



Clinical Paper

Factors affecting attitudes and barriers to a medical emergency team among nurses and medical doctors: A multi-centre survey[☆]



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ABSTRACT

Aim: To identify factors underlying attitudes towards the medical emergency team (MET) and barriers to its utilisation among ward nurses and physicians.

Methods: Multicentre survey using an anonymous questionnaire in hospitals with a fully operational MET system in the Piedmont Region, Italy. Response to questions was scored on a 5-point Likert-type agreement scale. Dichotomised results were included in a logistic regression model.

Results: Among 2279 staff members who were contacted, 1812 (79.6%) completed the survey. The vast majority of respondents valued the MET. Working in a surgical vs. medical ward and having participated in 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 the METal certification.

Conclusions: The 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 in the METal educational programme were associated with lower likelihood of showing barriers to MET activation.

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1. 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 an 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 The 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 surveys^{8–12} 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 fear of criticism in case an inappropriate call is made. However, although

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a positive correlation between having attended a MET education seminar and the likelihood of MET activation has been found,¹³ none of the existing studies had directly investigated whether ward staff education might change their attitudes towards the MET. Moreover, ward staff attitudes 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 to MET utilisation among both ward nurses and physicians and to investigate whether these attitudes and barriers are influenced by participation in a specific educational programme on the MET, by previous MET activation, or by the characteristics of the ward staff, such as professional roles, seniority, and type of ward.

2. Methods

2.1. MET implementation in the Piedmont Region

The survey was conducted in hospitals in the Piedmont Region (www.regione.piemonte.it), an area of 25,402 km² in North-west Italy with a population of 4.6 million people. Since 2008, the Regional Health Service of the Piedmont Region has been implementing a programme for continuous quality improvement of in-hospital emergency systems, in accordance with the Recommendations from the Italian Society of Anaesthesia, Analgesia, Resuscitation and Intensive Care (SIAARTI) and the Italian Resuscitation Council (IRC).¹⁴ This programme consisted of 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 at documenting the epidemiology of cardiac arrests in participating hospitals, according to the Utstein style.¹⁵ Hospitals participating in the programme adopted uniform MET calling criteria (see ESM Appendix 1). Composition of the MET staff (one intensive care registrar and one intensive care nurse, both of whom are certified in advanced life support [ALS]) was consistent in all hospitals.

2.2. The METal course

The Piedmont Region adopted the METal (medical emergency team alert) course¹⁶ to educate the ward staff. The METal is a one-day course, endorsed by IRC and specifically developed to teach the medical and nursing staff of hospital non-critical care areas how to properly accomplish the tasks of afferent arm members (see ESM Appendix 2 for a full description of the METal course). METal topics include:

1. Characteristics of patients at risk.
2. Patient assessment using the ABCDE approach.
3. Criteria for MET activation.
4. How to perform a MET call using basic communication skills.
5. Early actions to perform before MET arrival, such as, how to avoid further deterioration.
6. Teamwork with the MET and handover.

The course is deployed over 8 h and it includes lectures, skill stations and simulated scenarios. The METal course faculty includes both medical doctors and nurses. All faculty members are board-certified ALS and basic life support and defibrillation (BLS) instructors.

2.3. Target population and recruitment criteria

The hospitals for this study were selected among those participating in 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 in medical and surgical wards caring for adult inpatients. Personnel in emergency departments, intensive care units, operating rooms and outpatient areas were excluded.

2.4. Study questionnaire

The survey instrument was a modified version of a previously published questionnaire developed by Jones et al.¹⁰ and also adopted by other authors^{8,9} in similar surveys. We added to the original questionnaire two questions (2 and 19) aimed to assess the perceived usefulness of the METal educational programme, one question (17) aimed to assess whether the ward staff perceived their participation in MET interventions as an opportunity to have their work appraised, and two final questions (21 and 22) to assess whether the respondents felt safer because of the availability of the MET in their hospitals. The questionnaire also recorded the characteristics of the study population (physician/nurse, seniority, clinical/surgical area, previous participation in the METal course, number of activated MET interventions in the last year; see ESM Appendix 3).

The questions covered the following subjects:

- a) Perceived usefulness of the MET for managing critical patients (questions 1, 8 and 9); benefits of the MET for improving both patient safety (questions 3, 4, 5, 12, 13) and ward staff confidence (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 the 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 utilisation: 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 METal educational programme (questions 2 and 19).

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

Response to questions was 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 reviewed by an independent panel including three physicians, two senior nurses, and a nurse educator. The physicians are experts in the management of hospital emergencies, one senior nurse is skilled in hospital management, and the other is a nurse-lecturer of nursing science at Turin University. The nurse educator is a graduate in pedagogy. The panel reviewed the survey questions for appropriateness and clarity. As a result, eight questions were reworded. Rewording consisted mainly of removing some ambiguous terms and double-negative statements. 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 suggested no further changes, and the questionnaire was approved in its definitive format.

Table 1
Characteristics of the respondents completing the survey ($n = 1812$).

	Nurses ($n = 1278$) n (%)	Physicians ($n = 534$) n (%)	p -value
Seniority			<0.001
<5 years	248 (20%)	84 (16%)	
>20 years	298 (24%)	188 (36%)	
5–20 years	722 (57%)	257 (49%)	
Type of ward			0.012
Surgical	793 (62%)	297 (56%)	
Medical	484 (38%)	236 (44%)	
No. 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%)	

2.5. Study approval, consent, and data collection

The study was approved by the Scientific Committee of the Regional Board for In-hospital Emergencies of the Piedmont Region. Before being distributed, the survey was also submitted for approval to the general management as well as the nursing administration of each selected hospital. Before participation respondents were informed with a letter that they were to participate in an anonymous survey whose scope was to know their opinion on the RRS in their hospital. Participation in the survey was voluntary and anonymous. Consent for participation was implicit by completion of the questionnaire.

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

2.6. Statistical analysis

Data on participants in the survey were described as counts and percentages. Differences between physicians and nurses in baseline characteristics were evaluated using the chi-square test. Data on 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 in the METal 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/>).

Power calculation for our study was aimed at detecting a 10% difference in the proportions of the two dichotomized scores of the 5-point Likert scale between the population subgroups we compared (nurses vs. doctors, surgical vs. medical wards, seniority) with a >90% power and an alpha set at 0.05 according to the method described by Cohen¹⁷ with a Bonferroni correction for multiple comparisons. This would have required a sample size of at least

1700 subjects. The eligible study population included 2479 subjects with a 1:2 doctor-to-nurse ratio in the payroll of the ten hospitals which met the inclusion criteria. We estimated a 70% completion rate based on an average of 72.5% reported in three comparable surveys,^{8–10} which corresponded to a sample size of 1735 subjects.

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 in Table 1. MET interventions had been activated at least once by 336/534 (62.9%) doctors and 683/1278 (53.4%) nurses. Among these, 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 METal course certification than doctors (859/1278 vs. 194/534; $p < 0.001$).

Table 2 shows the ratings of the 22 survey questions 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 in improving 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 the 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 specific training was necessary to interact appropriately with the MET during hospital emergencies. Finally, 54% of responders agreed that the METal 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 the fear of being criticised for not caring for their patients well

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.

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 the 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 ^a	12	17	9	38	24	3.44 (1.33)
7	I am reluctant to call a MET because I will be criticised 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 patients 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 criticised for not taking care of 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 to 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	The 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 METal 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)

^a This question was only directed to nurses.

enough (5%) or for having made an inappropriate call (12%), while 21% of respondents would not have called the MET in a patient fulfilling the MET calling criteria but not looking unwell. Finally, the majority (62%) of nurses would have called the covering doctor before calling a MET for a deteriorating patient in the ward.

3.1. Multivariate analysis

Table 3a and 3b report the results of multivariate logistic regression analysis. Questions concerning the perceived usefulness of the MET or the METal 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 with 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 METal course certification are reported.

Respondents from surgical wards, both 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 the 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 in 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 ward staff 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 calling the covering doctor before calling the MET in an unstable patient (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 the MET (questions 4, 12, and 13) but more likely to agree on the utility of the METal 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 in the METal course valued the MET system significantly more than those who did not (questions

Table 3a
Questions concerning the perceived usefulness of the MET or the METal course.

Question number	Profession Doctors vs. nurses	Seniority >20 years vs. <5 years	Type of ward Surgical vs. medical	MET interventions >5 vs. never	METal course Yes vs. no
1	Patients in this hospital have complex medical problems 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	No specific training is needed to interact appropriately with the MET during in-hospital emergencies 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	The MET can prevent cardiac arrest in deteriorating patients 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	The MET allows me to find help for my patients when I am worried about them 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	The MET is NOT helpful in managing sick patients on the ward 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	MET calls are required because the management of patients at risk is too complex for the ward doctors 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	MET calls are required because the management of patients at risk is too complex for the ward nurses 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	MET interventions ensure a timely response to clinical problems of deteriorating patients 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	MET interventions are beneficial to sick patients in my ward 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	MET interventions represent an opportunity to improve my skills in managing sick patients 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	MET interventions add value to my role, making me feel part of the hospital emergency system 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	The METal course has significantly improved my skills in managing sick patients in the ward 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	If I worked in a hospital without a MET I would feel less safe in my everyday work 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	If I had to choose between two workplaces, I would choose the hospital with an established MET system, other things being equal 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)*

* 0.05 > p > 0.01.

** 0.01 > p > 0.001.

*** p ≤ 0.001.

Table 3b
Questions concerning the perceived unfavourable effects the MET or the barriers to activating the MET.

Question number	Profession Doctors vs. nurses	Seniority >20 years vs. <5 years	Type of ward Surgical vs. medical	MET interventions >5 vs. never	METal course Yes vs. no
6	When one of my patients is deteriorating I call the covering doctor before calling a MET (nurse only) –	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 am reluctant to call a MET because I will be criticised if my call is inappropriate 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 am reluctant to call a MET because I will be criticised for not taking care of my patients well enough 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	If my patient fulfils the MET criteria but does not look unwell I would not make a MET call 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	MET calls reduce my skills in managing sick patients 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	Using the MET system increases my workload when caring for sick patients 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	The MET does NOT make me feel part of the emergency team during MET interventions 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	The MET represents a waste of resources 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)

* 0.05 > p > 0.01.

** 0.01 > p > 0.001.

*** p ≤ 0.001.

3, 13 and 17) and were significantly less worried about the possible increase in their workload due to MET interventions (question 16) or that MET would have reduced their skills in managing sick patients. They agreed more on the need for 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 calling 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' work experience were less likely to agree on the utility of both the MET and the METal course. Senior nurses were also less prone to referring 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 staffs, and the first one to be made as a multicentre study. Its results showed that the vast majority of the ward staff in 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 in a MET intervention or had participated in the MET educational programme.

In accordance with the findings of other authors,^{8,9} our survey showed that the fear of criticism was hardly ever 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 the delivery of patient care. Although informing the covering doctor as to the deterioration of a patient's conditions is per se appropriate and might facilitate the collaboration between the MET and the ward staff, calling the covering doctor before the MET may result in delayed MET activation,⁸ which, in turn, is associated with an increased risk of hospital death.¹⁸ However, as our study shows, a focused educational programme can significantly reduce this attitude and restore the priority of MET activation.

In our study population, nurses in surgical wards were significantly less likely to call the covering doctor for a deteriorating patient than those in medical wards. This may reflect a limited attitude of these nurses to rely on surgeons for managing medical emergencies.

In general, both doctors and nurses from surgical areas showed better compliance with the MET system than those in medical areas. This finding is indirectly confirmed by the results of a study from Jones et al.¹⁹ which showed a significantly greater increase in MET utilisation in surgical vs. medical wards after the implementation of an RRS in a teaching hospital. This is probably due to the fact that surgeons are accustomed to relying 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 for evaluating 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 in managing critical patients. This suggests that implementation of a MET system in surgical areas can be particularly beneficial, as confirmed by results of interventional studies.²⁰

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 in the METal 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 the 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. In our study, 21% of respondents declared they would not make a MET call in a patient fulfilling MET calling criteria but not looking unwell. This percentage was lower than that reported in other studies.⁸ 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) in deciding when to call the MET, rather than to use the objective criteria included in the MET activation procedure. A comparative inter-centre analysis of the survey responses to question 11 showed no significant differences, which suggests this attitude was consistent throughout the study population and it reflected a limited confidence in the appropriateness of the MET calling criteria rather than a heterogeneity in the METal course quality or content through participating centres. This potential issue deserves further investigations using focused open-ended questions and contacts with members of the ward staff, and, if confirmed, it would warrant an update of the METal course.

Physicians' attitudes 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 in 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 in 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 in the METal course or in MET interventions. This suggests that 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 experience in mature RRS suggests that continuous education and monitoring are associated with an increase in RRS effectiveness over time.²¹

4.1. 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 bias²² may have occurred and may have led to an overestimation of the positive opinion the population showed towards the MET. Secondly, the rate of participation of medical doctors in the METal 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. Thirdly, the multiple-choice format of the study questionnaire we adopted did not include open-ended questions which may have allowed participants to add potentially useful comments, suggestions and explanations to their answers. Finally, the results of this study 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 activation²³ 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 an RRS.

5. Conclusions

Our survey showed that both nurses and medical doctors in the wards in hospitals where the RRS had been implemented valued the MET. Working in a surgical vs. a medical ward, and having participated in either the MET educational programme or 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 in 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 METal 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 METal course. Further improvements in the METal content and possibly even changes in the METal educational format with addition of onsite training²⁴ may be necessary to effectively address these barriers.

Conflict of interest statement

Giulio Radeschi and Roberto Penso are authors (unpaid) of the METal course manual, edited by the Italian Resuscitation Council.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.resuscitation.2014.12.027>.

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