<5 yrs	248 (20%)	84 (16%)	
>20 yrs	298 (24%)	188 (36%)	
5-20 yrs	722 (57%)	257 (49%)	
Type of ward			0.012
Surgical	793 (62%)	297 (56%)	
Medical	484 (38%)	236 (44%)	
N. of activated MET interventions			<0.001
none	574 (46%)	192 (36%)	
<=5	574 (46%)	256 (48%)	
>5	109 (9%)	80 (15%)	
METal course certification			<0.001
Yes	859 (68%)	194 (37%)	
No	399 (32%)	337 (63%)	
Medical Specialties			0.02
Medicine and medical specialties	874 (68%)	335 (63%)	
Surgery and surgical specialties	404 (32%)	199 (37%)	

Table 2

Question number	Question	%					Mean (SD)
		Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	
1	Patients in this hospital have complex medical problems	1	6	11	50	32	4.05 (0.87)
2	No specific training is needed to interact appropriately with MET during in-hospital emergencies	46	28	10	9	6	2.02 (1.22)
3	The MET can prevent cardiac arrest in deteriorating patients	3	5	11	41	41	4.12 (0.97)
4	The MET allows me to find help for my patients when I am worried about them	6	12	14	41	28	3.73 (1.15)
5	The MET is NOT helpful in managing sick patients on the ward	36	32	13	14	5	2.18 (1.2)
6	When one of my patients is deteriorating I call the covering doctor before calling a MET (*)	12	17	9	38	24	3.44 (1.33)
7	I am reluctant to call a MET because I will be criticized if my call is inappropriate	39	38	11	9	3	1.99 (3.06)
8	MET calls are required because the management of patients at risk is too complex for the ward doctors	6	17	18	36	23	3.53(1.2)
9	MET calls are required because the management of the patient at risk is too complex for the ward nurses	8	17	16	36	22	3.48 (1.23)
10	I am reluctant to call a MET because I will be criticized for not caring my patients well enough	50	38	7	4	1	1.69 (0.86)
11	If my patient fulfils the MET criteria but does not look unwell I would not make a MET call	26	39	14	17	4	2.33(1.15)
12	MET interventions ensure a timely response to clinical problems of deteriorating patients	2	4	13	49	32	4.04 (0.89)
13	MET interventions are beneficial for sick patients in my ward	1	2	20	43	33	4.06 (0.85)
14	MET interventions represent an opportunity to improve my skills in managing sick patients	1	4	10	50	35	4.14 (0.83)
15	MET calls reduce my skills in managing sick patients	37	47	8	6	2	1.88 (0.92)
16	Using the MET system increases my workload when caring for sick patients	35	42	11	10	2	2.01 (1.02)
17	MET interventions add value to my role, making me feel part of the Hospital Emergency System	2	6	17	50	25	3.9 (0.92)
18	MET does NOT make me feel part of the emergency team during MET interventions	34	43	14	7	2	2.01 (0.98)
19	The MET course has significantly improved my skills in managing sick patients in the ward	2	3	30	28	26	3.84 (0.92)
20	The MET represents a waste of resources	63	26	8	2	1	1.51 (0.8)
21	If I worked in a hospital without a MET I would feel less safe in my everyday work	5	10	19	41	26	3.74 (1.09)
22	If I had to choose between two workplaces, I would choose the hospital with an established MET system, other things being equal	2	4	15	38	40	4.1 (0.94)

(*) This question was directed only to nurses.

Table 3a.

Question number	Profession	Seniority	Type of ward	MET interventions	METal course
	Doctors vs Nurses	>20 yrs vs <5 yrs	Surgical vs Medical	>5 vs never	Yes vs No
1	<i>Patients in this hospital have complex medical problems</i> 0.92 (0.69-1.23)	0.77 (0.53-1.11)	0.58 (0.45-0.74)***	2.78 (1.69-4.87)***	1.25 (0.96-1.63)
2	<i>No specific training is needed to interact appropriately with MET during in-hospital emergencies</i> 0.7 (0.52-0.93)*	1.89 (1.26-2.88)**	0.93 (0.71-1.21)	0.88 (0.56-1.37)	0.68 (0.52-0.9)**
3	<i>The MET can prevent cardiac arrest in deteriorating patients</i> 0.8 (0.6-1.06)	1.14 (0.79-1.64)	1.86 (1.43-2.44)***	1.3 (0.84-2.07)	2.61 (2-3.42)***
4	<i>The MET allows me to find help for my patients when I am worried about them</i> 0.61 (0.47-0.77)***	0.96 (0.7-1.3)	1.39 (1.12-1.71)**	1.38 (0.96-2)	1.12 (0.9-1.4)
5	<i>The MET is NOT helpful in managing sick patients on the ward</i> 1.08 (0.81-1.43)	1.5 (1.03-2.2)*	1.07 (0.84-1.37)	0.71 (0.45-1.09)	0.87 (0.67-1.13)
8	<i>MET calls are required because the management of patients at risk is too complex for the ward doctors</i> 0.84 (0.67-1.05)	1.34 (1-1.79)*	1.59 (1.3-1.94)***	0.87 (0.63-1.21)	1.03 (0.83-1.27)
9	<i>MET calls are required because the management of the patient at risk is too complex for the ward nurses</i> 0.99 (0.79-1.24)	1.27 (0.95-1.7)	1.83 (1.5-2.24)***	0.94 (0.67-1.31)	0.92 (0.75-1.14)
12	<i>MET interventions ensure a timely response to clinical problems of deteriorating patients</i> 0.73 (0.54-0.97)*	0.91 (0.63-1.29)	1.87 (1.45-2.44)***	2.53 (1.61-4.15)***	1.42 (1.1-1.84)**
13	<i>MET interventions are beneficial for sick patients in my ward</i> 0.67 (0.5-0.9)*	0.88 (0.62-1.27)	1.42 (1.1-1.83)**	6.62 (4.04-11.5)***	1.8 (1.39-2.34)***
14	<i>MET interventions represent an opportunity to improve my skills in managing sick patients</i> 0.82 (0.59-1.11)	0.87 (0.58-1.29)	1.12 (0.85-1.47)	0.99 (0.64-1.57)	1.25 (0.94-1.67)
17	<i>MET interventions add value to my role, making me feel part of the Hospital Emergency System</i> 1.47 (1.15-1.89)**	1.47 (1.06-2.04)*	1.09 (0.87-1.37)	1.81 (1.23-2.72)**	1.56 (1.23-1.98)***
19	<i>The METal course has significantly improved my skills in managing sick patients in the ward</i> 1.48 (1.14-1.92)**	1.04 (0.73-1.48)	1.14 (0.9-1.46)	1.86 (1.23-2.84)**	9.2 (7.22-11.79)***
21	<i>If I worked in a hospital without a MET I would feel less safe in my everyday work</i> 0.57 (0.44-0.73)***	1.28 (0.94-1.75)	1.3 (1.06-1.61)*	1.94 (1.34-2.83)***	1.35 (1.08-1.69)
22	<i>If I had to choose between two workplaces, I would choose the hospital with an established MET system, other things being equal</i> 0.91 (0.69-1.19)	1.31 (0.93-1.85)	1.27 (1-1.61)	1.99 (1.3-3.13)**	1.38 (1.08-1.77)*

Table 3b.

Question number	Profession	Seniority	Type of ward	MET interventions	MET <i>al</i> course
	Doctors vs Nurses	>20 yrs vs <5 yrs	Surgical vs Medical	>5 vs never	Yes vs No
6	<i>When one of my patients is deteriorating I call the covering doctor before calling a MET (nurse only)</i>				
	---	0.69 (0.47;0.99)*	0.51 (0.4;0.65)***	0.94 (0.61;1.48)	0.6 (0.46;0.79)***
7	<i>I am reluctant to call a MET because I will be criticized if my call is inappropriate</i>				
	1.24 (0.87-1.79)	0.64 (0.41-1.02)	0.72 (0.53-0.98)*	0.66 (0.38-1.09)	1.24 (0.9-1.73)
10	<i>I am reluctant to call a MET because I will be criticized for not caring my patients well enough</i>				
	0.99 (0.62-1.61)	0.94 (0.53-1.69)	0.89 (0.58-1.35)	0.84 (0.4-1.63)	0.86 (0.55-1.35)
11	<i>If my patient fulfils the MET criteria but does not look unwell I would not make a MET call</i>				
	0.65 (0.5-0.85)**	1.34 (0.94-1.93)	0.63 (0.49-0.8)***	0.85 (0.57-1.25)	1.01 (0.78-1.3)
15	<i>MET calls reduce my skills in managing sick patients</i>				
	0.69 (0.46-1.02)	1.61 (0.94-2.86)	1.01 (0.7-1.44)	0.39 (0.16-0.8)	1.22 (0.83-1.8)
16	<i>Using the MET system increases my workload when caring for sick patients</i>				
	1.72 (1.2-2.49)**	0.75 (0.49-1.15)	0.88 (0.65-1.18)	1.35 (0.82-2.16)	0.65 (0.48-0.89)**
18	<i>MET does NOT make me feel part of the emergency team during MET interventions</i>				
	0.77 (0.54-1.11)	1.36 (0.84-2.24)	1.07 (0.77-1.48)	0.83 (0.47-1.4)	0.86 (0.61-1.22)
20	<i>The MET represents a waste of resources</i>				
	0.82 (0.44-1.57)	1.24 (0.56-2.91)	0.67 (0.36-1.2)	1.03 (0.41-2.29)	0.86 (0.48-1.58)