Implementation of the Medical Response to Major Incidents Course in Madeira, Portugal

Luis Manuel Ramada Pereira Vale[1,A–F], Rui Nuno Faria[2,B,C,E,F],
Dinarte João Freitas[3,A,B,E,F], Luís Jardim[4,A–C,E,F], Pedro Ramos[5,C,E,F]

[1] Department of Anesthesiology, Nélio Mendonça's Hospital - SESARAM, Funchal, Madeira Island, Portugal

[2] Emergency Department, Nélio Mendonça's Hospital - SESARAM, Funchal, Madeira Island, Portugal

[3] Primary Care Centre - SESARAM, Machico, Madeira Island, Portugal

[4] Operating Theatre, Nélio Mendonça's Hospital - SESARAM, Funchal, Madeira Island, Portugal

[5] Department of Surgery, Nélio Mendonça's Hospital - SESARAM, Funchal, Madeira Island, Portugal

A – research concept and design; B – collection and/or assembly of data; C – data analysis and interpretation;
D – writing the article; E – critical revision of the article; F – final approval of the article

Address for correspondence
Luis Manuel Ramada Pereira Vale
E-mail: lmrpvale@gmail.com

Abstract

Background. The Medical Response to Major Incidents (MRMI) course was created in response to the need to train people from multi-agencies on major incidents management. In Madeira, a group of physicians and nurses from SESARAM attended this course and "Madeira International Disaster Training Center" (MIDTC) was created with the objective of providing training in the areas of emergency, trauma and catastrophe. Since its implementation, the MRMI course has been offered in Portugal twice a year in Madeira, Mainland Portugal and Azores.

Objectives. To describe the method of implementation and functioning of the MRMI course and, additionally, to study the degree of satisfaction of the trainees.

Material and methods. A quantitative study was performed during our last courses, using a satisfaction scale with the simulated clinical experience composed of 17 items with a Likert-type scale, punctuated from one (lowest level of satisfaction) to ten (highest level of satisfaction), in terms of practical, cognitive and realism dimensions. Data analysis was performed using the SPSS Statistic software, v. 25. A p-value of < 0.05 was used as the significance threshold.

Results. Twenty-one Portuguese MRMI courses were attended by 1,556 trainees from different professional areas (physicians, nurses, emergency and security technicians, social workers, command and control professionals). One hundred sixty-three surveys submitted by the trainees were available for analysis. A total of 60.7% of the respondents were men aged 30–49 years (71.8%). The overall satisfaction average score was 9.06. The practical dimension attained the highest score (9.12), followed by realism (9.05) and finally the cognitive aspect (8.90). Non-medical trainees' scores were slightly lower when compared to the scores provided by the medical trainees.

Conclusions. Demand for the MRMI course in Portugal has been high, with the number of students increasing since its first implementation. This makes the MRMI course a practical doctrine to implement in Portugal by the national authorities.

Key words: simulation, major incident, disaster medicine, medical response, mass casualty

Introduction

Madeira is a Portuguese island located in the Atlantic Ocean, roughly 900 km from Portugal and 700 km from North Africa. It has a population of 250,000. Madeira is also a popular tourist destination with a number of tourists estimated at 3,000 people/day. These arrive with cruises and flights. Efficient services to assist both the indigenous and visitors are necessary. Natural disasters are also common, with floods being the most common. Raimundo Quintal in "Estudos sobre os Aluviões na Madeira"[1] describes hundreds of episodes over the past 200 years. On February 20, 2010, a major flood afflicted Madeira Island, dragging mud, rocks, trees, cars, houses, destroying everything in its path (Fig. 1).

Fig. 1. Main arterial road in Funchal, Madeira Island, during the 02/20/2010 floods

Source: Civil Protection in Madeira (SRPCBRAM).

The Medical Response to Major Incidents (MRMI) course was created in 2009 in Sweden. Professor Sten Lennquist, a full Professor of Surgery, designed the course, which included a vast curriculum in the area of Emergency and Trauma Surgery. The core part of the course includes two simulations in which the students need to respond to a mass casualty incident. The victims are represented by patient cards. These are based on clinical information retrieved from real victims treated in the terrorist bombing attacks in Madrid, 2004. The students play their corresponding roles, whether in the scene (command, primary triage, secondary triage), ambulance dispatch center, a regional command center, and several hospitals (emergency department, operating theaters, intensive care unit, and hospital command centers). The simulations, based on the victims' clinical needs, allow for both a qualitative and quantitative evaluation of the overall response of the whole chain of command.

In October 2010, the MRMI course was brought to Madeira at the request of the regional authorities. Though the training is mainly aimed at health professionals, achieving an optimal response to catastrophes with medical implications demands an integrated approach, which includes non-medical personnel from the Civil Protection Services, such as firefighters, police, military, social workers, other security agencies, as well as the media. It is for this reason that in the Madeira course we integrated all the professionals responsible for public or private management of emergencies that exist within the Integrated Systems of Medical Emergency (SIEM) (Fig. 2).

Fig. 2. MRMI course in Azores (Ilha Terceira), 2016 (MIDTC)

Fig. 3. Madeira International Disaster Training Center (MIDTC) purpose and activity

Following the first course in 2010, the Portuguese chapter of the MRMI was gradually created with the aid of Prof. Sten Lennquist and other international MRMI instructors.

Portuguese professionals from different sectors of the Civil Protection were trained as instructors. More courses were run in Madeira and in Portugal's mainland. On February 11, 2016, the Madeira International Disaster Training Center (MIDTC) was established under the auspices of the Health Services of the Autonomic Region of Madeira (Servico de Saúde da Região Autónoma da Madeira – SESARAM) with the mission to educate, train, simulate in the areas of trauma, emergency and catastrophe, with a special focus on the MRMI Course. The founder of MIDTC, Dr. Pedro Ramos, is a General Surgeon, who, at the time the center was founded, was the director of the Emergency Department of SESARAM and the 1st Chairman of MRMI Portugal. The center currently runs with 60 international accredited instructors, from the most diverse areas of response (Fig. 3).

In April 2019, a meeting of the international MRMI centers was organized in Madeira by MIDTC/MRMI Portugal with the participation of European partners and Prof. Sten Lennquist, as guest of honor and co-host (Fig. 4).

Fig. 4. International meeting of MRMID Board, Madeira, 2019

Objectives

The objectives of this study were the following:

1) describe the method of implementation and functioning of the MRMI course and,

2) present the degree of satisfaction of the trainees in terms of practical, cognitive and realism dimensions.

Methods

Implementation of MRMI course

The course manual (last updated in 2016) is based on the book edited by Prof. Lennquist, *Medical Response to Major Inicidents and Disasters – A Practical Guide for All Medical Staff* [2], the Major Incident Medical Management Support (MIMMS) Course, and the Advanced Life Support Group (ALSG) course. These highlight the importance of communication, triage, therapeutics, transport and coordination and control, which are the pillars of disaster training (Fig. 5). The pedagogical model was validated by Kristine L. Montán[3–6], who evaluated the training methods used for the course with a diverse range of professionals. Training goals are tailored for each professional group, and each candidate receives a formative pre-test and post-test by e-learning. All the trainees who enroll in the course are asked to provide their feedback using a standardized evaluation form.

This course is based on an advanced simulation model MACSIM (mass casualty simulation) that, apart from the patient cards, also simulates the entire chain of command. This includes the accident scenario, transport, hospital departments, hospital command group and the regional command center (Fig. 6).

The simulation involves patient cards that provide clinical information from real victims. The patients are

Fig. 5. Principles of Major Incidents Medical Management and Support (MIMMS)

transferred from one treatment station to the next. The stations are represented on whiteboards and printed screens with the desired realities (scene, transports – Dispatch Center, Hospitals, Coordination center and Command) in a fictional country called Anyland. The trainees need to set priorities for treatment. Treatment is represented by adhesive tapes that are attached to the cards (Fig. 7). The time from accident up until optimal treatment is provided and can be evaluated.

The MACSIM system can provide protocols for the uniformity of the Response to Disaster:

- Alert – response times;
- Effectiveness in the alert process;
- Channels, times and quality of communication;
- Over and under triage in the scene and/or hospitals;

Fig. 6. Scene and secondary triage station, Madeira MRMI Course 2018 (MIDTC)

Fig. 7. Mass Casualty Simulation (MACSIM) card – victim from one incident with multiple therapies performed (stickers attached to MACSIM card)

• Transport efficiency (waiting times for ambulances, helicopters);
• Use of hospital resources;
• Identification of critical limiting factors for the surge capacity in hospitals;
• Preventable deaths and rate of complications related to severity indexes in trauma.

Achieving the same training objectives using large-scale exercises demands significant human and physical (venue) resources as well as higher expenses.

Evaluation of the satisfaction degree of the trainees

We evaluated the degree of satisfaction with the course in 170 trainees who participated in the last MRMI courses in Portugal. A questionnaire was developed and validated by Baptista et al.[7] The questionnaire was filled out by the trainees at the end of the course. It consisted of 17 questions with a Likert-type scale, where the score of one represented the lowest level of satisfaction and the score of ten represented the highest level of satisfaction. Three domains were evaluated: the practical dimension, the realism instilled in the training, and the cognitive dimension. We calculated the average of scores provided for all of the 17 questions asked. This mean represented the overall satisfaction. We evaluated differences between two groups of trainees according to whether these were health professionals or not.

Statistical analysis

Cronbach's alpha coefficient[8] was calculated to estimate the reliability of the questionnaire applied to the trainees.

The normality of the variables was tested using the Kolmogorov–Smirnov and the Shapiro–Wilk tests in order to verify which tests are most appropriate.

The Mann–Whitney non-parametric test was used to verify whether there were significant differences between the continuous variables and the chi-square test was used for the categorical variables. Continuous values are presented with the respective mean ± standard deviation and categorical values with their percentage.

Data analysis was performed using the IBM SPSS Statistic software, v. 25. P-values below 0.05 were considered significant.

Results

Implementation of MRMI courses

The wide implementation of catastrophe training by MIDTC resulted in 21 MRMI courses provided between October 2010 and December 2019. These took place in Madeira, Azores, North, Center and South of Mainland Portugal, always with the collaboration of invited instructors from other MRMI centers in Europe.

Over the 10 years of MRMI Portugal's activity, 1,556 trainees were trained. These came from different professional areas (physicians, nurses, emergency and security technicians, social workers and professionals involved in command and control) (Fig. 8).

Evaluation of the overall satisfaction degree of the trainees

One hundred sixty-three people completed the questionnaire. Of these, 60.7% were male and the majority was aged 30–49 years (71.8%) (Fig. 9).

The respondents compromised a heterogeneous group as much as the professional category is concerned. There were physicians, nurses, emergency and security technicians, social workers and professionals involved in command and control. Nurses and command and control professionals constituted the most represented group (Fig. 10). Cronbach's alpha coefficient[8] was 0.95.

Regarding overall satisfaction with MRMI course (Fig. 11), an average score of 9.06 (±0.8) was obtained. Specifically, we found that the practical dimension attained the highest score 9.12 (±0.8), followed by the realism 9.05 (±0.9) and finally the cognitive aspect 8.90 (±1.1).

Evaluation of the satisfaction degree of the trainees according to the professional category

Two groups were formed according to whether or not they were health professionals. The group of health professionals was composed of 72 trainees (44.4% male)
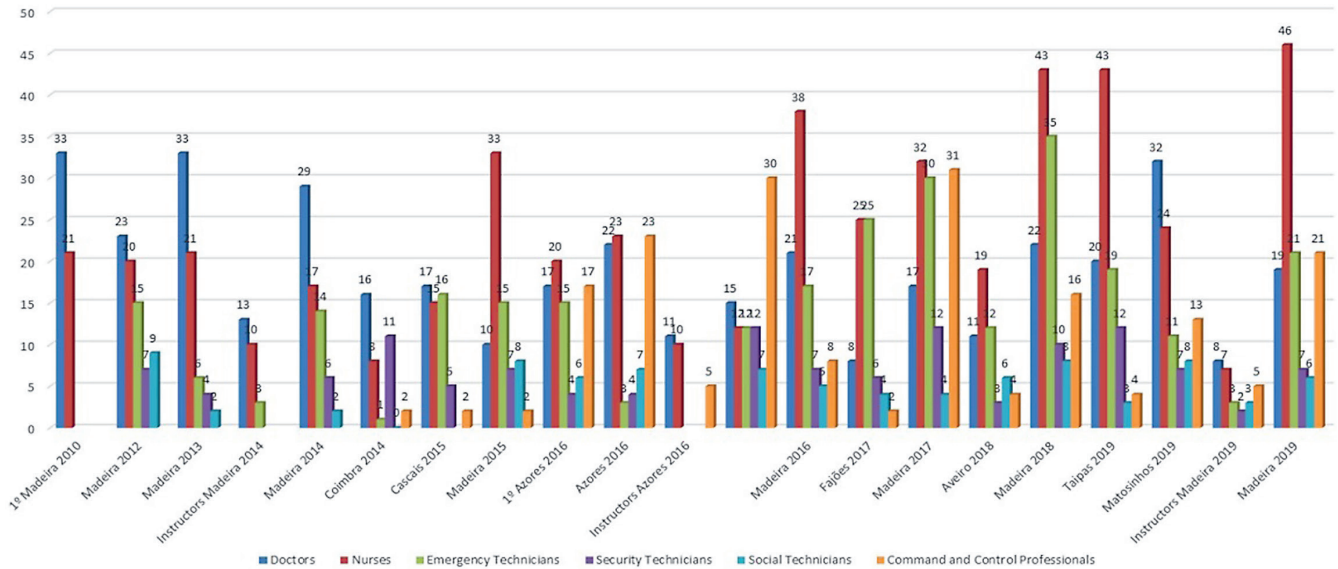
Fig. 8. Distribution of MRMI trainees in a total of 21 courses, according to the professional category (2010–2019)
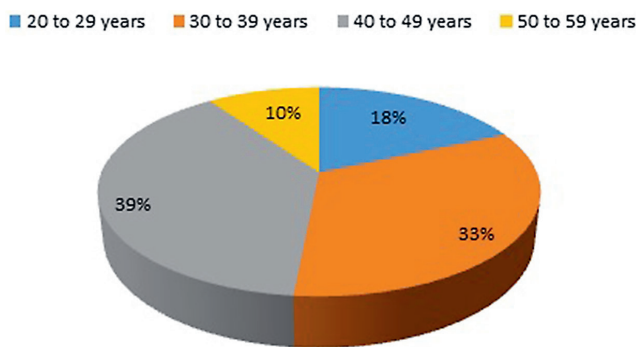

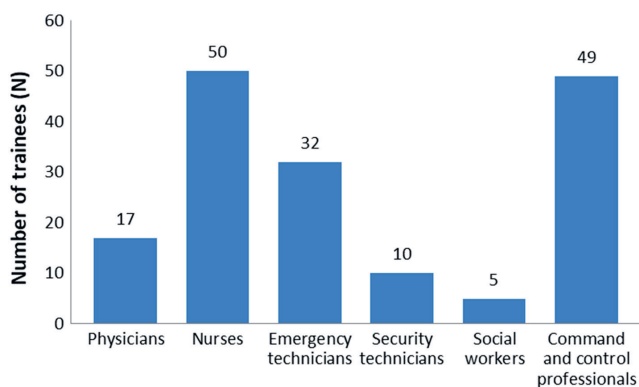Fig. 9. Distribution of the 163 trainees by age group

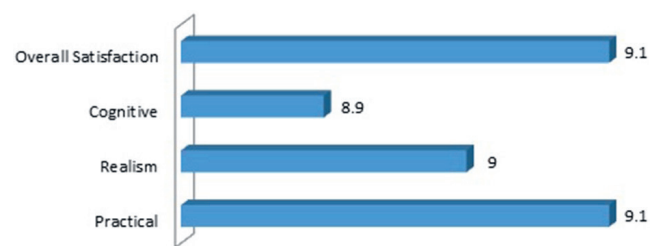Fig. 10. Distribution of the 163 trainees by professional category

Fig. 11. Overall satisfaction and analyzed dimensions of MRMI trainees, using Likert Scale (0–10)

Table 1. Distribution of the two groups of trainees (health and non-health professional) by gender

Sex	Health professional		p-value
	yes (n = 72)	no (n = 91)	
Male, n (%)	32 (44.4)	67 (73.6)	<0.0001
Female, n (%)	40 (55.6)	24 (26.4)	

Statistically significant for p < 0.05.

Table 2. Distribution of the two groups of trainees (health and non-health professional) by age groups

Age group	Health professional		p-value
	yes (n = 72)	no (n = 91)	
20 to 29 years, n (%)	23 (31.9)	7 (7.7)	<0.0001
30 to 39 years, n (%)	26 (36.1)	28 (30.8)	
40 to 49 years, n (%)	15 (20.8)	48 (52.7)	
50 to 59 years, n (%)	8 (11.1)	8 (8.8)	

Statistically significant for p < 0.05.

and included physicians, nurses, and psychologists. The group of non-health professionals consisted of 91 trainees (73.6% male) and comprised firefighters, police, security guards, coordinators, public managers and military (Table 1). The health professionals were older (p < 0.0001) (Table 2).

Table 3 presents the average scores for the different domains evaluated. Overall satisfaction was high. The health professionals graded the practical measure, realism dimension, and cognitive dimension and overall satisfaction higher than other non-health professionals.

Table 3. Analyzed dimensions and overall satisfaction of health and non-health professional's trainees

Dimensions	Health professional		p-value
	yes (n = 72)	no (n = 91)	
Practical	9.3 ±0.8	9.0 ±0.8	0.011
Realism	9.2 ±1.0	8.9 ±0.9	0.014
Cognitive	9.1 ±1.1	8.7 ±1.0	0.006
Overall satisfaction	9.2 ±0.9	8.9 ±0.8	0.007

Likert Scale (0–10) was used; statistically significant for p < 0.05.

Discussion

"Train more, perform better" is an indisputable truth and the MRMI course provided the opportunity for widespread training across Portugal and other countries in Europe and Asia. The success of the MRMI course is clearly manifested by the high volume of courses provided and the number of candidates trained every year.

The results of the questionnaire indicate that the level of satisfaction was high (90%), with the practical dimension being responsible for the highest score. The results highlight the quality of the course and support the improvement made by trainees. Differences were noted between the two groups (health and non-health professionals) in the three dimensions analyzed. Differences in the cognitive domain were the most evident. We assume that this is probably due to the lower level of medical education of non-health professionals. For participants from the military and militarized forces-security, the realism and practical dimensions were found to be lower. Though the main focus of the course is to improve the medical response of both medically oriented and non-medically oriented rescuers, integrating non-medical educational resources within the course, could further enhance the satisfaction of the non-medical rescuers and their willingness to participate in the MRMI courses in the future.

These results indicate the need to involve MRMI instructors with the same professional category as the trainees, thus strengthening the multi-agency involvement.

The feedback analysis encourages MIDTC to continue with this training while adapting it to new needs, such as e-learning (content and evaluations), video enhancement, different scenarios, involving know-how on how deal with the press, creating websites, updating the MACSIM system from a card based to a digital based system, among others.

The MRMI board allows each center to incorporate additional disaster response skills in order to train for various scenarios. In Madeira, an island with a high volume of sea related activities, there was an opportunity to compliment the educational program with the experience of the Portuguese Navy in dealing with potential sea related disaster – Mass Rescue Operation – MRO.[9]

Since the implementation of the MRMI course, the Civil Protection had to respond to several catastrophes. The concepts taught and trained in the MRMI course were clearly reflected in the way the different agencies responded. This point is still the subject of study by MIDTC in the data analysis.

Limitations

Only a minority of participants' feedback evaluations was included in this study, which might generate selection bias. We started evaluating the participants' perception of the course only recently. During the first years, most of our attention was invested in the implementation of the MRMI course. However, with further development of the course, the instructors thought it necessary to evaluate the satisfaction level of the trainees. We intend to continue and analyze in future courses the degree of satisfaction of the trainees, as well as to assess the level of knowledge acquired and its impact on individual or institutional performances.

Conclusions

In his textbook, Prof. Sten Lennquist states that the best way to train for major incidents and disasters is by the use of interactive simulations ("learning by doing") using realistic scenarios, where decision-making plays a key role.[2]

"Train more, perform better" is a wonderful truth. Using the same language while in an MRMI training as in an actual catastrophe makes MRMI a practical doctrine to be implemented by all parties, responders, as much as regional and national leaders, allowing for a perfect symbiosis with the national policies in disaster management.

The study shows the relevance and satisfaction of the course for the trainees. We do recognize that MRMI improved the response to major incidents in Madeira and Mainland Portugal, although future studies should include a long-term survey to quantify the change in the candidate's attitudes.

Further approaches with multi-victims in pandemic scenarios (e.g., COVID-19) must be considered by various centers in Europe, including the active participation of the Madeira group.

ORCID iDs

Luis Manuel Ramada Pereira Vale
 https://orcid.org/0000-0003-1340-9625
Rui Nuno Faria https://orcid.org/0000-0002-6226-6045
Dinarte João Freitas https://orcid.org/0000-0002-9444-1442
Luís Jardim https://orcid.org/0000-0001-5008-6648
Pedro Ramos https://orcid.org/0000-0003-3616-1175

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